Clay County Multi-Hazard Mitigation Plan

January 2025

Prepared for:

Clay County Emergency Management Agency
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EXECUTIVE SUMMARY

The Federal Emergency Management Agency (FEMA) defines the disaster life cycle as the process through which emergency managers respond to disasters when they occur; help people and institutions recover from them; reduce the risk of future losses; and prepare for emergencies and disasters. In **Figure i** each phase in the Emergency Management Lifecycle; Mitigate, Prepare, Respond, and Recover has a description of the phase as well as a time frame within the disaster cycle. Although each of the phases is visually tied to a specific time period within the life cycle of the disaster, mitigation can take place throughout much of the disaster life cycle. The Clay County Multi-Hazard Mitigation Plan (MHMP) update focuses on the mitigation activities that may be implemented throughout the disaster life cycle.

Figure i Phases of the Emergency Management Lifecycle

According to FEMA, mitigation is most effective when it's based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs. The MHMP planning process identifies hazards, the extent that they affect the municipality, and formulates mitigation practices to ultimately reduce the social, physical, and economic impact of the hazards.

The overall goals of the Clay County MHMP, which align closely with the State of Indiana MHMP, are:

1) Lessen the impacts of disasters and enhance community resilience.
2) Minimize the loss of life and injuries caused by disasters.
3) Promote mitigation activities both prior to and following a disaster.

To achieve the stated goals the community strategy includes the following:

1) Lessen the impacts of disasters and enhance community resilience by:
   a. Supporting resilience opportunities within the community
   b. Incorporating the MHMP into local ordinances, local planning efforts and the community comprehensive plans
   c. Evaluating and strengthening collaboration among organizations
   d. Making sure essential facilities can withstand disasters
   e. Supporting the NFIP
   f. Identifying opportunities to reduce repetitive loss incidents

2) Minimize the loss of life and injures caused by disasters by:
   a. Improving warning systems for the residents
   b. Developing public awareness and outreach programs
   c. Improving shelter availability
   d. Developing a program of affordable housing that is resilient to flooding
   e. Improving education and training for emergency personnel and officials
   f. Developing ways to provide education, awareness, and warning of disasters to the underserved populations.

3) Promote mitigation activities prior to and following a disaster by:
   a. Ensuring better communication between federal, state and local officials
   b. Seizing opportunities to buy out properties, floodproof buildings, or improve building codes

c. Conducting new studies and/or research opportunities to reduce impacts from disasters and prepare for future events anticipating the impacts of our changing climate.
d. Conducting outreach efforts to educate community members of the risks and hazards in their area as well as encouraging the implementation of a variety of mitigation actions.

For National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt either their own MHMP or participate in the development of a multi-jurisdictional MHMP. Further, it is required that local jurisdictions review, revise, and resubmit the MHMP every five years. As representatives from Clay County, the City of Brazil, the Towns of Carbon, Center Point, Clay City, Harmony, Knightsville, and Staunton have provided information, attended meetings, and participated in the planning process, the planning process used to update the Clay County MHMP satisfies the requirements of a multi-jurisdictional plan.

During Planning Committee meetings, those in attendance revisited existing the 2018 MHMP and identified new critical facilities and local hazards; reviewed the State's mitigation goals and updated the local mitigation goals; reviewed the most recent local hazard data, vulnerability assessment, and maps; evaluated the effectiveness of existing mitigation measures and identified new mitigation projects; and reviewed materials for public participation. Keeping in mind the ever-changing climate, the team also examined the needs of underserved populations that may be more vulnerable to the impacts of the listed hazards. Meetings were conducted with key groups such as city planners, health department specialists, representatives of organizations serving the underserved populations and various emergency responders. Their information has been incorporated into this MHMP update. This plan update will examine each of the hazards with data from the past 5 years, where possible.

The review of hazards and risks is based on the methodology described in the Local Mitigation Planning Policy Guide FP 206-21-0002, Effective April 19, 2023. The plan identifies the hazards assessed, the nature of each hazard including historic occurrences, vulnerabilities, and the relationship to other hazards. Using a ranking tool known as the Calculated Risk Priority Index (CPRI), the planning team scored each of the hazards. **Table i** lists the hazards in the plan and compares the scores to the previous plan. The CPRI scores reflect the hazards of most concern by the planning team members and change from one plan to another based on recent experiences, changes in community demographics, and challenges.

Table i: Comparison of CPRI Scores for All Hazards

Hazard	2024 Rank	CPRI Score	2016 Rank	Hazard
Hazard Materials	1	3.9	7	Hazmat
Land Subsidence	2	3..57	9	Gound Failure
Wildfire - Fire	3	3.50	11	Fire
Hail/Thunderstorm/Wind	4	2.93	3	Severe Thunderstorm/Winds
Winter storm and Ice	5	2.81	2	Winter Storm
Drought	6	2.77	10	Drought
Flood	7	2.64	5/6	Flood/Flash Flood
Extreme Temperatures	8	2.56	12	Extreme Temperatures
Tornado	9	2.50	1	Tornado
Dam/Levee Failures	10	1.45	13/14	Dam/Levee Failure
Earthquake	11	1.45	8	Earthquake
			4	Utility Failure

Lastly, the plan concludes with a discussion about mitigation actions. The MHMP lists a variety of mitigation actions the planning team members would like to accomplish within the next 5 years to enhance the resilience of Clay County. In addition, it celebrates the mitigation successes from the previous MHMP Plans and community actions which contribute to mitigating the various risks and hazards identified.

This MHMP is a living document which has a 5-year life span. During the next 5 years, Clay County and the incorporated communities that adopt this plan will work to complete the mitigation actions as well as regularly noting items for the 2029 MHMP update. The County EMA and planning team members will also use tools contained in the Appendices, or similar documents, to track progress, and note changes that may impact community resilience.

1.0 INTRODUCTION

1.1 DISASTER LIFE CYCLE

The Federal Emergency Management Agency (FEMA) defines the disaster life cycle as the process through which emergency managers respond to disasters when they occur; help people and institutions recover from them; reduce the risk of future losses; and prepare for emergencies and disasters. The disaster life cycle, shown in **Figure 1** includes four phases:

Figure 1 Disaster Life Cycle

Mitigation – to prevent or to reduce the effects of disasters (building codes and zoning, vulnerability analyses, public education)
Preparedness – planning, organizing, training, equipping, exercising, evaluation and improvement activities to ensure effective coordination and the enhancement of capabilities (preparedness plans, emergency exercises/training, warning systems)
Response – the mobilization of the necessary emergency services and first responders to the disaster area (search and rescue; emergency relief)
Recovery – to restore the affected area to its previous state (rebuilding destroyed property, re-employment, and the repair of other essential infrastructure)

The Clay County Multi-Hazard Mitigation Plan (MHMP) focuses on the mitigation phase of the disaster life cycle. According to FEMA, mitigation is most effective when it's based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs. Recent reviews of grant programs have determined for every $1 spent on mitigation efforts, between $6 and $10 are saved within the community on efforts following disasters. The MHMP planning process identifies hazards, the extent that they affect the municipality, and formulates mitigation practices to ultimately reduce the social, physical, and economic impact of the hazards.

1.2 PROJECT SCOPE & PURPOSE

REQUIREMENT §201.6(d)(3):

A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.

The purpose of mitigation planning is for State, local, and Indian tribal governments to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources. (44 CFR §201.1(b))

A FEMA-approved MHMP is required to apply for and/or receive project grants under the Building Resilient Infrastructure and Communities (BRIC), Hazard Mitigation Grant Program (HMGP), and Flood Mitigation Assistance (FMA). Additional detailed studies may need to be completed prior to applying for these grants even though this plan meets the requirements of DMA 2000 and eligibility requirements of the above listed grant programs.

The National Flood Insurance Program (NFIP) requires participating communities adopt either their own MHMP or participate in the development of a multi-jurisdictional MHMP to be eligible for future mitigation funds. The Indiana Department of Homeland Security (IDHS) and the United States Department of Homeland Security (US DHS)/FEMA Region V offices administer the MHMP program in Indiana. Local jurisdictions are required to review, revise, and resubmit the MHMP every five years. The MHMP updates must demonstrate that progress has been made in the last five years to fulfill the commitments outlined in the previously approved MHMP. The update may validate the information in the previously approved MHMP or may be a major rewrite depending on community needs and planning guidance. The updated MHMP is not intended to be an annex to the previously approved Plan; it stands on its own as a complete and current MHMP.

The Clay County MHMP Update is a multi-jurisdictional planning effort led by the Clay County EMA. This Plan was prepared in partnership with Clay County, the City of Brazil, the Towns of Carbon, Center Point, Clay City, Harmony, Knightsville, and Staunton. Representatives from these communities attended the Committee meetings, provided valuable information about their community, reviewed, and commented on the draft MHMP, and assisted with local adoption of the approved Plan. As each of the jurisdictions had an equal opportunity for participation and representation in the planning process, the process used to update the Clay County MHMP satisfies the requirements of DMA 2000 in which multi-jurisdictional plans may be accepted.

The Community Rating Service (CRS) program is a voluntary incentive program that recognizes and encourages community floodplain activities that exceed the minimum NFIP requirements. As a result, flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote education and awareness of flood insurance. Savings in flood insurance premiums are proportional to the points assigned to various activities. A minimum of 500 points is necessary to enter the CRS program and receive a 5% flood insurance premium discount. This MHMP could contribute as many as 374 points toward participation in the CRS. At the time of this planning effort, the City of Brazil and Cay County participated in the NFIP. Throughout this Plan, activities that could count toward CRS points are identified with the NFIP/CRS logo. (**Figure 2)** Acronyms referenced throughout this plan are contained in **Appendix 1.**

Figure 2 NFIP/CRS Logo

Funding to update the MHMP was made available through a FEMA/DHS grant awarded to the Clay County EMA and is administered by IDHS. Clay County provided the local 25% match required by the grant. Christopher B. Burke Engineering, LLC (Burke) was hired to facilitate the planning process and prepare the Clay County MHMP.

1.3 ANALYSIS PROCESS

REQUIREMENT §201.6(c)(1):

The plan shall document the planning process used to prepare the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Preparation for the Clay County MHMP Update began in 2022, when the grant request was approved by FEMA and grant funds were awarded in 2022. The plan update process began immediately upon the hiring of Chrispher B. Burke Engineering, LLC. The planning process to update the 2016 MHMP took 24 months. This included a review period by IDHS and FEMA for the draft MHMP Update, and time for Clay County and communities to adopt the final MHMP Update.

1.3.1 Planning Committee and Involvement of Other Interested Parties

In February of 2022, the EMA began to compile a list of Planning Committee members to guide the MHMP update planning process. These individuals were specifically invited to serve on the Committee because they were knowledgeable of local hazards; have been involved in hazard mitigation activities; have the tools necessary to reduce the impact of future hazard events; and/or served as a representative on the prior Planning Committee in 2016. Parke, Putnam, Owen, Greene, Sullivan, and Vigo Counties were invited to attend the team meetings and were given an opportunity to provide input and feedback to the plan throughout the planning process and during draft review. No comments or corrections were received from the neighboring EMA offices. **Table 1** lists the individuals that actively participated on the Committee and the entity they represented.

Table 1: Clay County MHMP Planning Team

Name	Title	Organization	Representing
Linda Archer	Town Business Manager	Town of Carbon	Town of Carbon
Donnella Baumgartner	Council	Clay City Town Council	Town of Clay City
Mike Bemis	Town Board President	Town of Carbon	Town of Carbon
Jake Bennett	Fire Chief	City of Brazil Fire Department	City of Brazil
David Brinson	Storm Board	Clay County Storm Board	Clay County
Christine Carrico	Emergency Preparedness Coordinator	Clay County Health Department	Clay County
Josh Clarke	Chief of Police	Clay County Schools	Clay County
Susan Clodfelter	Clerk	Town of Knightsville	Town of Knightsville
Don Dayhoff	Town Board	Clay City	Town of Clay City
Melissa Gambill	911 Director	Clay County 911	Clay County
Robert Gambill	Director	Clay County EMA Director	Town of Staunton
Carl Haviland	Town Council	Town of Clay City	Town of Clay City
James Hayes	Vice President	Carbon Town Council	Town of Carbon
Bryan Husband	Fire Chief	Lewis Township	
Jade Knox	Public Information Officer	Bowling Green Vol. Fire Dept.	
Crissy Lawson	Executive Director	Brazil Housing Authority	City of Brazil
Andrew Marshall	Deputy	Clay County Sheriff's Office	Clay County
Janet McClellan	Planning and Zoning	City of Brazil	City of Brazil
Clint McQueen	Police Chief	Brazil Police Department	City of Brazil
Eric Oberholtzer	Chief Deputy	Clay County Sheriff's Office	Clay County
David Peck	Director	Star Ambulance	
Charles Phipps	SO/Emergency Management	Clay Hospital	Clay Hospital
Terry Silver	Chief	Clay City Police	Town of Clay City
Paul Sinders	Commissioner	Clay County Commissioners	Clay County
Roy Smith	Town Council	Town of Center Point	Town of Center Point
Brad Stultz	Highway Dept. Superintendent	Clay County Highway	Clay County
Chris Stylelo	Town Board President	Town of Knightsville	Town of Knightsville
Brian Swearingen	Sheriff	Clay County Sheriff's Office	Clay County
Larry Tempel	LEPC – Posey Fire	Staunton	Town of Stauton

Members of the Committee participated in the MHMP Update through various team meetings as well as outside group meetings where mitigation opportunities are supported or addressed. During the MHMP team meetings, the Committee:

- Reviewed the State's mitigation goals and updated the local mitigation goals.

- Reviewed the most recent local hazard data, vulnerability assessment, and maps.
- Comparatively evaluated and ranked the hazards based on probability of occurrence, impact, warning time and duration of the hazard event.
- Revisited existing (in the 2018 MHMP) critical and essential infrastructure and identified new critical infrastructure and local hazards.
- Evaluated the effectiveness of existing mitigation measures and identified new mitigation projects.
- Reviewed materials for public participation.

A sign-in sheet recorded those present at each meeting to document participation. The following members also represented the underserved populations: Christine Carrico – Clay County Health Department, Charles Phipps – Clay Hospital, as well as the EMA director, several firefighters and police department that regularly deal with the underserved populations. There are no census tracts in the Clay County which are identified as disadvantaged population areas. The Clay County team members were able to speak about the needs of the disadvantaged and programs currently underway to assist community members. Crissy Lawson from the Housing Authority was able to address issues associated with housing needs of the community. Meeting agendas and summaries are included in **Appendix 2**. Members of the Committee also reviewed a draft MHMP, provided comments and suggestions, and assisted with adoption of the Clay County MHMP Update.

1.3.2 Public Involvement

The Clay County Director of Emergency Management kept the public up to date about the planning process by placing an article in the local paper about the planning meetings. In addition, the EMA Director has reported on the planning effort at public commissioner's meetings, LEPC meetings, and other events. A draft of the Clay County MHMP Update was posted to the Clay County website for public review and comment. A media release indicating the posting of the draft MHMP and the ability to comment was submitted for release. No comments or corrections were received from the public or the Committee. The media release, web page posting, and any comments received are included in **Appendix 3**.

Neighboring Emergency Managers were invited to attend both planning meetings as well as being provided with an opportunity to review the draft plan. EMA Directors and staff from Adams and Whitley Counties attended the planning meetings. No comments or corrections were received from the neighboring Emergency Management Agencies in Parke, Putnam, Owen, Greene, Sullivan, and Vigo Counties.

1.4 PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION

REQUIREMENT §201.6(c)(1):

The plan shall include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

During the development of the Clay County MHMP Update, several relevant sources of information were reviewed either as a document or through discussions with local personnel. This exercise was completed to gather updated information since the development of the previous Clay County MHMP, and to assist the Committee in developing potential mitigation measures to reduce the social, physical, and economic losses associated with hazards affecting the County.

Just as the 2016 Clay County MHMP informed the plan writers of key concerns for the communities in 2016, including housing, land development and flood risks, this planning effort includes the review of

community specific plans and studies for incorporation in this plan update. For the purposes of this planning effort, the following materials (among others) were discussed and utilized:

- MHMP Clay County 2016
- Clay County Comprehensive Plan
- City of Brazil Comprehensive Plan 1964
- Clay County Ordinances
- City of Brazil Ordinances
- Watershed Management Plans for Big Walnut Creek, Otter Creek, Eel River, and Busseron Creek
- Flood Insurance Rate Maps and Flood Insurance Studies – FEMA and INFIP

The MHMP was used to inform decision makers during recent ordinance updates. Although not directly incorporated into other plans, the MHMP has served as a reference and information source for other planning efforts.

This MHMP planning effort sought to use existing plans to inform the planning team about mitigation actions that would support the community development, as outlined in the comprehensive plans, and to support and/or enhance existing ordinances.

The Clay County Building and Planning Department has jurisdiction over the unincorporated rural areas of Clay County as well as the Towns of Carbon, Center Point, Clay City, Harmony and Staunton. The City of Brazil has its own Building Department.

In addition to local agencies and offices such as those listed above, several regional and state agencies were contacted and subsequently provided data for this planning effort. Those contacts, and the information they provided, include:

- Indiana Department of Natural Resources, Division of Water – *Flood insurance policies, claims, and payment information; NFIP Participation; DNR listed Dams and associated records; Dam Breach Inundation App; and IN Floodplain Information Portal.*
- Indiana Department of Natural Resources, Other Divisions – *Mining Records*
- Indiana Geologic Survey and Water – *Earthquakes in Indiana; Liquefaction Potential Map: Karst Regions and Maps of Karst locations*
- Indiana Geographic Information Office - *IndianaMap*
- Indiana Department of Homeland Security – *Current Fire and Building Code Information*
- FEMA, Region V – Repetitive loss structure counts and insurance payments and FIRM Maps and Flood Studies
- Midwest Regional Climate Center – Climate Trends; County specific climate reports
- National Weather Service – Indianapolis Weather Forecast Office – Confirmation of WSSI tool; local storm reports; weather event photos.

The CRS program credits NFIP communities with a maximum of 170 points. Up to 15 points for organizing a planning committee composed of staff from various departments; up to 120 points for involving the public in the planning process; and up to 35 points for coordinating among other agencies and departments to resolve common problems relating to flooding and other known natural hazards.

2.0 COMMUNITY INFORMATION

Figure 3 Clay County Location

Clay County was established in 1825 and is named after Henry Clay. He was a famous statesman, senator, and author of the 1850 Missouri Compromise. Clay County has had 5 courthouses; the original one in 1828, second one in 1830's was destroyed by fire, rebuilt in 18660's, moved in 1876, and the final one was built in 1913-1914. The final courthouse is one of the most historical and architectural buildings in the City of Brazil and Clay County.

Clay County has been home to Exotic Feline Rescue Center in Center Point since the early 1990's. The Center serves as a rescue center and long-term home for many exotic felines that have been abused, unwanted or neglected. There are over 100 cats and foxes from 26 different states on 200 acres. They include tigers, lions, bobcats, leopards, etc.

Clay County has low rolling hills mostly agricultural and urban development. The total area of Clay County is 360.32 square miles of which 2.78 square miles is water. The county is divided into 11 townships. The City of Brazil serves as the county seat. The location of the county within the State of Indiana is identified in **Figure 3** Clay County Location**.**

2.1 POPULATION AND DEMOGRAPHICS

The US Census Bureau estimates the 2023 population for Clay County was 26,460 which ranks 59 of 92 in the State. Since 2020, increased by -0.0%, the City of Brazil is the county's largest incorporated area, accounting for 31.0% of the county's population (8,214 people). Clay County is a predominantly white community, making up 96.7% of the county's racial demographics. The county is 97.9% non-Hispanic and 2.1% Hispanic.

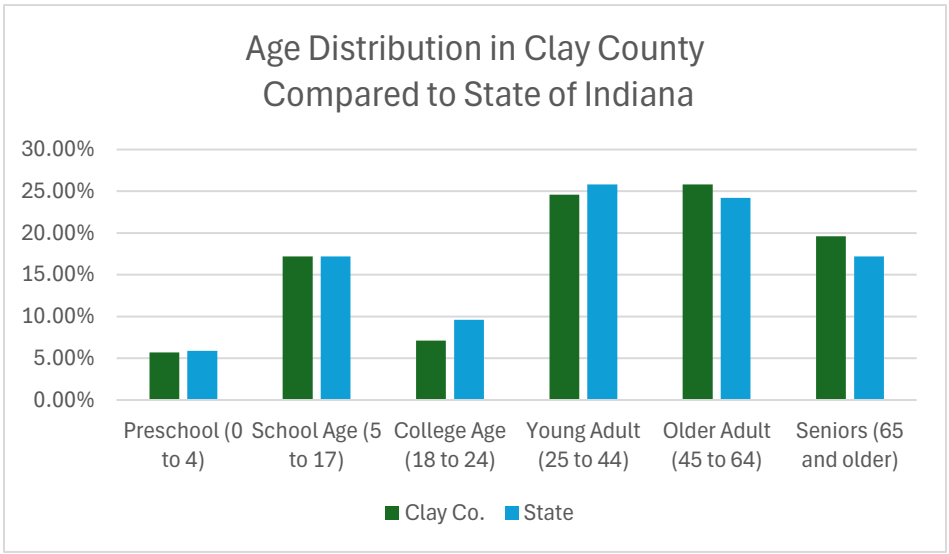


Figure 4 Clay County Population Compared to Indiana

In 2022, the median age of the population in the county was 41.4 years of age. The largest demographic age group in the county is Older Adults (45 to 64) making up 25.8% of the county's population. The second largest is the Younger Adult group (25 to 44) making up 24.6% of the county and the third largest age group is the Seniors group (65 and older). The school age group (5 to 17) follows, making up 17.2% of the population; then the college age group (18 to 24) and finally the preschool age group (0 to 4). Clay County age distribution is very similar to the state. Adults make up the largest portion of the population and this will be very important as the hazards are evaluated. **Figure 4** Clay County Population Compared to Indiana shows the age distribution totals compared to the state.

The approximate median household income in 2022 was reported to be $59,057 while the poverty rate in the same year was reported at 12.7% county-wide. In total, 2,017 (19.4%) of households are married with children, and 3,453 (33.1%) of households are married without children. There are 927 single parents in Clay County with the remaining 2,561 (24.6%) of the population living alone.

Within the county, 91.4% of adults older than 25, have reportedly completed a High School education. Further, 16.9% of those same adults have also completed a Bachelor of Arts or higher degree.

In the past 13 years, Clay County population has seen a slight decline in population. The lowest decline of 391 people (-1.5%) was in 2017. The US Census population projections anticipate the county will shrink in population by 2030 to 26,257 people.

2.2 EMPLOYMENT

US Census data indicates that of the Clay County workforce, the private sector is the largest employment sector within the county at 83.8%, followed by Government at 11% and then by Farming at 5%. Manufacturing is the largest private sector at 26.5%. The "Other Private – not listed above" category represents the second largest group within the Private Sector Employment category at 16.6%. The total resident labor force according to estimates in 2022 is 11,589 (with 397 unemployed) and as of September 2024, unemployment rate of 4.4%. The top 10 employers, based on number of employees, within Clay County according to Hoosiers by the Numbers are:

1. Great Dane Trailers (Brazil)
2. Process Development-Fabrications (Brazil)
3. Ascension St. Vincent Clay (Brazil)
4. Morris Manufacturing & Sales (Brazil)
5. Walmart (Brazil)
6. Kroger (Brazil)
7. North Clay Middle School (Brazil)
8. IVC/PPG Industrial Coatings (Brazil)
9. Northview High School (Brazil)
10. Cloverleaf Healthcare (Knightsville)

Clay County is part of the West Central Indiana Economic Development along with Vermillion, Parke, Putnam, Vigo, and Sullivan Counties. Clay County is home of the popcorn capital of the world, Orville Redenbacher. The key industries are Advanced Manufacturing, Health care, Agriculture, and Business Services. Education leads the way with world-class Rose-Hulman Institute of Technology, DePauw University, Indiana State University, Saint Mary of the Woods College, and Ivy Tech Community College. The County Economic Development team is working to grow the local economy and is working with community leaders with innovative plans with featured sites and locations.

2.3 TRANSPORTATION AND COMMUTING PATTERNS

Interstate 70 and US Route 40 crosses Clay County from east to west with State Roads 42, 46, 48, 59, 157, 159,246, and 340 serving as main connectors throughout the county. There is one railroad, Penn Central, which transects the county coming from Indianapolis to Terra Haute. **Figure 5** Clay County Transportation Routes shows the location of each of the transportation routes.

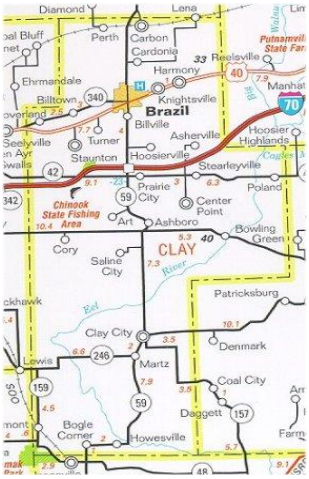


Figure 5 Clay County Transportation Routes

Although Clay County attracts several workers to the community from neighboring counties, a significant number of the Clay County workforce travel to neighboring counties for employment. According to STATSIndiana, 1,168 people commute into Clay County daily. Approximately 50.85% travel from Vigo County. Furthermore,

approximately 3,524 Clay County residents commute to other counties, with Vigo County receiving the greatest percentage of commuters from Clay County at 61.09%.

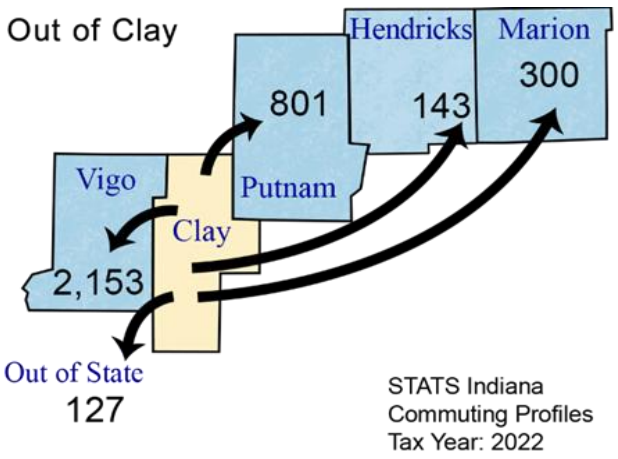


Figure 6 Commuters out of Clay County

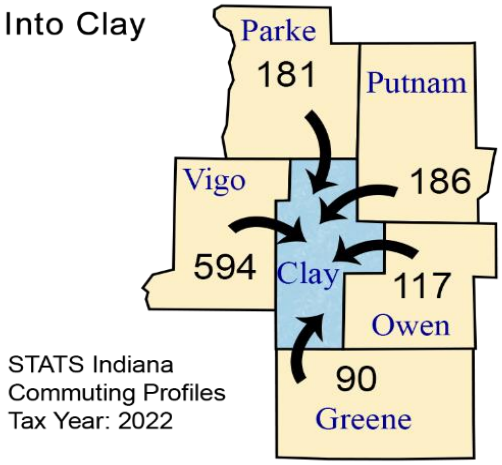


Figure 7 Commuters Traveling into Clay County

Figure 6 indicates the number of workers 16 and older who live in Clay County and commute out of the county for employment. .**Figure 7** indicates the number of Clay County residents 16 and older do not live within the County but commute into the County for employment purposes.

2.4 CRITICAL AND ESSENTIAL INFRASTRUCTURE

REQUIREMENT §201.6(c)(2)(ii)(A):

The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas….

Critical facilities, critical infrastructure, and essential facilities are the assets, systems, and networks, whether physical or virtual, so vital to local governments and the United States that their incapacitation or destruction would have a debilitating effect on security, economic security, public health or safety, or any combination thereof.

Figure 8 Clay County Courthouse

These structures are vital to the community's ability to provide essential services and protect life and property; are critical to the community's response and recovery activities; and/or are the facilities, the loss of which, would have a severe economic or catastrophic impact. The operation of these facilities becomes especially important following a hazard event.

The Clay County EMA and GIS Department Offices provided the listing and locations of the following 124 critical and essential facilities for the MHMP update. Critical facilities are infrastructure that is essential services for the community especially during and after a disaster such as hospitals, fire and

police stations. Essential facilities are necessary to maintain life, health, welfare and safety functions such as assisted living facilities, schools, places of worship, etc. **Figure 8** shows the Clay County Courthouse as one of the critical facilities. The following list identifies the number of each of the critical and essential facilities identified.

- 2 Airports
- 4 Assisted Living
- 1 Courthouse
- 4 Daycare Centers
- 12 Education/Schools
- 3 Emergency Services
- 1 Emergency Operation Center
- 11 Fire Departments
- 1 Hospital
- 8 Law Enforcement
- 4 Mobile Home Parks
- 79 Places of Worship
- 2 Shelters
- 10 Substations
- 42 Tier II Facilities

Information provided by the EMA, Clay County GIS, and the MHMP Planning Committee members was utilized to identify the types and locations of critical structures throughout the County. Draft maps were provided to the Planning Department and EMA, along with the Planning Committee for their review and all comments were incorporated into the maps and associated databases.

Exhibit 1, located after the narrative chapters of this document**,** illustrates the critical infrastructure identified throughout the unincorporated Clay County and the individual municipalities. **Appendix 4** lists the critical structures in Clay County by community. Non-critical structures include residential, industrial, commercial, and other structures not meeting the definition of a critical facility and are not required for a community to function. The development of this MHMP focused only on critical and essential structures; non-critical structures are neither mapped nor listed.

2.5 MAJOR WATERWAYS AND WATERSHEDS

According to the United States Geological Survey (USGS), there are 84 rivers and streams in Clay County, which are listed in **Appendix 5**. The county's main waterways are Eel River, Otter Creek, Birch Creek, Jordan Creek, Six Mile Creek, and Splunge Creek. The county lies within two 8-digit Hydrologic Unit Code (HUC): Eel River and Middle Wabash-Busseron. These major waterways, and others, are identified on **Exhibit 2**. There is one USGS gauges located in Clay County. The gauge is on the Eel River at Bowling Green.

Figure 9 Major Waterways of Clay County

Clay County is in the southwest part of the state. As a rural, agriculture-based community it is home to eight reservoirs, Twin Beach Lake, Tapawingo Lake, Izaak Walton Lake, Bowles Lake, Lake in the Woods, Water Works Lake, and Risslers Lake. There are several regulated drains in Clay County. Some of the other larger waterways in the county include Buck Creek, Busseron Creek, Knob Creek, Prairie Creek, White Oak Creek, Billy Creek, Bee Creek, and Big Creek. **Figure 9.**

Four Watershed Management Plans involving Clay County are available on the IDEM website. They are: Big Walnut, Busseron Creek, Otter Creek, and Eel River (Lower)

2.6 NFIP PARTICIPATION

The National Flood Insurance Program (NFIP) is a FEMA program that enables property owners in participating communities to purchase insurance protection against losses from flooding. According to FEMA, participation in the National Flood Insurance Program (NFIP) is voluntary. Clay County and the City of Brazil participate in the NFIP. At the time of this planning effort, according to the Indiana Department of Natural Resources, the Clay County Planning Director is responsible for the administration of the floodplain program in the unincorporated areas of the County as well as all the incorporated towns of the county. The City of Brazil has their own community floodplain administrator. Substantial damage determinations are carried out by the floodplain administrators and their designated personnel to remain in compliance with the community flood ordinances.

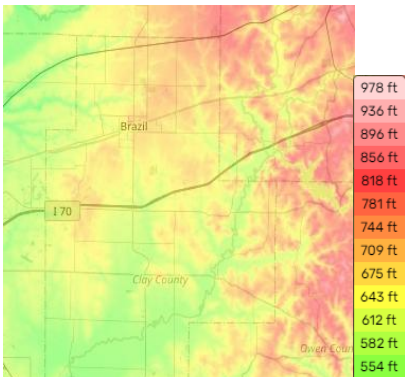
Note most of the towns have no Special Flood Hazard Area (SFHA).

Table 2 lists the NFIP number, effective map date, and the date each community joined the NFIP program from the NFIP Community Status Book. Clay County administers the program for the Towns of Carbon, Center Point, Clay City, Harmony, Knightsville, and Staunton. They do not have a join date on the latest FEMA Community Status Book Report. The NFIP Number as well as the flood hazard determination were located in the DNR Unity Database. Note most of the towns have no Special Flood Hazard Area (SFHA).

Table 2: NFIP Participation

NFIP Community	NFIP Number	Effective Map Date	Join Date
Clay County	180408	09/02/11	11/25/77
City of Brazil	180511	11/16/11	None shown
Town of Carbon	180534	09/02/11	No SFHA
Town of Center Point	180535	09/02/11	No SFHA
Town of Clay City	180536	09/02/11	No SFHA
Town of Harmony	180537	09/02/11	No SFHA
Town of Knightsville	180538	09/02/11	No SFHA
Town of Staunton	180539	09/02/11	No SFHA

2.7 TOPOGRAPHY



Clay County, Indiana, sprawls across 360.32 square miles, which is 357.54 square miles (99.23%) of land and 2.78 square miles is water (0.77%). The county shares its borders with Parke County to the North, Putnam County to the northeast, Owen County to the southeast, Vigo County to the west, Greene County to the south, and Sullivan County to the southwest. The Eel River enters the county north of the center of the eastern border with Putnam County and flows in a southwesterly direction across the county exits into Greene County. A second watershed is in the northwestern part of the county along Otter Creek draining west into Vigo County. These streams not only provide ample drainage for the county, but also

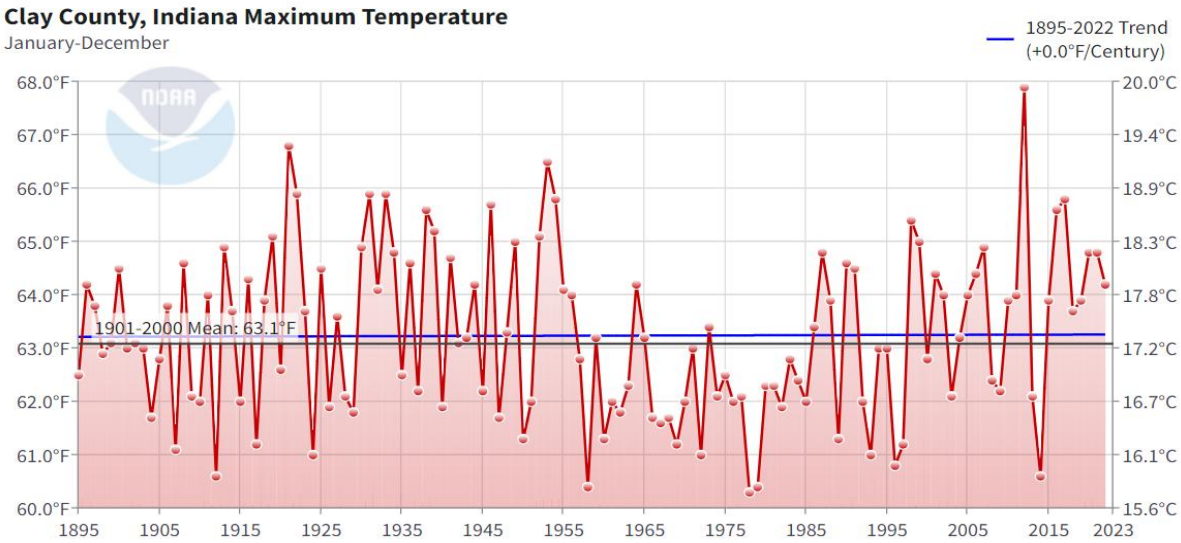


Figure 11 Maximum Temperature Trends from 1895 - 2023

provide shelter for wildlife. Most of Clay County is low flat ground and rolling hills. The land is devoted to either agriculture or urban development. With an average elevation of 620 feet, the highest point in the county is 925 feet, and the lowest point is 453 feet. The majority of the county land surface slopes toward the Eel River and its tributaries as it crosses the county. **Figure 10** the topographic map of Clay County. This riverside terrain offers wonderful views and opportunities for outdoor activities such as hiking, camping, and wildlife observation.

2.8 CLIMATE

In Clay County, the annual average maximum temperature was 63.1 degrees Fahrenheit with an average annual low (minimum) temperature of 41.3 degrees Fahrenheit. **Figure 11** and **Figure 12** chart the annual maximum and minimum temperatures and show trends utilizing data from the National Centers for Environmental Information (NCEI).The coldest month based on this data is January at a mean temperature of 28.7 degrees and the warmest is July with a mean temperature of 74.7 degrees. According to the Midwest Regional Climate Center (MRCC) between June 1, 1949, and October 16, 2024, at the Spencer, IN (the long-term weather data site), the maximum temperature was 107 degrees (7/19/1954), and the lowest minimum temperature was -33 degrees (1/19/1994). The average daily high was 63.5 degrees, which is 0.4 degree hotter than the median within that time frame. Additionally, the average daily minimum temperature for the same five-year period was recorded at 42.1 degrees. That is 0.8 degrees warmer than the median temperature identified at 41.3 degrees Fahrenheit.

May is typically the wettest month of the year, with February being the driest. The average annual precipitation for Clay County is 40.67 inches. In the past 8 years Clay County had a low of 32.63 inches in March 2024 and the highest annual precipitation of 56.82 inches. The highest monthly precipitation rate between January 2016 and September 2024 occurred in July 2022 where 7.46 inches fell. That is 2.13 times the normal average monthly rainfall amount of 3.5. On the opposite end of the spectrum the driest month was September of 2020 with 0.31 inches of precipitation. **Figure 13** illustrates the annual precipitation in Clay County.

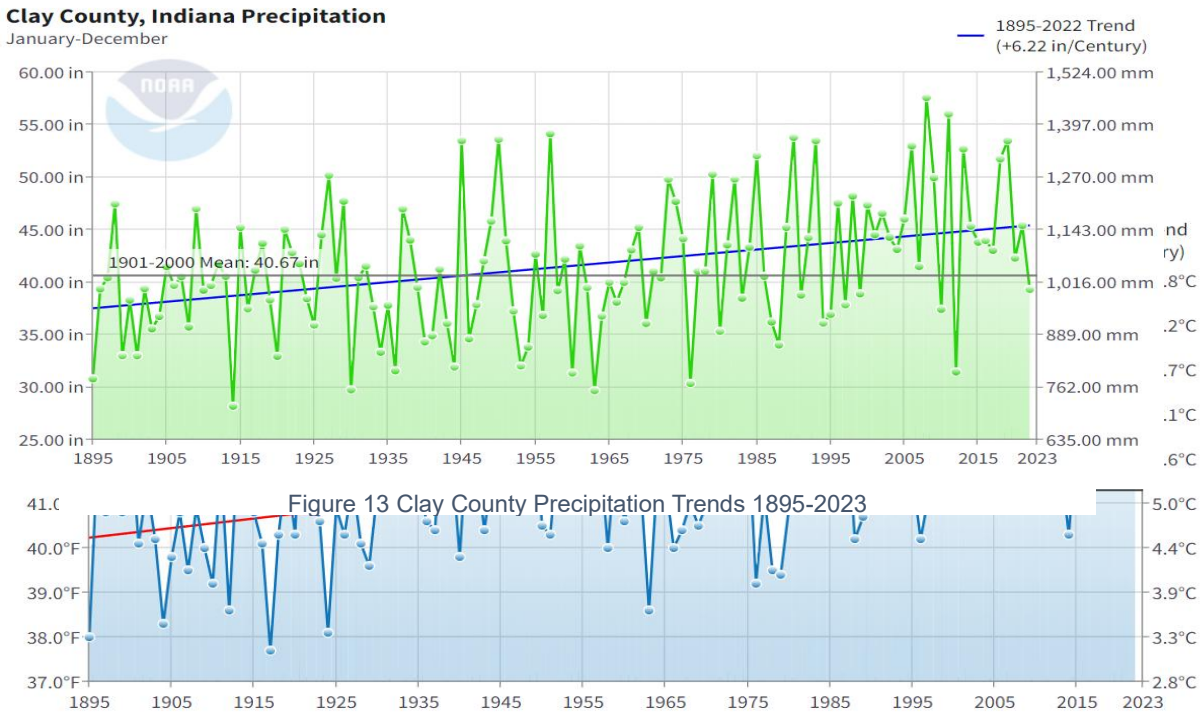


Figure 13 Clay County Precipitation Trends 1895-2023

Figure 12 Clay County Minimum Trends 1895-2023

Purdue University Indiana Climate Change Impacts Assessment Report analyzed the increased frequency of short duration high volume rain events, also known as extreme precipitation events, in Indiana. According to the report, an extreme rain event occurs when more than 0.86 inches of rain falls in a day. Since 1900, the number of days per year with extreme rain has been increasing by 0.2 days per decade on average. However, most of that increase has occurred since 1990.

The northwestern part of the state has seen the largest increase — a rate of about 0.4 days per decade. In **Figure 14** the trend line shows an increase in the number of days where the rainfall exceeds 99th percentile. This ever-increasing trend is resulting in more frequent flash flood and overland flood events.

According to NOAA National Centers for Environmental Information the State Climate Summary for Indiana the following observations have been observed based upon climate change:

- The temperatures have risen almost 1.5 degrees Fahrenheit since the beginning of the 20th Century. Temperatures in the 2000's have been higher than in any other historical period except during the early 1930's Dust Bowl era.
- Indiana has experienced an increase in the number of rain intensity is increasing and rain duration is decreasing.
- extreme events are increasing, especially flooding.

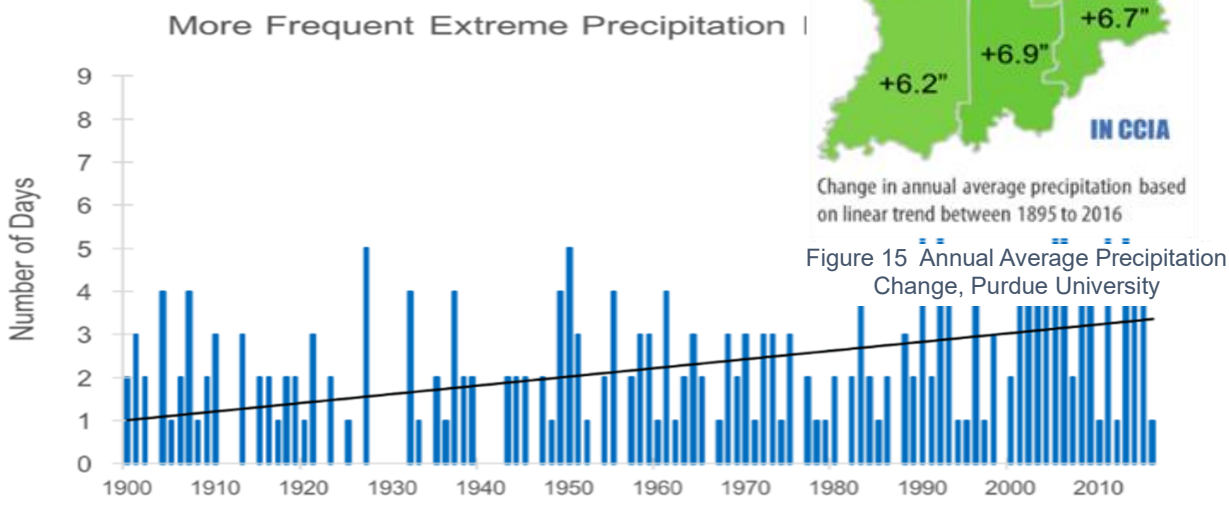


Figure 14 Extreme Precipitation Events in Indiana

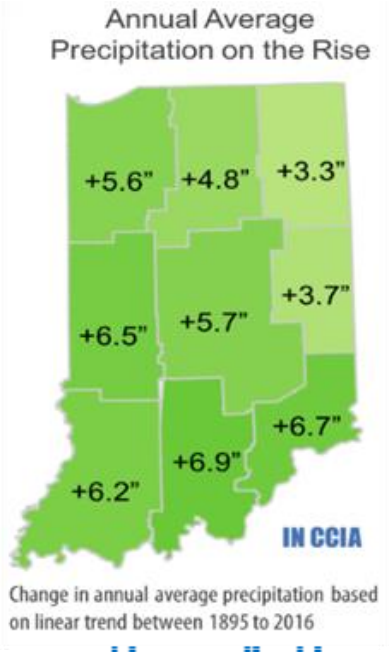


Figure 15 Annual Average Precipitation Change, Purdue University

This is also verified in the Indiana Climate Change Assessment report from Purdue University.**(Figure 15**) In the report, the authors wrote, "This assessment documents that significant changes in Indiana's climate have been underway for over a century, with the largest changes occurring in the past few decades. These projections suggest that the trends that are already occurring will continue, and the rates of these changes will accelerate. They indicate that Indiana's climate will warm dramatically in the coming decades, particularly in summer. Both the number of hot days and the hottest temperatures of the year are projected to increase markedly. Indiana's winters and springs are projected to become considerably wetter, and the frequency and intensity of extreme precipitation events are expected to increase, although more research is needed in this area to better determine the details."

2.9 UNDERSERVED, DISADVANTAGED AND SOCIALLY VULNERABLE POPULATIONS

For this planning effort, under the new FEMA guidance mitigation plan updates are required to include the perspective of socially vulnerable community members and the underserved communities in the county. The Agency for Toxic Substances and Disease Registry (ATSDR) and the Centers Disease Control (CDC) with higher education facilities to develop the Social Vulnerability Index (SVI). According to ATSDR/CDC, Social Vulnerability refers to the community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human caused threats, such as toxic chemical threats. Sixteen census-derived factors are grouped into 4 general themes which summarize the extent of social vulnerability. **Figure 16** shows the 16 factors and how they are grouped into the four themes. The more factors impacting community members to more vulnerable those members are to the hazardous events.

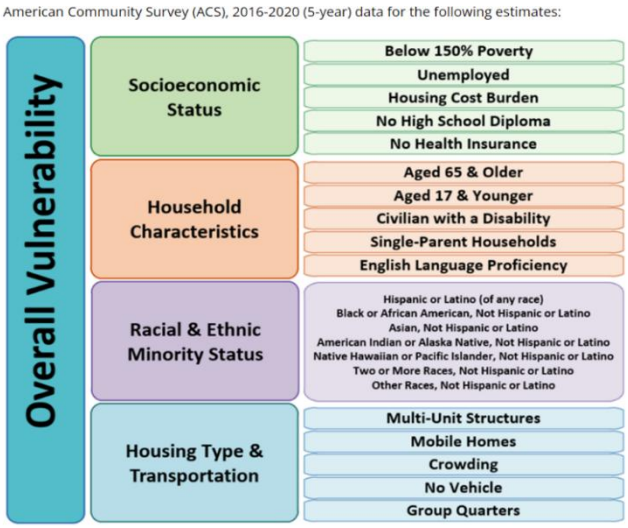


Figure 16 Social Vulnerability Factors

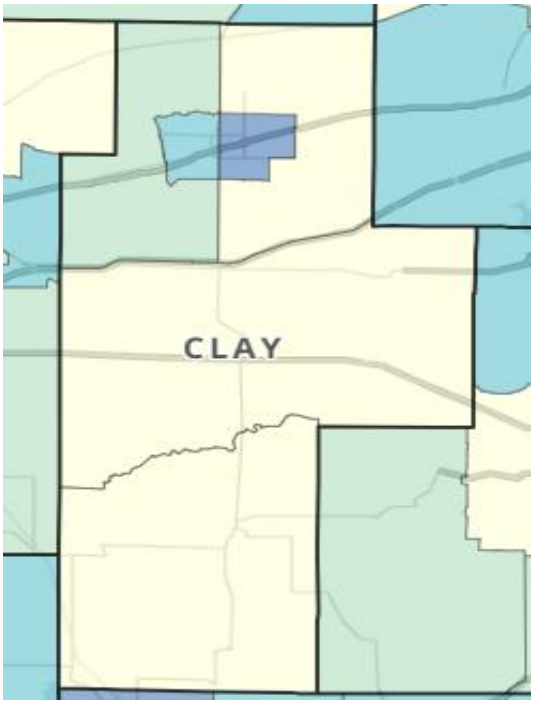


Figure 17 Clay County Social Vulnerability by Census Tract

Figure 17 is a map of the social vulnerabilty of each of the census tracts in Clay County. Further details, including the 4 thematic maps may be found in **Appendix 11**. The Social Vulnerability Index is used in FEMA's National Risk Index, where the data is paired with expected annual losses, and community resilience to calculate a risk index for each of the hazards. This data is available both on the county level and the census tract level. Overall as a county the social vulnerability is very low indicated by the pale yellow color. The northwest corner is low-medium indicated by the light green. The census tract on the west side of the City of Brazil is medium-high (light blue) and the east side of the city is high (dark blue). When struck by the same intensity event, the areas in dark blue on Figure 17 may require, more support in responding to and recovering from the hazardous event.

One last resource reviewed was the Climate and Economic Justice (CEJ) tool. Although the tool shows some similarities to the social vulnerabiltiy index, there are some differences.

The CEJ Tool highlights disadvantaged census tracts across all 50 states, the District of Columbia, and the U.S. territories. If the community is located in a census tracts that meet the thresholds for at least one of the tool's categories of burden, or if the community is on land within the boundaries of Federally Recognized Tribes then the people living within the census tract are considered disadvantaged.

There are no census tracts within Clay County which are considered disadvantaged.

The team discussed the impacts of social vulnerability on the overall commuity and where possible has identified mitigation efforts to help address the hazards and make these areas of the community more resilient.

2.10 COMMUNITY CAPACITY

In Indiana the Fire Prevention and Building Safety Commission is tasked with the establishment and maintenance of fire and building safety codes. The commission also reviews variance requests, code modification proposals and orders enforcing the fire and building safety law. Only the commission is permitted to adopt codes for the state. Local communities may not adopt editions other than those adopted by the state. All jurisdictions of the state are required to follow the state adopted fire safety and building laws.

Local Building Officials serve as the local authority for building construction matters within their jurisdiction. In Clay County, the county Local Building Official serves all the incorporated communities except the City of Brazil. The City of Brazil has its own Planning and Building Department. **Appendix 9** lists the local building official as well as a number of other key positions in each jurisdiction.

All the other incorporated communities and the county have digitally published their ordinances for easy access. The City of Brazil and Clay County have a local zoning ordinance, subdivision control ordinance, stormwater ordinance and flood ordinance. None currently have a water conservation ordinance. County and community leaders take advantage of grant funding to help address non-budgeted activities. The Health Department along with the hospital and county EMS service work together to assure health and safety needs are met. The planning team identified a few community-wide needs such as overnight sheltering capabilities for unhoused individuals but has already begun finding whole community solutions to address the challenges. As needs for capacity building are identified, the communities and their leadership work together to ensure the challenges are addressed.
The State of Indiana is presently working with subject matter experts to update the current fire and building safety codes to more recent International Code Council versions. Due to the hearing and adoptions processes this is a multi-year effort. It is hoped that within the next five years updated fire safety and building codes will be adopted to assist the community in becoming more resilient. In all cases, local floodplain ordinances are anticipated to be updated within the next five-year cycle using the state model ordinance to guide their process.

3.0 RISK ASSESSMENT

REQUIREMENT §201.6(c)(2):

[The risk assessment shall provide the] factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessment must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

A risk assessment measures the potential loss from a hazard incident by assessing the vulnerability of buildings, infrastructure, and people in a community. It identifies the characteristics and potential consequences of hazards, how much of the community may be affected by a hazard, and the impact on community assets. The risk assessment conducted for Clay County and the communities within is based on the methodology described in the Local Mitigation Planning Handbook published by FEMA in 2023 and is incorporated into the following sections:

Section 3.1: Hazard Identification lists the natural, technological, and political hazards selected by the Planning Committee as having the greatest direct and indirect impact to the county as well as the system used to rank and prioritize the hazards.

Section 3.2: Hazard Profile for each hazard, discusses 1) historic data relevant to the county where applicable; 2) vulnerability in terms of number and types of structures, repetitive loss properties (flood only), estimation of potential losses, and impact based on an analysis of development trends; and 3) the relationship to other hazards identified by the Planning Committee.

Section 3.3: Hazard Summary provides an overview of the risk assessment process; a table summarizing the relationship of the hazards; and a composite map to illustrate areas impacted by the hazards.

3.1 HAZARD IDENTIFICATION

3.1.1 Hazard Selection

The MHMP Planning Committee reviewed the list of natural and technological hazards in the 2016 Clay County MHMP, discussed recent events, and the potential for future hazard events. The Committee identified those hazards which affected the County and each community selecting the hazards to study in detail as part of this planning effort. As shown in **Table 3,** these hazards include dam failure; drought; earthquake; extreme temperature; fires and wildfire; flooding; hailstorms, thunderstorms, and windstorms; hazardous materials incident; land subsidence, landslides and fluvial erosion; snowstorms and ice storms; and tornado. All hazards studied within the 2016 Clay County MHMP, with the exception of utility failure, are included in the update. Since the COVID pandemic, the Health Department continues to develop plans and policies to better respond to and reduce the spread if both routine human disease-causing organisms as well as zoonotic diseases and changes in that field. Land Subsidence, Landslide, and Fluvial Erosion were added to the update since they are key hazards in the most recent Indiana State Multi-Hazard Mitigation Plan. The team will continue to assess the hazard inclusion for future MHMP updates.

Table 3: Hazards Selected

Type of Hazard	List of Hazards	MHMP	
		2016	2024
Natural	Drought	Yes	Yes
	Earthquake	Yes	Yes
	Extreme Temperature	Yes	Yes
	Fires and Wildfire	Yes	Yes
	Flood	Yes	Yes
	Hail/Thunder/Wind	Yes	Yes
	Land Subsidence/Landslide	No	Yes
	Snow / Ice Storm	Yes	Yes
	Tornado	Yes	Yes
Technological	Utility Failure	Yes	No
	Dam Failure	Yes	Yes
	Hazardous Material Incident	Yes	Yes

3.1.2 Hazard Ranking

The Planning Committee ranked the selected hazards in terms of importance and potential for disruption to the community using a modified version of the Calculated Priority Risk Index (CPRI). The CPRI is a tool by which individual hazards are evaluated and ranked according to an indexing system. The CPRI value (as modified by Burke) can be obtained by assigning varying degrees of risk probability, magnitude/severity, warning time, and the duration of the incident for each event, and then calculating as index value based on a weighted scheme. For ease of communications, simple graphical scales are used.

Probability:

Probability is defined as the likelihood of the hazard occurring over a given period. The probability can be specified in one of the following categories:

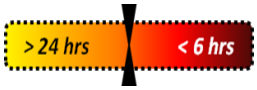
- Unlikely – incident is possible, but not probable, within the next 10 years.
- Possible – incident is probable within the next five years.
- Likely - incident is probable within the next three years.
- Highly Likely – incident is probable within the next calendar year.

Magnitude / Severity:

Magnitude/severity is defined by the extent of the injuries, shutdown of critical infrastructure, the extent of property damage sustained, and the duration of the incident response. The magnitude can be specified in one of the following categories:

- Negligible – few injuries OR critical infrastructure shutdown for 24 hours or less OR less than 10% property damaged OR average response duration of less than six hours.
- Limited – few injuries OR critical infrastructure shut down for more than one week OR more than 10% property damaged OR average response duration of less than one day.
- Significant – multiple injuries OR critical infrastructure shut down of at least two weeks OR more than 25% property damaged OR average response duration of less than one week.
- Critical – multiple deaths OR critical infrastructure shut down of one month or more OR more than 50% property damaged OR average response duration of less than one month.

Warning Time:



Warning time is defined as the length of time before the event occurs and can be specified in one of the following categories:

- More than 24 hours
- 12-24 hours
- 6-12 hours
- Less than six hours

Duration:

Duration is defined as the length of time that the actual event occurs. This does not include response or recovery efforts. The duration of the event can be specified in one of the following categories:

- Less than six hours
- Less than one day
- Less than one week
- Greater than one week

Calculating the CPRI:

The following calculation illustrates how the index values are weighted and how the CPRI value is calculated. CPRI = (Probability x 0.45) + (Magnitude/Severity x 0.30) + (Warning Time x 0.15) + (Duration x 0.10). For the purposes of this planning effort, the calculated risk is defined as:

- **Low** if the CPRI value is between 1 and 2.
- **Elevated** if the CPRI value is between 2 and 3.
- **Severe** if the CPRI value is between 3 and 4.

The CPRI value provides a means to assess the impact of one hazard relative to other hazards within the community. A CPRI value for each hazard was determined for each incorporated community in Clay County, and then a weighted CPRI value was computed based on the population size of each community.

Table 4 presents each community, population, and the weight applied to individual CPRI values to arrive at a combined value for the entire county. Weight was calculated based on the average percentage of each community's population in relation to the total population of the county. Thus, the results reflect the relative population influence of each community on the overall priority rank.

Table 4: Determination of Weighted Value for Communities

Community	Population (2021)	% of Total Population	Weighted Value
Clay County (w/o incorporated communities)	15,031	57.0%	0.570
City of Brazil	8,154	30.9%	0.309
Town of Carbon	259	1.0%	0.010
Town of Center Point	215	0.8%	0.008
Town of Clay City	879	3.3%	0.033
Town of Harmony	681	2.6%	0.026
Town of Knightsville	689	2.6%	0.026
Town of Staunton	471	1.8%	0.018
Total	**26,379**	**100.0%**	**1**

3.2 HAZARD PROFILES

The hazards studied for this report are not equally threatening to all communities throughout Clay County. While it would be difficult to predict the probability of an earthquake or tornado affecting a specific community, it is much easier to predict where the most damage would occur in a known hazard area such as a floodplain or near a facility utilizing an Extremely Hazardous Substance (EHS). The magnitude and severity of the same hazard may cause varying levels of damage in different communities.

In the past six years Indiana has had 3 FEMA disaster declarations and 1 FEMA Emergency Declaration.

- DR 4363, declared May 5, 2018, for Severe Storms and Flooding
- DR 4704, declared April 15, 2023, for Severe Storms, Straight-line Winds and Tornadoes
- DR 4515, declared April 3, 2020, for COVID 19 Pandemic
- EM 3456 declared March 13, 2020.

In addition, the US SBA had disaster declarations for 10 Indiana events. Of all these events in Indiana, Clay County was only included in the two COVID declarations (DR-4515 and EM-3456) and SBA declaration IN 20002 for Severe Storms and Tornadoes on June 25, 2024. Clay County was listed as a contiguous county. Contiguous counties may have sustained some damage, but are included because they are located next to a heavily damaged county which is the source of the declaration.

This section describes each of the hazards that were identified by the Planning Committee for detailed study as a part of this MHMP Update. The discussion is divided into the following subsections:

3.2.1 DROUGHT

Overview

Drought, in general, means a moisture deficit extensive enough to have social, environmental, or economic effects. Drought is not a rare and random climate incident; rather, it is a normal, naturally recurring feature of climate. Drought may occur in all climactic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration and is different from aridity, which is restricted to low rainfall regions.

There are four academic approaches to examining droughts; these are meteorological, hydrological, agricultural, and socio-economic. Meteorological drought is based on the degree, or measure, of dryness compared to a normal, or average amount of dryness, and the duration of the dry period. Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply. Agricultural drought is related to agricultural impacts; and focuses on precipitation shortages, differences between actual and potential evapo-transpiration, soil water deficits, reduced ground water or reservoir levels, and crop yields. Socioeconomic drought relates the lack of moisture to community functions in the full range of societal functions, including power generation, the local economy, and food source **Figure 18** shows urban grassed areas affected by drought conditions.

Figure 18 Urban Grass Affected by Drought

Recent Occurrences

Data gathered from the U.S. Drought Monitor indicated that between January 1, 2018 – September 30, 2024, there were 138 weeks where some portions of Clay County was identified as being “Abnormally Dry” or at Drought Monitor Level D0. According to the Drought Monitor, there were 61 weeks within that period where any portion of Clay County was in a drought state higher than a D0. **Figure 19** shows the distribution of weeks in drought over the 6-year time frame.

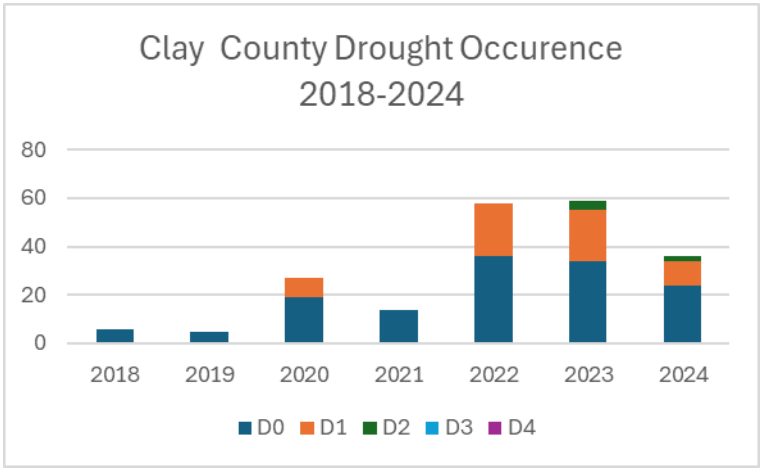


Figure 19 Drought Occurrences from January 2018 - September 2024

As rain patterns change there are periodic times when the county is deemed "Abnormally Dry" or D0. Most of these instances are resolved quickly as sufficient rain arrives and the soil rehydrates. On occasion, the rain is insufficient to address the dryness and weather conditions cause the soil to further dry out stressing crops and reducing lake levels. Examples of continued dryness can be found in 2020, 2022, 2023, and 2024. During each of these years, Clay County was found to be in "Moderate Drought" or D1. On July 14, 2020, USDA/NASS records showed crop conditions as of July 12 rated poor or very poor have reached or surpassed 10% for corn in Indiana and Ohio, and soy in Illinois, Indiana, and Ohio. The highest level of drought experienced in Clay County in the past five years is D2 or "Severe Drought". Many people will recall the summer of 2012 throughout Indiana because drought conditions had intensified and reached D3 for 11 weeks in Clay County. Burn bans were common and the fire threat was so great that all July 4 fireworks events were postponed or cancelled. Most recently, September 26, 2023 through January 9, 2024, Clay County once again was at D1 for 18 weeks. Although not as severe as 2012, due to high winds and low humidity many communities contemplated potential burn bans**. Figure 20**, from the U.S. Drought Monitor, describes the rationale to classify the severity of droughts.

Category	Description	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

Figure 20 US Drought Monitor Drought Classification Descriptions

Table 5: Percent of Each Year in Drought

Percent of the Year in Each Drought Category						
Year	None	D0	D1	D2	D3	D4
2018	88%	12%	0%	0%	0%	0%
2019	90%	10%	0%	0%	0%	0%
2020	64%	21%	15%	0%	0%	0%
2021	73%	27%	0%	0%	0%	0%
2022	31%	27%	42%	0%	0%	0%
2023	26%	33%	33%	8%	0%	0%
2024	15%	60%	20%	5%	0%	0%

The National Climate Data Center (NCDC) does not report any events nor property or crop losses within Clay County during this planning period in relation to drought. During discussions with the Planning Committee, effects from the drought were highlighted. Committee members recalled the dry conditions and discussed the large field/wildland fires which frequently occur during harvest season. Although NCDC does not show any reports of damage, fires during harvest result in damage to farming equipment even if crops are preserved. **Table 5** depicts the number of weeks per year at each of the drought levels indicated above. Clay County has not exceeded D2- Severe Drought during the past 6 years.

The Planning Committee, utilizing the CPRI, determined the overall risk of drought throughout Clay County is "Elevated." The impact of drought was determined to be the same for all communities and unincorporated area throughout the county due to the possible agricultural impacts and impacts to water wells. The committee agreed that a drought is "Highly Likely" (to occur within the next year)

except for City of Brazil and the Town of Knightsville it is “Likely”, and the magnitude of drought is anticipated to be “Limited” or “Negligible.” Further it is anticipated that with the enhanced weather forecasting abilities, the warning time for a drought is greater than 24 hours and the duration will be greater than one week. A summary is shown in Table 6.

Table 6: CPRI for Drought

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Clay County	Highly Likely	Limited	> 24 hours	> 1 week	Elevated
City of Brazil	Likely	Limited	> 24 hours	> 1 week	Elevated
Town of Carbon	Highly Likely	Limited	> 24 hours	> 1 week	Elevated
Town of Center Point	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Clay City	Highly Likely	Limited	> 24 hours	> 1 week	Elevated
Town of Harmony	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Knightsville	Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Stauton	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated

According to the National Drought Mitigation Center, scientists have difficulty predicting droughts more than one month in advance due to numerous variables such as the precipitation, temperature, soil moisture, topography, and air-sea interactions. Further anomalies may also enter the equation and create more dramatic droughts or lessen the severity of droughts. Based on the previous occurrences of significant droughts and drought related impacts felt within Clay County, the Committee estimated that the probability of a drought occurring in the area is “Highly Likely;” or occurrence is probable within the next year. The damage anticipated throughout the county is predicted to be “Limited” or “Negligible” as the municipalities rely on groundwater and surface water supplies for fire response efforts and face a higher risk during times of prolonged drought. Businesses and industry that rely upon water for their processes and products would be impacted by water limitations within the cities and towns. Throughout the unincorporated areas of the county, increased crop and livestock damage would also be expected during a significant drought. In addition, the long-term stress on the forested land could result in additional tree deaths and debris during subsequent high wind events.

Assessing Vulnerability

This type of hazard will generally affect entire counties and even multi-county regions at one time. Within Clay County, direct and indirect effects from a lengthy period of drought may include:

Direct Effects:

- Urban, developed areas, and local wildlife areas may experience revenue losses from decreased tourism; landscaping companies, golf courses revenue losses due to lack of growth and plant death; restrictions on industry cooling and processing demands; reduced incomes for businesses dependent on crop yields, and increased potential for fires.
- Rural areas within the county may experience revenue losses from reductions in decreased livestock and crop yields as well as increased incidence of field fires.
- Loss of tree canopy due to increased susceptibility to pests and diseases.
- Citizens served by drinking water wells or surface water supplies may be impacted during low water periods and may require drilling of deeper wells or loss of water service for a period.

- According to Purdue's Indiana Climate Change Impacts Assessment climate change will as temperatures rise, and rainfall patterns shift, managing multiple water needs will become increasingly difficult. This could result in more drought conditions.

Indirect Effects:

- Loss of income of employees from businesses and industry affected; loss of revenue to support services (food service, suppliers, etc.)
- Loss of revenue from recreational or tourism sectors associated with reservoirs, streams, and other open water venues.
- Lower yields from domestic gardens increasing the demand on purchasing produce and increased domestic water usage for landscaping.
- Increased demand for emergency responders and firefighting resources due to grass fires and increased medical calls for people having respiratory issues because of increased dust amounts.
- Drought conditions could make it more difficult for the underserved population as many of them do not have air conditioning which makes breathing more difficult and air quality conditions can become compromised.

Estimating Potential Losses

It is difficult to estimate the potential losses associated with a drought for Clay County because of the nature and complexity of this hazard and the limited data on past occurrences. However, for the purpose of this MHMP update, a scenario was used to estimate the potential crop loss and associated revenue lost due to a drought similar to that experienced during the drought of record from 1988. In 2023, Clay County produced approximately 12.008M bushels of corn and 3.68M bushels of soybeans, as reported by the United States Department of Agriculture (USDA) National Agricultural Statistics Service. Using national averages of $4.70 per bushel of corn and $12.80 per bushel of soybeans, the estimated crop receipts for 2023 would be $103.54M. Using the range of crop yield decreases reported in 1988 and 1989, just after the 1988 drought period (50%-86%) and assuming a typical year, economic losses could range between $51.7M-$88.0M; depending on the crop produced and the market demand. Effects of drought on corn crops can be seen in **Figure 21.**

Figure 21 Drought Effects on Corn Crop

Purdue Agriculture News reports that as of March 2013, Indiana producers received more than $1.49B in crop insurance payments for 2012 corn, soybean, and wheat losses. This amount is nearly double that of the previous record, $522M following 2008 losses, also due to drought. These losses are still considered to be record-setting in terms of drought effects, damages, and costs for Indiana. In comparison, in 2022 Indiana received $51,104,285 in crop insurance from the drought and weather-related events.

According to a July 5, 2012, article in The Times (Noblesville, IN), "The effects of drought also could touch agricultural businesses, such as handlers and processors, equipment dealers, and see,

fertilizer and pesticide providers." Additional losses associated with a prolonged drought are more difficult to quantify. Drought has lasting impacts on trees: death to all or portions of a tree, reduction in the tree's ability to withstand insects and diseases, and interruption of normal growth patterns. Such effects on trees, especially urban trees can lead to additional impacts, both environmentally and monetarily in terms of the spread of Emerald Ash Borer insect and the weakening of tree limbs and trunks which may lead to increased damage during other hazard events such as wind and ice storms. Loss of trees also alters wildlife habitats causing wildlife to find new areas to live, often causing increased wildlife deaths as they navigate through more urbanized areas to reach new habitats.

Future Considerations

Advancements in plant hybrids and development have eased the impacts from short-lived droughts. Seeds and plants may be more tolerant of drier seasons and therefore fewer crop losses may be experienced.

As the municipal areas of the county continue to grow and expand, protocols may need to be updated to foster consistency throughout the communities and the unincorporated portions of the county for burn bans and water usage advisories.

According to the Indiana Climate Change Impacts Assessment, Indiana has experienced a rise in the average annual precipitation between 1895 and 2016; an increase of 6.2 inches for the area of Clay County. This increase in precipitation may lessen the likelihood or overall impact of a long-term drought in Clay County. However, the assessment also notes seasonal shifts in precipitation may lead to seasonal short-term droughts. In either scenario, changes in precipitation are not anticipated to relieve the area of a probability of a drought occurring.

Prior to municipalities expanding, provisions and considerations should be given regarding the potential additional demand for both water usage and fire response efforts. Following such expansion or development plans, alternative water sources should be explored. Since the previous MHMP was prepared, large scale and significant development has not occurred throughout the county. The majority of Clay County remains largely unincorporated and rural in nature.

Relationship to Other Hazards

Discussions with the Planning Committee were held regarding the similar effects of prolonged periods of extreme heat and the similar impacts that may be experienced during these times. Planning and mitigation efforts for one hazard may benefit the other. It is anticipated that rural areas of the county may be more susceptible to brush and rangeland or woodland fires during a drought, while urban areas may experience these impacts in areas where several abandoned buildings or overgrown lots exist, and this may lead to increased losses associated with a fire.

3.2.2 EARTHQUAKE

Overview

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the earth as the huge plates that form the earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of the plates.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can move off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

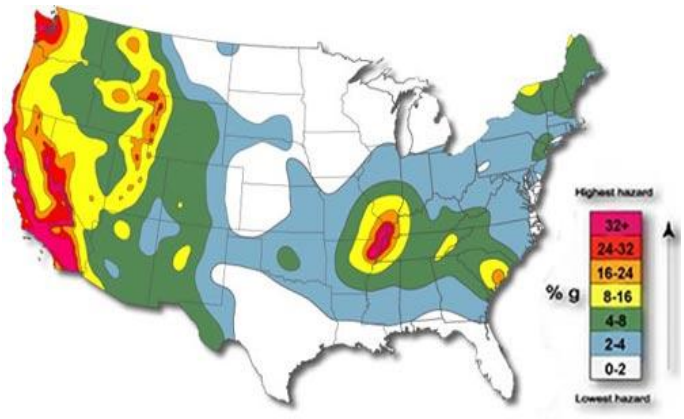


Figure 22 Earthquake Risk Areas in the US

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. On a yearly basis, 70-75 damaging earthquakes occur throughout the world. Estimates of losses from a future earthquake in the United States approach $200B.

One method of measuring the magnitude or energy of an earthquake is the Richter Scale. This scale uses whole numbers and decimal fractions whereby each increase of a whole number represents a release of 31 times more energy than the amount associated with the previous whole number on the scale. Scientists are currently studying the New Madrid fault area and have predicted that the chances of an earthquake in the M8.0 range occurring within the next 50 years are approximately 7%-10%. However, the chances of an earthquake at a M6.0 or greater, are at 90% within the next 50 years.

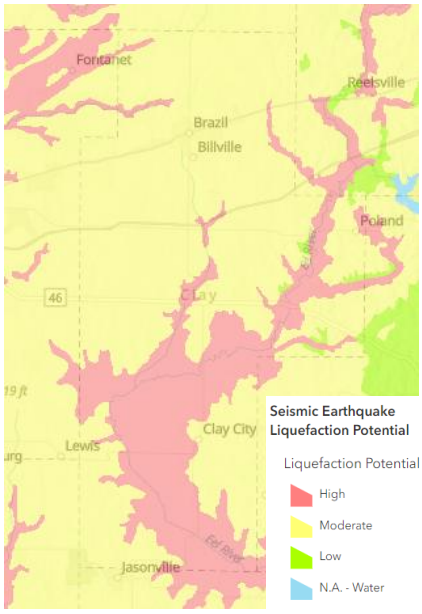


Figure 23 Clay County Liquefaction Potential Areas

There are 45 states and territories in the United States at moderate to very high risk from an earthquake, and they are located in every region of the county **(Figure 22)**. California experiences the most frequent damaging earthquakes; however, Alaska experiences the greatest number of large earthquakes – most located in uninhabited areas. The largest earthquakes felt in the United States were along the New Madrid Fault in Missouri, where a three-month long series of quakes from 1811 to 1812 occurred over the entire Eastern United States, with Missouri, Tennessee, Kentucky, Indiana,

Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking. Several smaller historic faults are located throughout the state of Indiana. Additionally, some soil in Indiana is highly susceptible to liquefaction during earthquake conditions. The older riverbeds within Clay County show signs of a potential for liquefaction, especially near the northeast corner of the county where the potential is rated as high. (Error! Reference source not found.)

Recent Occurrences

Indiana, as well as several other Midwestern states, lies in the most seismically active region east of the Rocky Mountains**. Figure 24** shows the 2014 Seismic Hazard for Indiana. The nearest known area of concern for Clay County is the New Madrid Fault Zone.

On June 17, 2021, an earthquake centered near Bloomingdale, Indiana in Parke County was felt as far north as Chicago, Illinois and as far east as Cincinnati, Ohio. With a magnitude of 3.8 several localized reports included descriptions of shaking buildings and feelings of tremors. No injuries or severe damage was reported due to this incident. As reported by the NBC 5 Chicago, "Once the earthquake was confirmed, officials said the 9-1-1 phone line "started ringing immediately."" Before this event, the last earthquake to be felt in Indiana was a magnitude 5.1 centered in Sparta, North Carolina, and the last event to occur within the state (near this event) was a magnitude 2.3 earthquake centered in Haubstadt, IN on May 28, 2015. No injuries or damage were reported with either of these events.

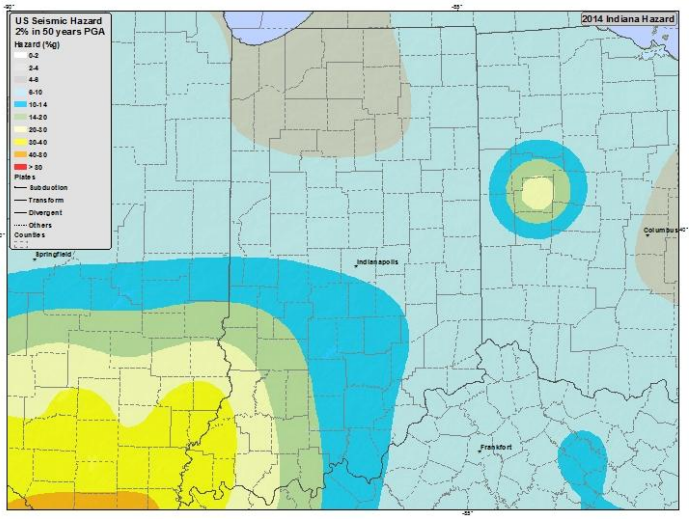


Figure 24 Indiana Seismic Zone Map

On December 30, 2010, central Indiana experienced an earthquake with a magnitude of 3.8; rare for this area in Indiana as it is only the 3rd earthquake of notable size to occur north of Indianapolis. Even rarer is the fact that scientists believe that the quake was centered in Greentown, Indiana approximately 13 miles southeast of Kokomo, Indiana. According to The Kokomo Tribune, "113 people called 911 in a 15-minute period after the quake, which was the first tremblor centered in Indiana since 2004". Further, a geophysicist from the USGS in Colorado stated, "It was considered a minor earthquake," and "Maybe some things would be knocked off shelves, but as far as some significant damage, you probably wouldn't expect it from a 3.8."

A M5.8 centered in Mineral, Virginia affected much of the East Coast on August 23, 2011. According to USA Today, 10 nuclear power plants were shut down for precautionary inspections following the quake, over 400 flights were delayed, and the Washington Monument was closed indefinitely pending detailed inspections by engineers.

Based on historical earthquake data, local knowledge of previous earthquakes, results of HAZUS-MH scenarios, and that Clay County has not been directly impacted by an earthquake, the Committee determined that the probability of an earthquake occurring in Clay County or any of the communities is "Unlikely". Should an earthquake occur, the impacts associated with this hazard are anticipated to be "Negligible" in all areas of the county. As with all earthquakes, it was determined that the residents of Clay County would have little to no warning time (less than six hours) and that the duration of the event would be expected to be less than 6 hours. A summary is shown in **Table 7.**

Table 7: CPRI for Earthquake

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Clay County	Unlikely	Negligible	< 6 hours	< 6 hours	Low
City of Brazil	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Carbon	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Center Point	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Clay City	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Harmony	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Knightsville	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Staunton	Unlikely	Negligible	< 6 hours	< 6 hours	Low

Per the Ohio Department of Natural Resources Division of Geological Survey, "…it is difficult to predict the maximum-size earthquake that could occur in the state and certainly impossible to predict when such an event would occur. In part, the size of an earthquake is a function of the area of a fault available for rupture. However, because all known earthquake-generating faults in Ohio are concealed beneath several thousand feet of Paleozoic sedimentary rock, it is difficult to directly determine the size of these faults." Further according to the Indiana Geological Survey, "…no one can say with any certainty when or if an earthquake strong enough to cause significant property damage, injury, or loss of life in Indiana will occur…we do indeed face the possibility of experiencing the potentially devastating effects of a major earthquake at some point in the future." The Committee felt that an earthquake occurring within or near Clay County is "Unlikely" to occur within the next five years.

Figure 25 Minor Earthquake Damage

Assessing Vulnerability

Earthquakes generally affect broad areas and potentially many counties at one time. Within Clay County, direct and indirect effects from an earthquake may include:

Direct Effects:

Urban areas may experience more damage due to the number of structures, the multi-story nature of the structures, and critical infrastructure (fire houses, cell phone towers, health care facilities, etc.) located in these areas.

- Rural areas may experience losses associated with agricultural structures such as barns and silos.
- Bridges buried utilities (gas lines, waterlines, pipelines), and other infrastructure may be affected throughout the county and municipalities.
- The homeless or underserved population will need to be checked on, especially if they seek shelter under bridges or structures that are not stable.

Indirect Effects:

- Clay County may be called upon to provide emergency response personnel to assist in the areas with more damage.
- Provide shelter for residents of areas with more damage.
- Delays in delivery of goods or services originating from areas more affected by the earthquake or originating at locations beyond the damaged areas, but that would have to be re-routed to avoid damaged areas.

The types of loss caused by an earthquake could be physical, economic, or social in nature. Due to the unpredictability and broad impact regions associated with an earthquake, all critical and non-critical infrastructure are at risk of experiencing earthquake related damage. Damage to structures, infrastructure, and even business interruptions can be expected following an earthquake. Examples of varying degrees of damage are shown in **Figure 25** and **Figure 26.**

Figure 26 Structural Earthquake Damage

Estimating Potential Losses

To determine the losses associated with an earthquake, the HAZUS-MH software was utilized in the Clay County MHMP update. HAZUS-MH is a nationally standardized risk modeling methodology which identifies areas with high risk for natural hazards and estimates physical, economic, and social impacts of earthquakes, hurricanes, floods, and tsunamis. For this plan an arbitrary earthquake scenario placed a magnitude 5.0 within Clay County.

Per the HAZUS-MH scenario noted above, total economic losses are anticipated to be near $230.42M with moderately damage to approximately 1,125 buildings, of which 23 are anticipated to be damaged beyond repair. Further, there are 33 critical facilities (1 hospital, 12 schools, 1 EOC, 8 Police Stations, and 11 Fire Stations) with 31 with greater 50% functionality on day 1, and 0 highway segments with moderate damage. All other transportation segments (railways, buses, etc.) would be expected to remain undamaged. There is no damage anticipated for wastewater facilities. Residential occupancies would be anticipated to sustain the largest level of damage, representing 54% of total damages. No fires due to the earthquake were anticipated.

The HAZUS-MH model computes anticipated economic losses for the hypothetical earthquake due to direct building losses and business interruption losses. Direct building losses are the costs to repair or to replace the damage caused to the building and contents, while the interruption losses are associated with the inability to operate a business due to the damage sustained. Business interruption losses also include the temporary living expenses for those people displaced from their homes.

The HAZUS-MH Earthquake Model allows local building data to be imported into the analysis. However, these local data are imported as “general building stock,” meaning that the points are assigned to a census tract rather than a specific XY coordinate. HAZUS performs the damage

analysis as a county wide analysis and reports losses by census tract. While the results of the hypothetical scenario appear to be plausible, care should be taken when interpreting these results.

Future Considerations

While the occurrence of an earthquake in or near to Clay County may not be the highest priority hazard studied for the development of the plan, it is possible that residents, business owners, and visitors may be affected should an earthquake occur anywhere within the state. For that reason, the County should continue to provide education and outreach regarding earthquakes and earthquake insurance along with education and outreach for other hazards. As the County and the communities within the county grow and develop, the proper considerations for the potential of an earthquake to occur may help to mitigate social, physical, or economic losses in the future.

It can be anticipated that while all structures in Clay County will remain at-risk of earthquake damage and effects, new construction or redevelopment may reduce the overall risks. As redevelopment or growth occurs, the new construction may be significantly sturdier. Further, as blighted or abandoned areas are addressed, those communities and the county are less susceptible to economic and physical damage associated with earthquakes. Since the last planning effort, no significant development has occurred within the county.

Relationship to Other Hazards

Hazardous materials incidents may occur because of damage to material storage containers or transportation vehicles involved in road crashes or train derailments. Further, dam failures, levee breaks, or landslides may occur following an earthquake or associated aftershocks due to the shifting of the soils in these hazard areas. These types of related hazards may have greater impacts on Clay County communities than the earthquake itself. It is not expected that earthquakes will be caused by other hazards studied within this plan.

3.2.3 EXTREME TEMPERATURE

Overview

Extreme Heat

Extreme heat is defined as a temporary elevation of average daily temperatures that hover 10 degrees or more above the average high temperature for the region for the duration of several weeks. Humid or muggy conditions, which add to the discomfort of elevated temperatures, occur when a dome of high atmospheric pressure traps water-laden air near the ground. In a normal year, approximately 175 Americans die from extreme heat.

According to the NWS, "The Heat Index or the "Apparent Temperature" is an accurate measure of how hot it really feels when the Relative Humidity is added to the actual air temperature." To find the Heat Index Temperature, refer to the Heat Index Chart in **Figure 27**. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index – how hot it feels – is 121°F. The National Weather Service has 3 levels of Excessive Heat Notifications.

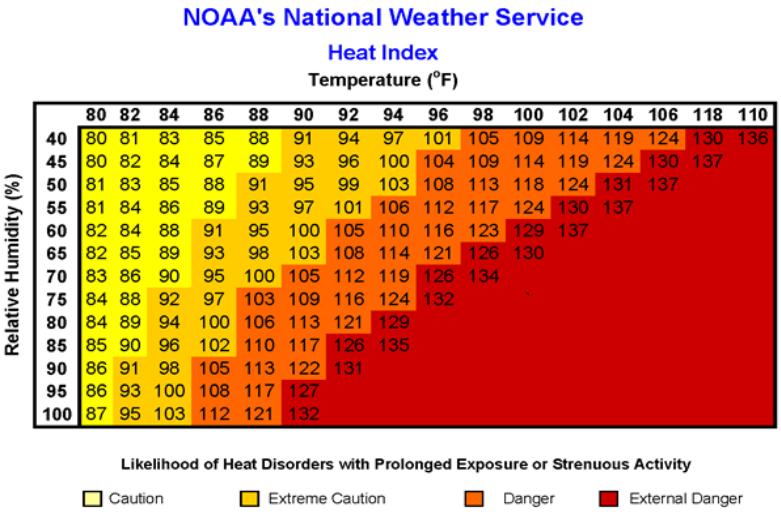


Figure 27 NWS heat Index Chart

1) A Heat Advisory - means that temperatures of at least 100°F* or Heat Index values of at least 105°F* are expected.

2) An Excessive Heat Watch means that Heat Index values are expected to reach or exceed 110°F* and not fall below 75°F* for at least a 48-hour period.

3) An Excessive Heat Warning means that Heat Index values are expected to reach or exceed 110°F* and not fall below 75°F* for at least a 48-hour period, beginning in the next 24 hours. A warning may also be issued for extended periods with afternoon heat index values of 105°F-110°F.

Classification	Heat Index	Effect on the body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

Figure 28 Extreme Heat Effects by Heat Index

It is important to also note that these heat index values were devised for shady, light wind conditions. Exposure to full sunshine may increase heat index values by up to 15°F. Further, high winds, particularly with very hot, dry air, can also be extremely hazardous.

As **Figure 28** indicates, there are four cautionary categories associated with varying heat index temperatures. Each category provides a heat index range along with effects on the human body.

People with underlying health issues, the very old or very young may be impacted at lower temperatures since their systems are less likely to be able to compensate for the heat and humidity.

Extreme Cold

Extreme cold is defined as a temporary, yet sustained, period of extremely low temperatures. Extremely low temperatures can occur in winter months when continental surface temperatures are at their lowest point and the North American Jet Stream pulls arctic air down into the continental United States. The jet stream is a current of fast-moving air found in the upper levels of the atmosphere. This rapid current is typically thousands of kilometers long, a few hundred kilometers wide, and only a few kilometers thick. Jet streams are usually found somewhere between 10-15 km (6-9 miles) above the Earth's surface. The position of this upper-level jet stream denotes the location of the strongest surface temperature contrast over the continent. The jet stream winds are strongest during the winter months when continental temperature extremes are greatest. When the jet stream pulls arctic cold air masses over portions of the United States, temperatures can drop below 0° F for one week or more. Sustained extreme cold poses a physical danger to all individuals in a community and can affect infrastructure function as well.(**Figure 29**)

Figure 29 Working in Extreme Cold

In addition to strictly cold temperatures, the wind chill temperature must also be considered when planning for extreme temperatures. The wind chill temperature, according to the NWS, is how cold people and animals feel when outside and it is based on the rate of heat loss from exposed skin. **Figure 30** identifies the Wind Chill Chart and how the same ambient temperature may feel vastly different in varying wind speeds.

Wind chill is a guide to winter danger

New wind chill chart

Frostbite occurs in 15 minutes or less

Wind (MPH) \ Temperature (°F)	30	25	20	15	10	5	0	-5	-10	-15	-10	-25
5	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40
10	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47
15	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51
20	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55
25	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58
30	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60
35	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62
40	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64
45	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65
50	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67
55	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68
60	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69

Figure 30 Wind Chill Guide

Recent Occurrences

The effects of extreme temperatures extend across large regions, typically affecting several counties, or states, during a single event. According to the NCDC, there has been one extreme heat event and two extreme cold events between January 1, 2016 and September 30, 2024. Local reports did not provide any additional information regarding the period of excessive heat during this time period. However, the National

Weather Service reported wind chills ranging from -25 to-50 degrees Fahrenheit in northern Indiana on January 29 - 31, 2019. Three years later December 23 and 24, 2022, an extremely cold event ushered in wind chills as low as -39 degrees Fahrenheit. Most recently, on January 14, 2024, temperatures were as low as -9 degrees Fahrenheit and wind chills as low as -30 degrees Fahrenheit. Although the committee members recall several hot days with heat indexes greater than 100 in the past 5 years, neither NCDC nor the local National Weather Service Office website have any reports. No damage or losses associated with the prolonged cold temperatures or heat events were reported.

It is difficult to predict the probability that an extreme temperature event will affect Clay County residents within any given year. However, based on historic knowledge and information provided by the community representatives, an extreme temperature event is "Highly Likely" (likely within the year to next 3 years) to "Possible" for the Clay County and the Town of Knightsville. If an event did occur, it would result in "Limited" to "Significant" in magnitude. **Table 8** identifies the CPRI for extreme temperatures-both heat and cold events for all communities in Clay County.

Table 8: CPRI for Extreme Temperatures

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Clay County	Possible	Limited	12 - 24 hours	< 1 week	Elevated
City of Brazil	Highly Likely	Significant	12 - 24 hours	< 1 week	Severe
Town of Carbon	Highly Likely	Significant	12 - 24 hours	< 1 week	Severe
Town of Center Point	Highly Likely	Limited	12 - 24 hours	< 1 week	Elevated
Town of Clay City	Highly Likely	Limited	6 - 12 hours	< 1 week	Severe
Town of Harmony	Highly Likely	Limited	12 - 24 hours	< 1 week	Elevated
Town of Knightsville	Possible	Limited	6 - 12 hours	< 1 week	Elevated
Town of Staunton	Highly Likely	Limited	12 - 24 hours	< 1 week	Elevated

Assessing Vulnerability

As noted above, this type of hazard will generally affect entire counties and even multi-county regions at one time; however, certain portions of the population may be more vulnerable to extreme temperatures. For example, outdoor laborers, very young and very old populations, low-income populations, and those in poor physical condition are at an increased risk to be impacted during these conditions.

By assessing the demographics of Clay County, a better understanding of the relative risk that extreme temperatures may pose to certain populations can be gained. In total, just over 19.6% of the county's population is over 65 years of age, 5.7% of the population is below the age of 5, and approximately 12.7% of the population is considered to be living below the poverty line. People within these demographic categories are more susceptible to social or health related impacts associated with extreme heat. Families below the poverty line are less likely to have functioning air conditioning in their homes. Because of high energy costs those who do have air conditioning may be less likely to use the units in a way to benefit their health and well-being. The same factors are key when looking at heating sources in cold temperatures. Elderly and those living below the poverty line are more likely to rely on alternative heating sources because of the cost of energy. These alternative heating sources are frequently the cause of carbon monoxide poisoning and/or house fires.

In January 2024, subzero windchills impacted the entire State of Indiana with Indianapolis reporting 84 hours of sub-zero windchills between January 13 and 17. Clay County EMA along with County

leadership and some non-governmental organizations together addressed the overnight warming needs for unsheltered homeless people who now reside in the community. Although there are numerous daytime facilities open to warm those who are cold, nighttime accommodations have not been identified as an unmet need until this event.

Extreme heat can affect the proper function of organ and brain systems by elevating core body temperatures above normal levels. Elevated core body temperatures, usually more than 104°F are often exhibited as heat stroke. For weaker individuals, an overheated core body temperature places additional stress on the body, and without proper hydration, the normal mechanisms for dealing with heat, such as sweating to cool down, are ineffective. Examples of danger levels associated with prolonged heat exposure are identified in **Figure 31.** Extreme cold may result in similar situations as normal functions are impacted as the temperature of the body is reduced. Prolonged exposure to cold may result in hypothermia, frostbite, and even death if the body is not warmed.

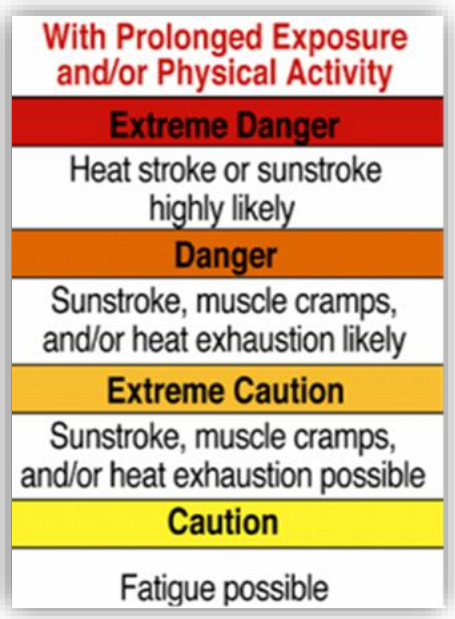


Figure 31 Heat Danger Classification

Within Clay County, direct and indirect effects from a prolonged period of extreme temperature may include:

Direct Effects:

- Direct effects are primarily associated with health risks to the elderly, infants, people with chronic medical disorders, lower income families, outdoor workers, and athletes. Health risks can range from heat exhaustion or mild hypothermia to death due to heat stroke, amputations due to frost bite or death due to severe hypothermia.

Indirect Effects:

- Increased need for cooling or warming shelters
- Increased medical emergency response efforts.
- Increased energy demands for heating or cooling.

Estimating Potential Losses

It is difficult to estimate the potential losses due to extreme temperatures as damage is not typically associated with buildings but instead with populations and people.

This hazard is not typically as damaging to structures or critical infrastructure as it is to populations so monetary damages associated with the direct effects of the extreme temperature are not possible to estimate accurately.

Indirect effects:

- Increased expenses for facilities such as healthcare or emergency services due to the increased number of calls and people seeking assistance.

- Manufacturing facilities where temperatures are normally elevated may need to alter work hours or experience loss of revenue if forced to limit production during the heat of the day.

- Energy suppliers may experience demand peaks during the hottest and/or coldest portions of the day.

- Extreme cold indirect effects include pipes freezing resulting in loss of access to water for industrial processes as well as personal hygiene, sanitation and hydration of livestock and people. These effects may disproportionately impact vulnerable populations (elderly and children) within the County.

Future Considerations

As more and more citizens are experiencing economic difficulties, local power suppliers along with charitable organizations have implemented programs to provide cooling and heating mechanisms to residents in need. Often, these programs are donation driven and the need for such assistance must be demonstrated. As susceptible populations increase, and/or as local economies are stressed, such programs may become more necessary to protect Clay County's at-risk populations. Additionally, the increase in the number of unsheltered homeless in the area calls for innovative approaches to addressing heating and cooling needs after traditional business hours when this population is particularly susceptible.

The Climate Change Assessment identifies several temperature related considerations of which communities should be aware of and begin planning to avoid further impacts. For example, rising temperatures will increase the number of extreme heat days, thereby increasing the potential for heat related illnesses, potential hospitalizations, and medication costs to vulnerable populations. In addition, added days of extreme heat will impact agriculture, manufacturing, and potentially, water sources. Increasing greenspaces within the cities and towns not only provide benefits of stormwater control, carbon sequestration and air pollution filtration, but also are great for reducing the energy from the sun reaching the ground surface, thus cooling the area. Future community planning should include the incorporation of heat tolerant green infrastructure to lessen the impacts of extreme heat upon the community as a whole.

New construction associated with development of residential areas often brings upgraded and more efficient utilities such as central heating and air units further reducing vulnerabilities to the aging populations in those municipalities mentioned above. Conversely, new development associated with industrial or large commercial structures in the inner-urban centers often result in increased heat over time, which may cause additional stress to labor-related populations. Since the last planning effort, there has not been significant residential and commercial development within the county.

Extreme Temperatures: Relationship to Other Hazards

While extreme temperatures may be extremely burdensome on the power supplies in Clay County, the Committee concluded that this type of hazard is not expected to cause any hazards studied. It is anticipated that due to prolonged extreme temperatures, primarily long periods of elevated temperatures, citizens may become increasingly agitated and irritable, and this may lead to a disturbance requiring emergency responder intervention.

3.2.4 FIRES AND WILDFIRE

Overview

A wildfire, also known as a forest fire, vegetation fire, or a bushfire, is an uncontrolled fire in wildland areas and is often caused by lightning; other common causes are human carelessness and arson. Small wildfires may be contained to areas less than one acre, whereas larger wildfires can extend to areas that cover several hundred or even thousand acres. Generally, ambient weather conditions determine the nature and severity of a wildfire event. Very low moisture and windy conditions can help to exacerbate combustion in forested or brush areas (**Figure 32**) and turn a small brush fire into a major regional fire event in a very short period. Wildfires can be very devastating for residents and property owners.

Figure 32 Forest Fire

A structural fire is an incident where a fire starts within a structure and is largely contained to that structure. Causes of structure fires can be related to electrical shorts, carelessness with ignition sources and/or alternative heating sources, poor storage of flammable materials, as well as arson. These types of fires can be deadly if no warning or prevention measures are present. The most dangerous aspect of structural fires is the production of toxic gases and fumes that can quickly accumulate in enclosed areas of structures and asphyxiate those who might be in the structure.

Problems associated with structural fires are compounded when high-rise buildings catch fire. High-rise fires hinder the ability of rescue workers to fight the fire, reach impacted building occupants, and evacuate impacted occupants. Rescue efforts also become more complicated when handicapped or disabled persons are involved. Complications associated with high-rise fires typically increase as the height and occupancy levels of the buildings increase. Structural collapse is another concern associated with high-rise fires. Structural collapse often results in people becoming trapped and severely injured. However, it is important to note that the concern associated with structural collapse, is not limited to high-rise buildings; the collapse of smaller residential buildings can also lead to severe injury and death.

Combating a wildfire or a structure fire is extremely dangerous. If weather conditions change suddenly, the fire may change course and/or increase in strength potentially overtaking neighboring structures and firefighters, causing severe injury or death. Fires can travel at speeds greater than 45 mph. Members of the homeless community, hunters and/or campers may also be in the area of the fires with no means to escape. Fire response capabilities are limited by the ever-dwindling number of volunteer firefighters able to respond, especially during “normal working hours”. This further increases the risks for first responders and community members alike.

Recent Occurrences

Within the NCDC, there are no reports of wildfires occurring in Clay County between January 1, 2016 to September 30, 2024. NCDC does not record smaller wild land fire events which frequently

are handled within the same day as the event is detected. Many 10 acre or larger field/grass and woods fires take place regularly in Indiana. In 2006 in Pike County, Indiana two field fires burned over 350 acres (larger than most field fires in Indiana). On November 20, 2022, a 110-acre brush fire was brough under control by several volunteer fire departments and Indiana DNR staff at Brown County State Park. Grass fires in the median and along Interstate 65 recently closed the southbound lanes for a number of hours while fire departments attempted to extinguish the wind driven fires. In Clay County it took several fire departments for an "Out of Control" brush fire in the Chinook Fish and Wildlife Area on October 14, 2024.

The impacts of wildfires can be quite extensive and reach well beyond the borders of the jurisdiction fighting the fire. This is well demonstrated by the summerlong wildland fires in Canada in 2023. Over 16.5 million acres, an area the size of the entire state of Florida, burned between March and September. The fires resulted in smoke plumes which reached central Indiana at levels requiring people with asthma and other respiratory difficulties to remain indoors.

Figure 33 Clay County Fire Departments at an Apartment Fire

The NCDC does not report structure fires; therefore, local sources were utilized to provide information regarding residential and business fires. Residential fires are the most common fire hazard affecting Clay County in the last several years. **Figure 34** shows fire department extinguishing activities at an apartment complex fire. Clay County has some managed land, including part of Shakamak State Park. Due to the expansive acreage of agricultural land within Clay County, and the potential for urban areas to be at risk due to abandoned homes, blighted areas, or industrial activities, the Planning Committee determined the probability to be "Highly Likely" throughout the County. **Table 9** identifies the CPRI rankings for fire in Clay County.

Table 9: CPRI for Fire

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Clay County	Highly Likely	Significant	< 6 hours	< 1 day	Severe
City of Brazil	Highly Likely	Significant	< 6 hours	< 1 day	Severe
Town of Carbon	Highly Likely	Significant	< 6 hours	< 1 day	Severe
Town of Center Point	Highly Likely	Significant	< 6 hours	< 1 day	Severe
Town of Clay City	Highly Likely	Significant	< 6 hours	< 1 day	Severe
Town of Harmony	Highly Likely	Significant	< 6 hours	< 1 day	Severe
Town of Knightsville	Highly Likely	Significant	< 6 hours	< 1 day	Severe
Town of Staunton	Highly Likely	Significant	< 6 hours	< 1 day	Severe

Information provided in **Table 10** highlights the number of fire calls the Clay County fire departments responded to during the time period January 2019 through December 2023. Damage to structures, contents, crops, forests, and vehicles is significant for each municipality on an annual basis. Social

losses, such as being unable to work following a residential structure fire or losses associated with a business fire should also be considered as an impact.

Table 10: Clay County Fire Calls

Department	2019	2020	2021	2022	2023	2024
Andrews Volunteer Fire Dept.	96	63	64	81		
Bippus Volunteer Fire Dept	83	93	96	106		
City Fire Department	1643	946	1122	1164		
Markle Volunteer Fire Dept	68	79	84	65		
Mt. Etna Volunteer Fire Dept	116	124	115	65		
Roanoke Volunteer Fire Dept	158	156	166	172		
Twp Vol. Fire Dept	203	172	177	180		
Warren Volunteer Fire Dept	169	134	151	234		

Assessing Vulnerability

Physical, economic, and/or social losses impact not only the property owner whose property was damaged by the fire, but also the community. Typically, a structural fire is limited to one or two structures, as the fire response focuses on extinguishment as well as containment thus preventing the fire from spreading to neighboring structures. This type of action works to reduce the magnitude and severity. Nonetheless, the loss of or damage to historic structures, town squares, etc. takes a toll on the community spirit as well as the financial and physical loss.

Much of the county is rural, which is also susceptible to brush and/or crop fires, especially in times of drought. Since agriculture is a big source of income for the community, field fires, especially during harvest season, or barn fires after crops have been stored have an immense impact.

Direct and indirect effects of fires and wildfires within Clay County may include:

Direct Effects:

- Loss of structures (residential as well as agricultural)
- Loss of vital equipment (industrial and agricultural)
- Loss of forests
- Loss of natural resources and wildlife

Indirect Effects:

- Loss of revenue as businesses may be closed.
- Loss of revenue from reduced tourist activities in the county
- Increased emergency response times based on safety of roads.
- Loss of income if dependent on crop production or timber harvest

Estimating Potential Losses

Given the nature and complexity of a potentially large hazard such as a wildfire, it is difficult to quantify potential losses to property and infrastructure. As a result, all critical and non-critical structures and infrastructure may be at some degree of risk.

Monetary damages associated with the direct effects of the fires are difficult to estimate, other than utilizing historic information as provided. Indirect effects would cause increased efforts associated with emergency response services as wildfires are difficult to contain and may accelerate very quickly. Further, multi-level business or residential structures place increased risks to those who work or live within those structures or nearby structures.

Future Considerations

As populations increase and community growth increases, the need to respond to fire will remain an important municipal effort. As new construction or re-development occurs, especially new or existing critical infrastructure, it is important to ensure that these new structures are equipped to deal with the potential risks associated with this hazard. Those may include increased risk for wooden or flammable outer structures and potential lengthy power outages. With the adverse impacts of extreme temperatures and drought upon the heavily forested areas, consideration must be given to mitigating fire risks for structures that are built in the rural areas to limit losses should a wildland fire take place.

In addition, increased populations require increased housing. Many urban communities develop large multi-family residential structures, or apartment complexes, where structures are not only in close proximity to each other, but also house a large number of citizens. As communities age, some structures may become abandoned, significantly increasing the risk of fire due to potential vagrant populations and lack of maintenance. These areas should be considered at-risk and potentially demolished to avoid such risk and potential hazard.

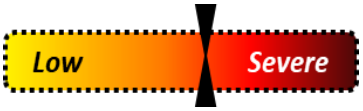
In areas such as Clay County which are reliant on volunteer firefighters, firefighting responses can be slowed due to the limited numbers of volunteers available at various times of the day. Increasing numbers of people working outside of the community in which they reside limits volunteer presence to outside of normal working hours. Recruitment initiatives will need to be considered as the firefighting needs and staffing levels change.

Fires can also result in substantial indirect costs. Increased emergency response times, loss of work or the inability to get to work, as well as business interruption, are possible indirect effects of a fire and how it may affect those businesses related to cropland or natural resource areas.

Relationship to Other Hazards

Fires may certainly result in a hazardous materials incident if storage structures are within the path of the fire. Material storage containers farther away from the burn path may become damaged by high winds and embers resulting in a spill or release of materials. Fires may result from lightning either alone or associated with a thunderstorm. Typical wind speeds during a thunderstorm may also exacerbate the impacts from any ignitions from the lightning.

3.2.5 FLOOD



Overview

Floods are the most common and widespread of all the natural disasters. Most communities in the United States have experienced flooding because of spring rains, heavy rain and thunderstorms, or winter snow melts. A flood, as defined by the National Flood Insurance Program (NFIP), is a general and temporary condition of partial or complete inundation or two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waters, or unusual and rapid accumulation or runoff of surface waters from any sources, or a mudflow. Floods can be slow or fast rising but generally develop over a period of days.

Flash flooding is a term often used to describe flood events which are a result of heavy or excessive rainfall in a short period of time, generally less than 6 hours. Unlike traditional flooding which can be slower developing, these raging torrents rip through river beds, streets and roads, and overland taking anything in its way with the force of the water. Flash floods typically occur within minutes up to a few hours after an excessive rain event.

Figure 35 Flooding in Clay County 2018

In Clay County, flooding and associated flood damage are most likely to occur during the spring because of heavy rains combined with melting snow. (**Figure 35)** However, provided the right saturated conditions, intense rainfall of short duration during rainstorms can produce damaging flash flood conditions, as well. There are no exceptions to when floods may occur. There are times they are less likely but given the right atmospheric conditions a flood or flash flood can take place. Climate change has directly impacted flooding with the increase in precipitation and the duration of the events being shorter.

The traditional benchmark for riverine or coastal flooding is a 1% Annual Exceedance Probability (AEP), formerly known as the 100-year flood. This is a benchmark used by FEMA to establish a standard of flood protection in communities throughout the country. The 1% AEP is referred to as the “regulatory” or “base” flood. Another term commonly used, the “100-year flood”, can be misleading. It does not mean that only one flood of that size will occur every 100 years, but rather there is a 1% chance of a flood of that intensity and elevation happening during any given event. In other words, the regulatory flood elevation has a 1% chance of being equaled, or exceeded, in any given event and it could occur more than once in a relatively short time period. The area impacted by the 1% AEP flood event is called the Special Flood Hazard Area (SFHA). **Exhibit1** is a map of Clay County with the Special Flood Hazard Area identified as well as an overlay of the critical and essential facilities. This map is taken from the FEMA Flood Insurance Rate Maps (FIRMS) for the County and the participating communities. For the most up-to-date floodplain information readers are encouraged to consult with the Indiana Floodplain Portal which may be found at the DNR webpage. This portal is the best available regulatory data including both state and federal mapped

areas. The current web address is: https://www.in.gov/dnr/water/surface-water/indiana-floodplain-mapping/indiana-floodplain-information-portal/.

Recent Occurrences

The NCDC indicates that between January 1, 2016 to September 30, 2024, there were two flash floods resulting in $25,000 in property damage and $7,000 in crop damage. On July 13,2016 in the City of Brazil a culvert washed out because of the flash flood and on September 6, 2018, several roads were closed because of flooding. The remnants of Tropical Storm Gordon brought between 4 and 6 inches of rain in 72 hours. There were also two traditional riverine floods in Clay County

Figure 36 Clay County USGS Stream Gauge

during that same time frame. Both events had between 2 and 3 inches of rain resulting in standing water in low-lying areas and water crossing the roads. On August 25, 2023, there were reports of water reaching the bottom of automobiles at the intersection of US 40 and State Road 59. There were no reports of ice jams.

Stream gages are utilized to monitor surface water elevations and/or discharges at key locations and time periods. Some such gages are further equipped with NWS's National Water Prediction Service (NWPS) capabilities. These gages have the potential to provide valuable information regarding historical high and low water stages, hydrographs representing current and forecasted stages, and a map of the surrounding areas likely to be flooded. Within Clay County, there is 1 active stream gage, pictured in Error! Reference source not found.. The Eel River at Bowling Green.

The gage reached its highest recorded river level in August 1875 at 30 feet. Since the completion of Cagles Mill Dam in 1953, it is unlikely that his height will ever be reached again. The river is nearly 1 mile wide and would submerge SR 46 and 59 would be 2 feet. There would be many evacuations and levees overtopped.

More recent crests, from January 1, 2016, through September 30,2024, were not as destructive. Of the 5 recent crests they were just above minor flooding (15 ft.). On April 3, 2024, the crest was at 19.73 feet which is almost moderate flooding at 20 feet.

Flood insurance is a key for flood recovery. Any property having received two insurance claim payments for flood damages totaling at least $1,000, paid by the NFIP within any 10-year period since 1978 is defined as a repetitive loss property. These properties are important to the NFIP because they account for approximately 1/3 of the country's flood insurance payments. According to FEMA Region V, there are a total of one repetitive loss structures in unincorporated Clay County. Additional repetitive loss structures were reported for the City of Brazil and the Town of Center Point. **Table 11** identifies the number of repetitive losses and claims per community, as provided by FEMA.

Table 11: Repetitive Properties, Claims, and Payments

Community	# Repetitive Loss Properties	Occupancy			Total # of Losses
		Residence	Business	Non-Residential	
Clay County	1	0	0	1	3
City of Brazil	1	1	0	0	2
Town of Carbon	0	0	0	0	0
Town of Center Point	1	1	0	0	2
Town of Clay City	0	0	0	0	0
Town of Harmony	0	0	0	0	0
Town of Knightsville	0	0	0	0	0
Town of Staunton	0	0	0	0	0
TOTAL	3	2	0	1	7

There have been several claims made for damages associated with flooding in Clay County since 1978. **Table 12** further indicates the current premiums and coverage totals for individual communities.

Table 12: Insurance Premiums and Coverage

Community	Flood Insurance Premiums	Flood Insurance Coverage, Millions
Clay County	$35,352	$5.214M
City of Brazil	$3,091	$0.636M
Town of Carbon	0	0
Town of Center Point	0	0
Town of Clay City	0	0
Town of Harmony	0	0
Town of Knightsville	0	0
Town of Staunton	0	0
TOTAL	$38,443	$5.846M

As determined by the Committee, the probability of riverine based flooding occurring throughout Clay County is “Highly Likely.” The City of Brazil and the Towns of Carbon, Knightsville, and Staunton felt it was “Possible” and the Town of Harmony felt it was “Unlikely” to experience a Riverine Flood. This is largely based on recent experiences with the rivers and streams near the communities. The Committee also determined that accurate warning time would be less than 24 hours based on the terrain and flashy nature of the waterways in the county, forecasting methods, and local knowledge of stream activities. Finally, the duration of such an event is anticipated to last less than a week since the county is located closer to the headwaters for each of the streams and the presence of the flood control dams. A summary of riverine flooding CPRI is shown in **Table 13.**

Table 13: CPRI for Flood

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Clay County	Highly Likely	Significant	< 24 hours	< 1 week	Severe
City of Brazil	Possible	Negligible	< 24 hours	< 1 week	Low
Town of Carbon	Possible	Limited	< 24 hours	< 1 week	Elevated

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Town of Center Point	Highly Likely	Limited	< 24 hours	< 1 week	Elevated
Town of Clay City	Highly Likely	Limited	< 24 hours	< 1 week	Elevated
Town of Harmony	Unlikely	Negligible	< 24 hours	< 1 week	Low
Town of Knightsville	Possible	Negligible	< 24 hours	< 1 week	Low
Town of Staunton	Possible	Negligible	< 24 hours	< 1 week	Low

Assessing Vulnerability

Flood events may affect substantial portions of Clay County at one time as river systems and areas with limited drainage cover much of the county and the incorporated communities. With an increase in high volume rain events, the low-lying roads within the county are vulnerable to frequent inundation isolating and/or restricting access to some parts of the county. Wooded areas and farm fields have provided ample supply of debris causing clogs and damage to culverts, and bridges, in the past.

Whenever significant flooding impacts the communities in Clay County, the concern about riverbank erosion also known as fluvial erosion is elevated. Fluvial Erosion Hazard (FEH) represents the risk associated with natural stream movements and losses associated with buildings and infrastructure. In some cases, this may be represented by a gradual movement of a stream across a farm field. In other, more extreme instances, homes or other infrastructure may be lost as riverbanks or bluffs sluff into the water below. This will be discussed in greater detail within the landslide/land subsidence discussion.

Log and ice jam flooding is unlikely to occur in Clay County. Although log jams can occur at any time of the year, ice jams are predominantly and early or late winter occurrence when air temperature rise after freezing temperatures which allow lake and river ice to form. Flooding occurs when pieces of ice either jam up against stationary sheets of ice or against structures in the river such as bridge pylons. The jammed ice can form a dam causing water levels behind it to rise causing localized flooding and pushing large pieces of ice out of the stream. The force of the moving ice pieces is enough to break off nearby trees and/or damage building foundations and small outbuildings. (**Figure 37**) The greatest challenge with ice jams is the lack of good science to predict when the jams will form and where jam formation is likely. With the variations in temperatures in late winter and early spring ice jams are becoming more common. Log jams, like ice jams, accumulate in low flow areas and near bridges and similar structures located in the stream, causing water levels to rise. Bridges and

Figure 37 Ice Slabs Remaining After Ice Jam Flood, 2014

culverts are most frequently impacted since water flow is easily blocked at these locations forcing water outside of the riverbanks into neighborhoods and businesses.

There are no flood inundation maps developed to identify areas impacted by a variety of flood stages on any of the rivers located in Clay County. The closest flood inundation map is on the White River at Spencer. Because all of the communities are vulnerable to flooding either from short duration heavy rain events, or the more familiar riverine flooding, all have chosen to participate in the National Flood Insurance Program (NFIP).

All of communities in the county have areas of flooding concern within their corporate limits However all the incorporated towns have no FEMA identified Special Flood Hazard Area as stated in DNR records. **Figure 38** shows the listing of communities and the effective dates of their flood maps. Many of the flood risk areas are located near the homes of the disadvantaged and underserved population census blocks. With less financial capacity to mitigate flooding becomes an additional burden on the communities. Flash flooding, being less predictable, does not allow the advanced warning to be able to protect property and seek shelter out of harm's way, thus increasing vulnerability throughout the county, especially the underserved and disadvantaged community members. **(Figure 38)**

Community	Init FHBM	Identified FIRM	Current Effective Map Date
Clay County	11/25/1977	5/1/2010	9/2/2011
City of Brazil		9/2/2011	9/2/2011
Town of Carbon		9/2/2011	
Town of Center Point		9/2/2011	
Town of Clay City		9/2/2011	
Town of Harmony		9/2/2011	
Town of Knightsville		9/2/2011	
Town of Staunton		9/2/2011	

Figure 38 List of NFIP Participating Communities

Within Clay County, direct and indirect effects of a flood event may include:

Direct Effects:

- Structural and content damage and/or loss of revenue for properties affected by increased water.
- Increased costs associated with additional response personnel, evacuations, and sheltering needs.
- Increased potential impacts to infrastructure and buildings located within the SFHA.
- Increased cleanup costs for more frequent flash flood impacts.
- Loss of topsoil and deposition of sand due to flood inundation of farm fields.

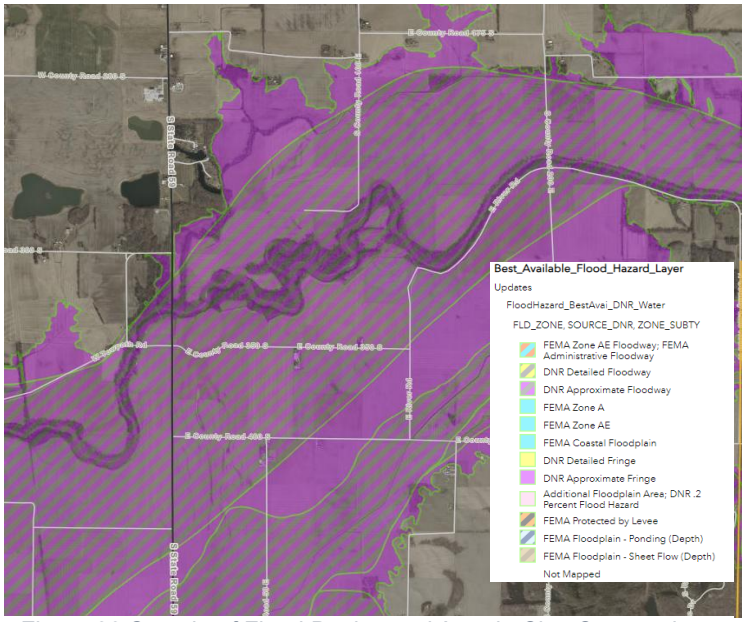


Figure 39 Sample of Flood Designated Area in Clay County along

Indirect Effects:

- Increased response times for emergency personnel when roads are impassable.
- Increased costs associated with personnel carrying out evacuations in needed areas.
- Increased risk of explosions and other hazards associated with floating propane tanks or other debris.
- Losses associated with missed work or school due to closures or recovery activities.
- Cancellations of special events in impacted areas or water related activities that become too dangerous due to high water.
- Debris removal costs to return local drainage to normal function.
- Getting notifications to the underserved populations that may not have access to radio, television, or social media of evacuations.

Estimating Potential Losses

Critical and non-critical structures located in regulated floodplains, poorly drained areas, or low-lying areas are most at risk for damages associated with flooding. For this planning effort, a GIS Desktop Analysis methodology was utilized to estimate flood damages.

For the GIS Desktop Analysis method, an analysis was completed utilizing the effective Digital FIRMs (DFIRMs) overlaid upon a Modified Building Inventory developed with information provided by Clay County. Structures located within each flood zone were tallied using GIS analysis techniques.

In the assessment, any structure listed as less than 400 ft^2 in area or classified in the Assessor's database as a non-habitable structure was assumed to be an outbuilding. It was assumed that a building was located on a parcel if the value listed in the "Assessed Value (Improvements)" showed a value greater than zero dollars. Parcels that intersected any portion of the FEMA flood zones were considered to be flood prone, and subsequently, further analyzed separately from parcels without structures. Structure values were calculated using:

Residential = Assessed Value x 0.5
Commercial = Assessed Value x 1.0
Industrial = Assessed Value x 1.5
Agricultural = Assessed Value x 1.0
Education = Assessed Value x 1.0
Government = Assessed Value x 1.0
Religious = Assessed Value x 1.0

To estimate anticipated damages associated with each flood zone in Clay County and communities, it was estimated that 25% of structures in the flood zones would be destroyed, 35% of structures would be 50% damaged, and 40% of structures would be 25% damaged. **Table 14** identifies the estimated losses associated with structures in the floodway, the 1% AEP (100-year floodplain), and the 0.2% AEP (500-year floodplain) areas by community within Clay County.

Table 14: Clay County Building Inventory Utilizing Best Available Data

	Floodway		1% AEP		0.2% AEP		Unnumbered	
	#	$, Million	#	$, Million	#	$. Million	#	$, Million
Clay County	460	$44.61M	1	$0.06M	0	0	213	$18.29M
City of Brazil	37	$2.31M	27	$1.67M	4	$0.23M	6	$0.66M

	Floodway		1% AEP		0.2% AEP		Unnumbered	
Town of Carbon	0	0	0	0	0	0	0	0
Town of Center Point	0	0	0	0	0	0	0	0
Town of Clay City	3	$0.17M	0	0	0	0	0	0
Town of Harmony	0	0	0	0	0	0	2	$0.23M
Town of Knightsville	1	$0.12M	0	0	0	0	0	0
Town of Staunton	0	0	0	0	0	0	0	0
TOTAL	501	$47.21M	28	$1.73M	4	$0.23M	221	$19.18M

Utilizing the same GIS information and process, critical infrastructure within each of the flood hazard areas in Clay County was assessed and are included in **Table 15**. These buildings are included in the overall number of structures and damage estimate information provided in **Table 16**.

Table 15: Critical Infrastructure in the Flood Zones

Community	Floodway	1% AEP	0.2% AEP	DNR Zone A
Clay County				
City of Brazil		Brazil 1st Baptist Church		
Town of Carbon				
Town of Center Point				
Town of Clay City				
Town of Harmony				
Town of Knightsville				
Town of Staunton				

Utilizing the information in Table 14 regarding the number of structures within each of the flood hazard areas, it is also important to note the number of flood insurance policies within each area in Clay County. **Table 16** provides the comparison between the number of structures in the 1.0% AEP and the number of flood insurance policies. It is also important to note that flood insurance is voluntary unless the property owner carries a federally subsidized mortgage; insurance coverage may be discontinued when the mortgage is completed.

Table 16: Structures in the 1.0% AEP and Number of Flood Insurance Policies

Community	# Structures In 1.0% AEP	# Policies
Clay County	1	7
City of Brazil	27	33
Town of Carbon	0	0
Town of Center Point	0	0
Town of Clay City	0	0
Town of Harmony	0	0
Town of Knightsville	0	0
Town of Staunton	0	0
Total	28	40

Future Considerations

As the municipalities within Clay County grow in population and redevelop, it can be anticipated that the number of critical and non-critical infrastructure will also increase accordingly. Clay County updated and adopted the County Floodplain Ordinance in 2011 similarly to the City of Brazil adopted their most recent updated Floodplain Ordinance in 2022. All the listed communities discourage critical facilities such as schools, medical facilities, community centers, municipal buildings, and other critical infrastructure from being located within the 1% AEP (100-year) floodplain. New structures must also be protected to that level along with flood-free access to reduce the risk of damage caused by flooding and to ensure that these critical infrastructures will be able to continue functioning during major flood events. Flooding due to poor drainage, low-lying land, or flash flooding is also an important consideration. It will be important for recognition of potential flood impacts to residents and businesses in these areas to be coupled with proper planning for future development and redevelopment of the flood zones. This would also include studying the inundation areas mapped through the development of the Indiana Floodplain Portal as well as studies of all the streams with 1 square mile or drainage area or greater. Since the previous planning effort, no development has occurred within the flood zones of Clay County or the incorporated communities within the county.

It is important to ensure that owners and occupants of residences and businesses within the known hazard areas, such as delineated or approximated flood zones and FEH, are well informed about the potential impacts from flooding incidents as well as proper methods to protect themselves and their property.

Increased precipitation, as predicted in the Indiana Climate Change Assessment, is anticipated to come in the form of heavier, shorter events which lead to the increased potential for flooding and stress on infrastructure such as sanitary and storm sewers. Heavy precipitation events are anticipated to occur more frequently as temperatures rise, replacing rain when previously there was snow.

Despite these efforts, the overall vulnerability and monetary value of damages is expected to increase in the area unless additional measures, such as those discussed later in Chapter 4 of this report, are implemented.

Indirect effects of flooding may include increased emergency response times due to flooded or redirected streets (**Figure 40),** the danger of dislodged and floating propane tanks causing explosions, and the need for additional personnel to carry out the necessary evacuations. Additional effects may include sheltering needs for those evacuated, and the loss of income or revenue related to business interruptions. Several communities within Clay County host numerous special events near to or on the rivers and waterways. These special events may have to be cancelled or postponed due to flooding or high-water levels.

Figure 40 Fire Engine in Flood Waters

Relationship to Other Hazards

While flooding creates social, physical, and economic losses, it may also cause other hazards to occur. For example, flooding may increase the potential for a hazardous materials incident to occur. Above ground storage facilities may be toppled or become loosened and migrate from the original location. In less severe situations, the materials commonly stored in homes and garages such as oils, cleaners, and de-greasers, may be mobilized by flood waters. Should access roads to hazardous materials handlers become flooded, or if bridges are damaged by flood waters, response times to more significant incidents may be increased, potentially increasing the damage associated with the release.

Increased volumes of water during a flood event may also lead to a dam failure. As the water levels rise in areas protected by dams, at some point, these structures will over-top or will breach leading to even more water being released. These two hazards, flood, and dam failure, when combined, may certainly result in catastrophic damage.

In a similar fashion, a snowstorm or ice storm can also lead to flooding on either a localized or regional scale. When a large amount of snow or ice accumulates, the potential for a flood is increased. As the snow or ice melts, and the ground becomes saturated or remains frozen, downstream flooding may occur. Ice jams near bridges and culverts may also result in flooding of localized areas and potentially damage the bridge or culvert itself.

Repeated flooding may also create impacts associated with landslides along riverbanks and bluff areas. As floodwaters travel through the systems, saturating shorelines and increasing volumes and velocities of water, the natural process of fluvial erosion may be exacerbated. As these processes are increased, structures and infrastructure located on bluffs or in proximity to the river may be at risk.

Flooding in known hazard areas may also be caused by dams that experience structural damage or failures not related to increased volumes or velocities of water. These “sunny day failures,” while not typical, may occur wherever these structures exist throughout the county.

3.2.6 HAILSTORMS, THUNDERSTORMS, AND WINDSTORMS

Overview

Hail occurs when frozen water droplets form inside a thunderstorm cloud, and then grow into ice formations held aloft by powerful thunderstorm updrafts, and when the weight of the ice formations becomes too heavy, they fall to the ground as hail. Hail size ranges from smaller than a pea to as large as a softball, and can be very destructive to buildings, vehicles (**Figure 41)** and crops. Even small hail can cause considerable damage to young and tender plants. Residents should take cover immediately in a hailstorm, and protect pets and livestock, which are particularly vulnerable to hail, and should be under shelter as well.

Thunderstorms are defined as strong storm systems produced by a cumulonimbus cloud, usually accompanied by thunder, lightning, gusty winds, and heavy rains. All thunderstorms are considered dangerous as lightning is one of the by-products of the initial storm. In the United States, on average, 300 people are injured, and 80 people are killed each year by lightning. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms. Other associated dangers of thunderstorms included tornados, high winds, hail, and flash flooding.

Windstorms or high winds can result from thunderstorm inflow and outflow, or downburst winds when the storm cloud collapses, and can result from strong frontal systems, or gradient winds (high- or low-pressure systems). High winds are speeds reaching 50 mph or greater, either sustained or gusting.

Recent Occurrences

Figure 41 Damaaging Hail on Vehicles

In Clay County, the NCDC has recorded 3 reports of hail. The average diameter hail stone occurring throughout Clay County ranges from ¾ to 1 inch with the largest one for this period of interest being 1.75 inches. According to the Midwest Regional Climate Center (MRCC) hail is considered severe if a thunderstorm produces hail stones larger than one inch in diameter, or larger than the size of a quarter.

Between January 1st, 2016, to September 30th, 2024, 23 thunderstorms/windstorm events took place. Significant windstorms are characterized by the top wind speeds achieved during the incident. Such high wind events characteristically occur in conjunction with thunderstorms and have historically occurred year-round with the greatest frequency and damage occurring in May, June, July, and August. Within Clay County, NCDC reports only 6 instances where top wind speeds were 60 mph or greater.

The NCDC recorded damages for hailstorms, thunderstorms, and windstorms throughout Clay County. From January 2016 to September 2024, there were instances of hailstorms, resulting in no property damage and no additional crop damage. Of the 23 instances of thunderstorms and high wind events, resulting in 20 reports indicated damages adding up to $1.004M in property damage and no additional crop damage. No injuries or deaths associated with these events. Many event reports included in the NCDC did not provide descriptive information on the social, physical, and economic losses resulting from individual storms specific to Clay County. In local storm reports at the National Weather Service, where damages were reported, narrative descriptions of the event

rarely extended beyond reports of damage to broken tree limbs, downed power lines, or roof damage.

Appendix 6 provides the NCDC information regarding hailstorms, thunderstorms, and windstorms that have resulted in injuries, deaths, and monetary damage to property and/or crops.

According to the Institute for Business and Home Safety, central Indiana can expect to experience damaging hailstorms three to four times over 20 years; the average life of a residential roof. Further, thunderstorms and windstorms are considered a high frequency hazard and may occur numerous times per year. Climate change has impacted the frequency of hailstorms, thunderstorms, and windstorms.

The Committee determined the probability of a hailstorm, thunderstorm, or windstorm occurring anywhere throughout Clay County is "Highly Likely" and will typically affect broad portions of the county at one time resulting in potentially "Negligible" to "Limited" damages. As advancements in technologies such as weather radar systems and broadcast alerts are continually made, the warning time for such incidents may increase. Currently, the Committee feels that the warning time is anticipated to be less than six to twelve hours and the duration is expected to last less than one day.

Indicative of a regional hazard, the probability, magnitude, warning time, and duration of a hailstorm, thunderstorm, or windstorm are expected to be similar throughout the county. These events are highly unpredictable, and the occurrences are distributed throughout the county, sometimes impacting one community more often or more severely than another. Therefore, the CPRI values reflect the distributed risk and associated priority for a hailstorm, thunderstorm, or windstorm. A summary is provided in **Table 17**.

Table 17: CPRI for Hailstorm, Thunderstorm, and Windstorm

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Clay County	Highly Likely	Limited	6 - 12 hours	< 1 day	Severe
City of Brazil	Highly Likely	Negligible	6 - 12 hours	< 1 day	Elevated
Town of Carbon	Highly Likely	Negligible	6 - 12 hours	< 1 day	Elevated
Town of Center Point	Highly Likely	Limited	6 - 12 hours	< 1 day	Severe
Town of Clay City	Highly Likely	Limited	6 - 12 hours	< 1 day	Severe
Town of Harmony	Highly Likely	Negligible	6 - 12 hours	< 1 day	Elevated
Town of Knightsville	Highly Likely	Negligible	6 - 12 hours	< 1 day	Elevated
Town of Staunton	Highly Likely	Limited	6 - 12 hours	< 1 day	Severe

Specific locations and frequency of hailstorms, thunderstorms, and windstorms are difficult to predict as many of these individual events are without significant warning time and may have impacts to very limited areas or may affect broader areas. However, based on NCDC data and personal experiences of the Committee, it was determined that all areas within the County are anticipated to experience a hailstorm, thunderstorm, or windstorm within the calendar year. More likely, these communities will be impacted by several of these hazard events each year. The magnitude is anticipated to be similar based on the number of critical infrastructure and populations of each of the municipalities, or "Limited" or "Negligible."

Assessing Vulnerability

The effects of a hailstorm, thunderstorm, or windstorm may be minimal to extensive in nature and may affect small or broad ranges of land area. Within Clay County, direct and indirect effects from a hailstorm, thunderstorm, or windstorm may include:

Direct Effects:

- Damages to infrastructure (power lines)
- Damages to individual properties (homes, cars)
- Physical injuries may be experienced by those unable to find shelter during storm events, such as homeless people, hikers and outdoor workers.

Indirect Effects:

- Downed power lines due to falling tree limbs.
- Losses associated with power outages.
- Damages sustained from blowing debris.
- Cancellation or interruption of special events.

Estimating Potential Losses

Figure 42 Home Damaged During Windstorm

Due to the unpredictability of this hazard all critical infrastructure and non-critical structures in Clay County are at risk of damage including temporary or permanent loss of function. For hailstorms, thunderstorms, and windstorms, it is not possible to isolate specific critical infrastructure or non-critical structures that would be vulnerable to damages. However, areas where utility lines are above ground and areas where dead or dying trees have not been removed may be at a higher risk of property damage or power outages during hailstorms, thunderstorms, and windstorms. Additionally, mobile homes and accessory buildings such as pole barns and sheds may also be at a higher risk of damage from hailstorms, thunderstorms, and windstorms if not properly anchored to the ground. Damage from falling limbs or uprooted trees such as that shown in **Figure 42.** Homeless individuals and families who have alternative means of sheltering may experience greater losses since the stability of tents and alternative structures does not withstand the damaging forces of the storms.

Future Considerations

As the population of the communities in Clay County develops and redevelops, it can be anticipated that the number of structures will also increase. To reduce the vulnerability for damage resulting from a hailstorm, thunderstorm, or windstorm, measures such as proper anchoring are vital. This includes not only roof anchors but also mobile home anchors. Proper tree maintenance, and burial of power lines should be completed. Adoption and enforcement of the current International Building Codes is key to ensuring structures are able to withstand the power of wind and hailstorms. While measures can be taken to remove existing structures or prevent future structures from being built in known hazard areas such as floodplains and hazardous materials facility buffers, such measures

are not applicable to hailstorms, thunderstorms, and windstorms due to the diffuse nature and regional impacts of this hazard.

Indirect effects resulting from a hailstorm, thunderstorm, or windstorm can include power outages caused by downed tree limbs or flying debris, damage resulting from prolonged power outages, and damage to structures or property as a result of debris. Damage to homeless encampments resulting in loss of personal property and potential injuries are also a concern during storms.

Relationship to Other Hazards

Hailstorms, thunderstorms, and windstorms may be the precursor for other hazards. For example, hazardous materials incidents can be the result of a hailstorm, thunderstorm, or a windstorm. Material storage containers can become damaged by high winds, debris, or even lightning, and can result in a spill or release of materials. With wind speeds greater than 58 mph, tankers and other transportation vehicles carrying hazardous materials are also at risk while on the road. High winds may also cause gaseous substances to travel farther distances at a much faster rate, increasing the evacuation area necessary to protect residents and visitors of Clay County.

Additionally, rainfall typically occurs with a thunderstorm and this additional precipitation may lead to localized flooding or riverine flooding depending on the amount of rain during the event. Debris from a windstorm may also lead to localized flooding if debris is deposited over drains or if obstructions are created by downed limbs, trees, or other storm related debris. A similar concern due to the potential precipitation would be dam failure. High winds may place debris near spillways, blocking the emergency drainage mechanism for the dams. High winds may also lead to structural damage to a dam or may cause damage to nearby trees or other structures, leading to indirect damage.

The risk of social losses also increases during a hailstorm, thunderstorm, or windstorm, as these hazards often result in downed power lines, utility poles, and trees. Debris such as this may impede traffic patterns and make it difficult for emergency vehicles (Fire, EMS, and Police) to pass through affected areas or people may be directly injured because of falling or flying debris.

3.2.7 LANDSLIDE/SUBSIDENCE

Overview

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors. For example, erosion by rivers, glaciers, or ocean waves can cause rock to fall. Rock and soil slopes may be weakened through saturation by snowmelt or heavy rains, earthquakes can create stresses that make weak slopes fail, and excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or man-made structures that may stress weak slopes to the point of collapse.

Another important consideration is Fluvial Erosion Hazard (FEH). This represents the risk associated with natural stream movements and losses associated with buildings and infrastructure. In some cases, this may be represented by a gradual movement of a stream across a farm field. In other, more extreme instances, homes or other infrastructure may be lost as steep riverbanks or bluffs sluff into the water below.

Land subsidence, according to the USGS, is “a gradual settling or sudden sinking of the Earth’s surface owing to subsurface movement of earth materials.” Further, there are three processes that contribute to subsidence: compaction of aquifer systems, drainage and subsequent oxidation of organic soils, and dissolution and collapse of susceptible rocks.

Recent Occurrences

The potential for landslides or land subsidence within Clay County was discussed by the Planning Committee. IndianaMap shows that there are no Karst Sinkhole areas anywhere in the County. To the knowledge of the Planning Committee, there are four surface mines, one underground mine, and 1 processing area within Clay County. **Figure *43*** shows the location of the active coal mining and processing. In the past there were several more surface and underground mines. Additionally, to date, there have not been any reported landslides or subsidence events reported in Clay County.

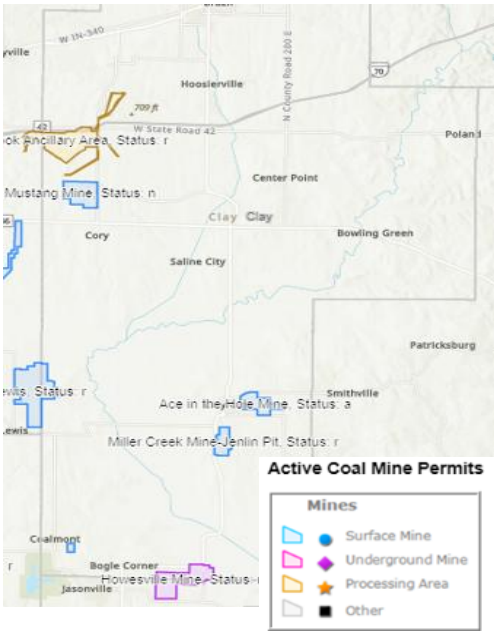


Figure 43 Active Coal Mine locations in Clay County

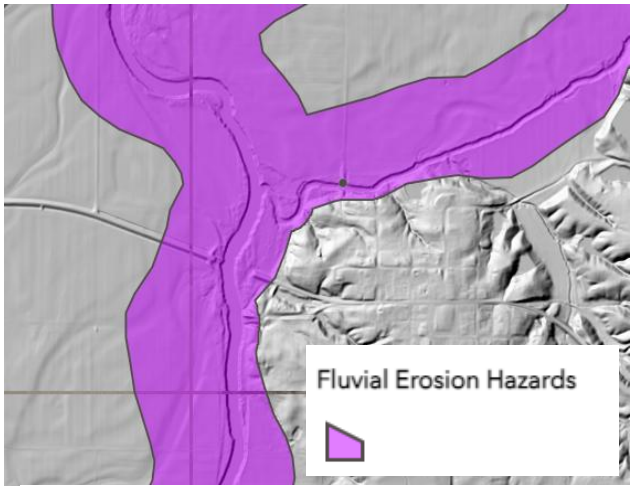


Figure 44 Fluvial Erosion Hazard along the Eel River near Bowling Green

Figure 44 shows the FEH corridor near Bowling Green on Eel River. The FEH zone appears to be relatively very stable and located within the 1% flood event boundaries.

The Committee determined the probability of a landslide or subsidence occurring in Clay County is “Highly Likely” except the Town of

Staunton thought it was “Possible”. Any event is expected to result in potentially “Significant” damages except in the Town of Clay City it is “Limited.” Currently, the Committee feels that the warning time is expected to be less than six hours and similarly, the duration is expected to last less than one week. These events are highly unpredictable and the risk, is “Severe” or “Elevated” according to the Committee, is distributed throughout the county. Therefore, the CPRI values reflect the distributed risk and associated priority for a landslide or subsidence event. A summary is provided in **Table 18**.

Table 18: CPRI for Land subsidence, Landslide and FEH

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Clay County	Highly Likely	Significant	< 6 hours	< 1 week	Severe
City of Brazil	Highly Likely	Significant	< 6 hours	< 1 week	Severe
Town of Carbon	Highly Likely	Significant	< 6 hours	< 1 week	Severe
Town of Center Point	Highly Likely	Significant	< 6 hours	< 1 week	Severe
Town of Clay City	Highly Likely	Limited	< 6 hours	< 1 week	Severe
Town of Harmony	Highly Likely	Significant	< 6 hours	< 1 week	Severe
Town of Knightsville	Highly Likely	Significant	< 6 hours	< 1 week	Severe
Town of Staunton	Possible	Significant	< 6 hours	< 1 week	Elevated

Assessing Vulnerability

Although Clay County has no known presence of Karst geology and is at a low risk of land subsidence or sink holes, the portions of the county are considered at relatively moderate to low risk according to the National Risk Index for landslides. The risk index considers expected annual loss as well as vulnerabilities by census tract and community resilience. The Risk Index for Landslide in Clay County is shown in Error! Reference source not found.. Ranging from relatively m oderate on the northern portions of the county, the southern portion is relatively low risk. This rating is related to the social vulnerability of the community living in the area. The planning committee rated the Landslide, Land Subsidence and Fluvial Erosion Hazard as “Highly Likely” and “Possible” according to the Planning Committee with “Severe” and “Elevated” severity.

Within Clay County, direct and indirect effects may include:

Direct Effects:

- Damages to infrastructure (power lines, roads, bridges)
- Damages to individual properties (homes, cars)
- Loss of cropland immediately adjacent to the rivers

Indirect Effects:

- Increased response time for emergency vehicles
- Losses associated with affected land (crop loss)
- Potential contamination of groundwater resources
- Loss of business due to roadway access and power loss.

Estimating Potential Losses

According to the National Risk Index, expected annual losses have been calculated for the areas in Clay County which are at risk of damage including temporary or permanent loss of function. The greatest factor involving the higher risk rating is the potential for larger segments of the population to be exposed to the potential hazard. **Figure 45** depicts where the National Risk Index has identified areas of moderate risk of Landslide.

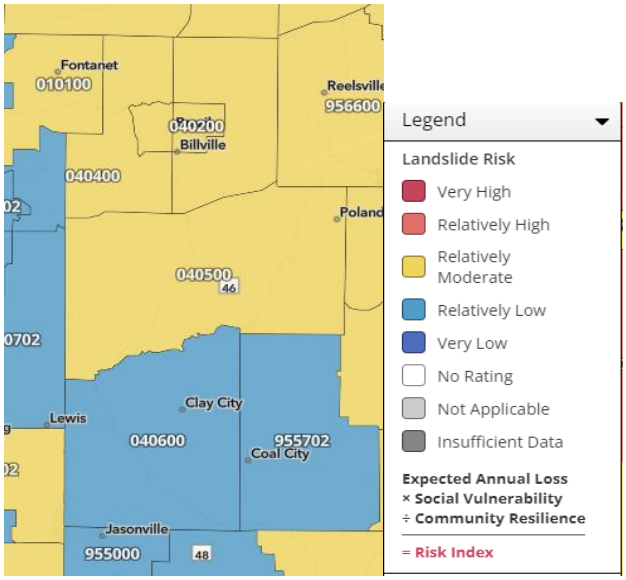


Figure 45 Risk Index for Landslide in Clay County

In addition, areas where FEH meander belt widths (FEH Zones) have been identified may be at a higher risk of property damage caused by such events. To prepare a community based basic "what-if" scenario, the Indiana FEH GIS layers were overlaid onto parcel data provided by the County. **Table 19** identifies the number of structures and potential damage within the FEH areas.

Table 19: Summary of Parcels in the FEH Zone

Community	# Parcels
Clay County	90
City of Brazil	37
Town of Carbon	0
Town of Center Point	0
Town of Clay City	2
Town of Harmony	0
Town of Knightsville	3
Town of Staunton	0

Future Considerations

As the populations of the communities in Clay County grow, it can be anticipated that the number of critical and non-critical structures will also increase. To reduce the vulnerability for damages resulting from a landslide or land subsidence, FEH area GIS layers along with the floodplain information should be integrated into the building permit or approval process. In recent years, no significant development has occurred within these areas of Clay County. However, depending on the location, any development may increase the vulnerability to this hazard.

Clay County rivers are considered relatively unstable having lateral movement annually, extreme precipitation events may cause erosion to take place in previously stable areas. Given this potential it is key the community continues to discourage construction of infrastructure and homes in the meander belt widths for each stream. Because of the changes in elevation on the Eel River of the Clay County, landslide is a possibility, especially during extreme precipitation events. Caution must be exercised for existing structures. Clay County and the City of Brazil should consider prevention efforts and opportunities to assure structures are not in potential slide areas.

As future growth takes place, the indirect effects resulting from a landslide or land subsidence event can cause challenges for the community if transportation routes are damaged, and businesses must

close due to access issues and loss of power. Cascading impacts in smaller counties can have long lasting effects on the local economy, community growth, health and welfare.

Relationship to Other Hazards

A landslide, subsidence event or FEH event may be the precursor for other hazards. Depending on the location of the event, material storage containers can become damaged resulting in a spill or release of materials and potentially contaminating groundwater reserves. Dam failures may occur in much the same fashion if located in the potential hazard areas, or resulting from heavy saturation following a rainstorm, heavy snow, or rapid snow melt. FEH may result in flooding in areas previously not impacted by flood due to debris clogging drainage ways and loss of earthen berms near the waterways.

Similarly, these types of events may be caused by hail, thunder, or windstorms and their effects on the soils; an earthquake may release the ground enough to set a slide in motion; or a flood may add increased soil saturation or weight to at-risk areas increasing the potential for an event and resulting damages.

3.2.8 TORNADO

Overview

Tornadoes are defined as violently rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground. However, the funnel cloud may reach the ground very quickly – becoming a tornado. If there is debris lifted and blown around by the "funnel cloud," then it has reached the ground and is a tornado.

Figure 46 Funnel Cloud During Lightning Storm at Night

A tornado is generated when conditions in a strong cell are produced that exhibit a wall of cool air that overrides a layer of warm air. The underlying layer of warm air rapidly rises, while the layer of cool air drops – sparking the swirling action. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally from April through June in Indiana, although tornadoes can occur at any time of year. Tornadoes tend to occur in the afternoons and evenings; over 80 percent of all tornados strike between 3:00 pm and 9:00 pm but can occur at any time of day or night as shown in **Figure 46.** Tornadoes occur most frequently in the United States east of the Rocky Mountains. In Indiana, tornadoes generally come from the southwest to the northeast and/or from west to east. While most tornadoes (69%) have winds of less than 100 mph, they can be much stronger. Although violent tornadoes (winds greater than 205 mph) account for only 2% of all tornadoes, they cause 70% of all tornado deaths. In 1931, a tornado in Minnesota lifted an 83-ton rail car with 117 passengers and carried it more than 80 feet. In another instance, a tornado in Oklahoma carried a motel sign 30 miles and dropped it in Arkansas. In 1975, a Mississippi tornado carried a home freezer more than a mile. Tornado debris can be clearly seen in **Figure 47.** According to an article in the New York Times, researchers say that in recent years tornadoes seem to be occurring in greater "clusters," and that the region known as tornado alley in the Great Plains, where most tornadoes occur, appears to be shifting eastward. This shift brings greater numbers and more intense tornadic storms to Indiana. The actual number of tornadoes nationwide appears to remain constant near 1,200, but tornadoes are occurring more frequently in traditionally" quiet" cooler months.

Figure 47 Debris Flying as Tornado Destroys Apartments under Construction

Recent Occurrences

The classification of tornadoes utilizes the Enhanced Fujita Scale of tornado intensity and damage. Tornado intensity ranges from low intensity (EF0) tornadoes with effective wind speeds of 65-85 mph to high intensity (EF5+) tornadoes with effective wind speeds of 200+ mph. (**Table 20**)

According to the NCDC, Clay County experienced 0 tornados between January 1, 2016, and September 30, 2024.

Table 20: Enhanced Fujita Scale for Tornados

EF-Scale	Windspeed, mph	Character of Damage	Relative Frequency	Typical Damages
EF0	65-85	Light damage	29%	Shallow rooted trees blown over; damage to roofs, gutters, siding
EF1	86-110	Moderate damage	40%	Mobile homes overturned, roofs stripped, windows broken
EF2	111-135	Considerable damage	24%	Large trees snapped, light-object missiles generated, cars lifted
EF3	136-165	Severe damage	6%	Severe damages to large buildings, trains overturned
EF4	166-200	Devastating damage	2%	Whole houses destroyed; cars thrown
EF5	200+	Incredible damage	<1%	High-rise buildings significantly damaged, strong framed homes blown away

The Committee estimated the probability of a tornado occurring in Clay County would be "Possible" and the magnitude and severity of such an event to be "Significant". The overall risk index is "Elevated" throughout the county. As with many hazardous events, the Committee anticipated a short warning time of typically less than six hours, and a short duration, also less than six hours. The summary is shown in **Table 21.**

Table 21: CPRI for Tornado

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Clay County	Possible	Significant	< 6 hours	< 6 hours	Elevated
City of Brazil	Possible	Significant	< 6 hours	< 6 hours	Elevated
Town of Carbon	Possible	Significant	< 6 hours	< 6 hours	Elevated
Town of Center Point	Possible	Significant	< 6 hours	< 6 hours	Elevated
Town of Clay City	Possible	Significant	< 6 hours	< 6 hours	Elevated
Town of Harmony	Possible	Significant	< 6 hours	< 6 hours	Elevated
Town of Knightsville	Possible	Significant	< 6 hours	< 6 hours	Elevated
Town of Staunton	Possible	Significant	< 6 hours	< 6 hours	Elevated

The Indiana State Climate Office estimates that throughout Indiana, there is an average of 20 tornado touchdowns per year. Based on the number of tornado touchdowns previously reported through the NCDC and local weather agencies, the Committee determined the general probability of a future tornado occurring in Clay County is "Possible" (within the next five years).

Assessing Vulnerability

As the path of a tornado is not pre-defined, it is difficult to isolate specific critical infrastructure and non-critical structures, or areas of Clay County that would be vulnerable to a tornado. Direct and indirect effects from a tornado may include:

Direct Effects:

- Increase damage to older construction including residential and business structures, mobile homes, and accessory structures (pole barns, silos, sheds, etc.)
- Damage to structures in the immediate pathway. (businesses, residences, warehouses, etc.)
- Loss of alternative housing stock nearby.
- Damages to above ground utility lines and structures

Indirect Effects:

- Loss of revenue for affected businesses.
- Expenses related to community clean-up and debris removal from public rights of way and public facilities.
- Inability for property owners to work while addressing damages from the tornado and debris removal from high winds.
- Affected business owners may experience loss of revenue if they are unable to continue operations following the event. Similarly, if a business is affected and unable to operate, employees may experience a loss of wages during the period of recovery.

Estimating Potential Losses

Due to the unpredictability of this hazard, all critical and non-critical structures within the county are at risk of future damage or loss of function. Estimates of potential physical losses were determined through a hypothetical exercise where an EF2 intensity tornado traveled through portions of the county and the communities. This is intended to present a "what-if" scenario of a tornado incident and associated damages. Damage estimates were derived by assuming that 25% of all structures in the path of the tornado would be completely destroyed, 35% of the structures would be 50% damaged, and 40% of the structures would sustain 25% damage. These estimations were also determined utilizing three wind speed zones based on distance from the tornado path. Zone 1 is nearest the center of the tornado path, while Zone 3 is the farthest from the path and with a theoretically lower wind speed. **Table 22** provides summary data for the hypothetical tornado, which is identified on **Exhibit 3**.

Table 22: Summary of Hypothetical Tornado Damages

	Zone 1		Zone 2		Zone 3		Total	
	#	$, Million	#	$, Million	#	$, Million	#	$, Million
Clay County	43	$5.57M	22	$2.45M	27	$3.07M	92	$11.09M
City of Brazil	114	$15.53M	95	$10.77M	103	$13.14M	312	$39.44M
Town of Carbon	0	0	0	0	0	0	0	0
Town of Center Point	0	0	0	0	0	0	0	0
Town of Clay City	0	0	0	0	0	0	0	0
Town of Harmony	0	0	0	0	0	0	0	0
Town of Knightsville	26	$3.49M	22	$3.11M	18	$2.13M	66	$8.73M
Town of Staunton	0	0	0	0	0	0	0	0
Totals	183	$24.59	139	$16.33M	148	$18.34M	470	$59.26M

Utilizing the same GIS information and process, critical infrastructure within each of the hypothetical tornado zones are included in **Table *22*.** There were no critical or essential buildings structures and damage in this example.

Future Considerations

The communities of Clay County host numerous events each year in addition to the regular tourist attractions and outdoor recreation opportunities which draw thousands of guests. Due to this, it is imperative that the EMA place continued importance on the need to maintain their outdoor warning siren coverage and/or support alternative notification methods for people who may not be tuned in to local media. Because of the dispersed population concentrations, coverage is limited to the more densely populated portions of the county. The existing siren locations are identified in **Figure 48.**

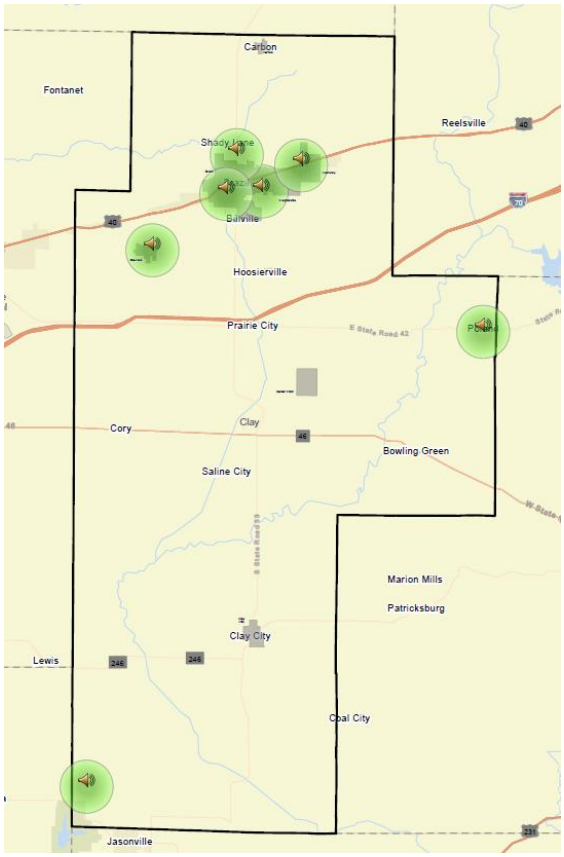


Figure 48 Siren Locations in Clay County

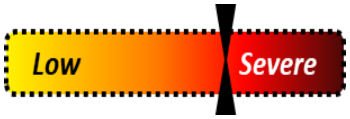
While it can be anticipated that new construction associated with development may be stronger than older or existing construction, existing older structures, barns, pole buildings, silos and mobile homes remain threatened by tornados. The unincorporated portions of Clay County will remain vulnerable, especially where the outdoor warning siren coverage is not present. It is impossible to predict the path of a tornado and therefore all current and future development will continue to be at risk for damage. Risks to the citizens of Clay County may be lessened through participation in mass notification programs, use of weather radios, and turning on the emergency alert feature on cell phones. Having multiple means of warning citizens, businesses and visitors of incoming weather events is critical to continued economic growth and well-being of the communities and the county.

Relationship to Other Hazards

Tornadoes may result in a hazardous materials incident. Material storage containers can become damaged by high winds and debris can result in a spill or release of materials. As wind speeds increase, the potential for damage to above ground storage containers also increases. Tankers and other transportation vehicles carrying hazardous materials are also at an increased risk while on the road or rail.

Tornadoes may also result in a dam failure as the increased wind speeds, and debris caused by the tornado, may directly impact the dam, or cause indirect damage by clogging outlet structures and/or emergency spillways. In addition, tornadoes may lead to structural fires as the destruction path is sometimes long and broad, leading to an increased number of potentially damaged homes, exposed power lines, gas leaks and substantial amounts of debris.

3.2.9 WINTER STORM AND ICE



Overview

A winter storm can range from moderate snow over a few hours to blizzard conditions with high winds, ice storms, freezing rain or sleet, heavy snowfall with blinding wind-driven snow, and extremely cold temperatures that can last for several days. Some winter storms may be large enough to affect several states while others may affect only a single community. Winter storms are typically accompanied by cold temperatures and blowing snow, which can severely reduce visibility. A winter storm is defined as one that drops four or more inches of snow during a 12-hour period, or six or more inches during a 24-hour span. An ice storm occurs when freezing rain falls from clouds and freezes immediately on contact with a variety of surfaces. All winter storms make driving and walking extremely hazardous. The aftermath of a winter storm can affect a community or region for days, weeks, and even months.

Figure 50 Ice Covered Powerlines

Storm effects such as extreme cold, flooding, and snow and ice accumulation can cause hazardous conditions and hidden problems for people in the affected area. **Figure 50** shows the added weight on trees and ice coated powerlines. People can become stranded on the road or trapped at home, without utilities or other services, including food, water, and fuel supplies. The conditions may overwhelm the capabilities of a local jurisdiction. Winter storms are considered deceptive killers as they may indirectly cause transportation accidents, and injury and death resulting from exhaustion/overexertion, hypothermia and frostbite from wind chill, and asphyxiation. House fires occur more frequently in the winter due to the use of alternative heat sources, such as space heaters, and lack of proper safety precautions.

Wind chill is a calculation of how cold it feels outside when the effects of temperature and wind speed are combined. On November 1, 2001, the NWS implemented a replacement Wind Chill Temperature (WCT) index for the 2001/2002 winter season. The reason for the change was to improve upon the current WCT Index, which was based on the 1945 Siple and Passel Index.

A winter storm watch indicates that severe winter weather may affect your area. A winter storm warning indicates that severe winter weather conditions are on the way. In the event of a blizzard, a winter storm warning will be issued and include the details of the blizzard - that large amount of falling or blowing snow and sustained winds of at least 35 mph are expected for several hours. Being in Southeastern Indiana, winter storms are not as common in Clay County

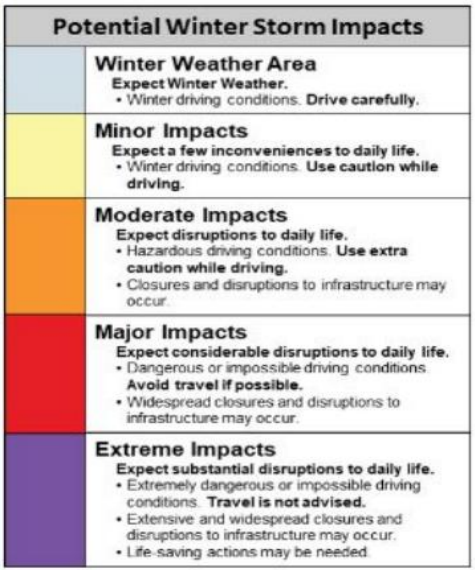


Figure 49 Winter Storm Impacts

and the surrounding region. Such conditions can result in substantial personal and property damage, even death. The National Weather Service recently (October 15, 2018) consolidated their watch and warning products. In doing so, blizzards and lake effect snows are no longer separate watches and warnings, but instead are detailed as a part of winter storm watches and warnings. A large number of winter storm products are available on the internet from the National Weather Service. One is The Winter Storm Severity Index (WSSI). When a storm is forecast, the NWS can help communities better understand the potential impacts of storm using WSSI. **Figure 49** shows the description of the WSSI impacts. More detailed information with regards to the timing of the storms, etc., is provided as the event gets closer to the forecast area.

Recent Occurrences

Since January 1, 2016 to September 30, 2024 the NCDC has recorded 1 winter weather events, 0 ice storms, 1 heavy snow event, and 2 winter storms. NCDC reports indicated that on January 8, 2022, Indiana State Police icy conditions on Interstate 70 caused a vehicle to lose control and strike a tree; killing 3 adults and one suffer minor non-life-threatening injuries. In addition, there was $25,000 in property damage. The other events had no personal property damage, no additional crop damage and no injuries, or deaths associated with any of the other events. Many narrative descriptions indicated poor travel conditions, lots of power outages and debris associated with the winter weather events.

The probability, magnitude, warning times, and duration of a snowstorm or ice storm causing disruption to residents and businesses in Clay County, as determined by the Planning Committee, is expected to be mostly consistent throughout the county and communities. It is "Possible" to "Likely" that this type of hazard will occur in the area and will typically affect the entire county, and possibly several surrounding counties at one time, resulting in primarily "Limited" to "Significant" damage. The typical warning time for severe temperatures or several inches of snow associated with a winter storm is usually between 12 and 24 hours while the duration of the incident is anticipated to be less than one week. A summary is shown in **Table 23.**

Table 23: CPRI Summary for Winter Storms and Ice

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Clay County	Likely	Significant	12 -24 hours	< 1 week	Elevated
City of Brazil	Likely	Significant	12 -24 hours	< 1 week	Elevated
Town of Carbon	Likely	Limited	12 -24 hours	< 1 week	Elevated
Town of Center Point	Likely	Limited	12 -24 hours	< 1 week	Elevated
Town of Clay City	Possible	Limited	12 -24 hours	< 1 week	Elevated
Town of Harmony	Likely	Significant	12 -24 hours	< 1 week	Elevated
Town of Knightsville	Likely	Significant	12 -24 hours	< 1 week	Elevated
Town of Staunton	Likely	Limited	12 -24 hours	< 1 week	Elevated

The Planning Committee determined that the probability for a snowstorm or ice storm to occur in Clay County and the communities within is "Likely" or "Possible" may occur within the calendar year. Based on historical data and the experience of the Planning Committee, snowstorms have become less common in Clay County with the changing climate, however, ice storms bring more extensive challenges to the communities. Actions have been taken to mitigate many impacts from snow and ice storms. The Committee considered only the larger, more detrimental events for this effort.

Assessing Vulnerability

A snowstorm typically affects a large regional area with potential for physical, economic, and/or social losses. Direct and indirect effects of a snowstorm or ice storm within Clay County may include:

Direct Effects:

- A higher number of businesses rely on the outside workforce and may experience loss of production as employees may not be able to get to work. The high number of residents traveling to other areas for work results in loss of income due to the inability to reach their normal worksites.
- Rural (County) roads may impassable
- Expenses related to snow removal or brine/sand applications.
- Weight of ice and wet snow impacts older structures roofs as well as powerlines.
- Large ice and snow events interrupt economic activity within the community.

Indirect Effects:

- Loss of revenue as businesses are closed.
- Increased emergency response times based on safety of roads.
- Loss of income if workers are unable to get to their place of employment.
- Delayed impacts due to supply chain disruptions – products not received or shipped on time cause lost wages and revenues.
- Cancellation of special events and reduced tourist activities impact the local economy.

Estimating Potential Losses

Figure 51 Travel Impacted During Snowstorm

Given the nature and complexity of a regional hazard such as a snowstorm, it is difficult to quantify potential losses to property and infrastructure. As a result, all critical and non-critical structures and infrastructure are at risk from snowstorm and ice storm incidents.

For planning purposes, information collected in snowstorms impacting other communities around the nation is also useful in assessing the potential social, physical, and economic impact that a winter storm could have on communities. For example, a March 2003 snowstorm in Denver, Colorado dropped approximately 31 inches of snow and caused an estimated $34M in total damage. In addition, a February 2003 winter storm dropped an estimated 15-20 inches of snow in parts of Ohio. The Federal and Ohio Emergency Management Agencies and U.S. Small Business Administration surveyed damaged areas and issued a preliminary assessment of $17M in disaster related costs. These costs included snow and debris removal, emergency loss prevention measures, and public utilities repair. The agencies found over 300 homes and businesses either damaged or destroyed in six counties. Snowstorms and blizzards also make road travel difficult and dangerous, as seen in **Figure 51**.

Looking a bit closer to home, In December 2008, Allen County had a wintry combination of freezing rains, snow and ice. This storm was the largest disaster for Indiana Michigan Power with 110,000 Allen County customers without power. One thousand six hundred (1,600) additional crew members were brought in to restore electrical service to the county. According to the Journal Gazette $10 – $12 million was spent to clean up the debris, make repairs and labor costs for this event.

While the above examples indicate the wide-ranging and large-scale impact that winter storms can have on a community or region, winter storms generally tend to result in less direct economic impacts than many other natural hazards. According to the Workshop on the Social and Economic Impacts of Weather, which was sponsored by the U.S. Weather Research Program, the American Meteorological Society, the White House Subcommittee on Natural Disaster Relief, and others, winter storms resulted in an average of 47 deaths and more than $1B in economic losses per year between 1988 and 1995. However, these totals account for only 3% of the total weather-related economic loss and only 9% of fatalities associated with all weather-related hazards over the same period.

Future Considerations

As populations increase and communities continue to grow, the need to respond to snowstorms or ice storms will remain an important municipal effort. As new construction or re-development occurs, especially new or existing critical infrastructure, it is important to ensure that these new structures are equipped to deal with the potential risks associated with this hazard. Those may include lengthy power outages and potentially impassable transportation routes, making it difficult to obtain supplies or for passage of response vehicles. These hazard events will typically affect the entire county, perhaps multiple counties, and therefore all developments, current and future, will be at risk for damage associated with snow and ice storms. In addition, there will be a need for additional warming shelters for the underserved populations to take refuge and get warm and safe respite for stranded commuters on their way to or from work. This not only includes daytime available spaces but also overnight accommodation as the winter storms is often accompanied by very cold temperatures and wind chills.

Winter storms can also result in substantial indirect costs. Increased emergency response times, loss of work or the inability to get to work, as well as business interruption, are possible indirect effects of a winter storm. According to a report by the National Center for Environmental Predictions, the cold and snowy winter in late 1977 and early 1978, which impacted several heavily populated regions of the country, was partially responsible for reducing the nation's Gross Domestic Product (GDP) from an estimated growth rate of between 6% and 7% during the first three quarters of 1977 to approximately -1% in the last quarter of 1977 and 3% during the first quarter of 1978.

Relationship to Other Hazards

Winter storms and ice storms can lead to flooding as the precipitation melts and enters local receiving waters. This increased volume of water on already saturated, or still frozen ground can quickly result in flood-related damage to structures and properties (**Figure 52)** as well as within the stream or river channel. Clay County has an increased risk of flooding following heavy precipitation events. The increased flooding may then lead to a dam failure within the same area, further exacerbating the damage.

Hazardous materials incidents may be caused by poor road conditions during winter storms or ice storms. Many hazardous materials are transported by rail or by tanker over highways and interstates. In the more rural areas of Clay County, or where open areas are more susceptible to snow drifts on roads, the possibility of a traffic related hazardous materials incident may increase due to road obstruction and lack of visibility.

Figure 52 Flooding Caused by Snow Melt

Power outages and other infrastructure failures may also occur during a winter storm. Weight from snow and ice accumulations can directly or indirectly cause power lines to fail. During extreme cold temperatures, power outages may prove deadly for certain populations such as the homeless, the elderly or ill. Power outages in the winter are especially dangerous as families try to generate heat using alternative heat sources. Alternative heating sources may not be safely used or may be placed too close to combustible materials resulting in fires and burn injuries or death.

3.2.10 DAM AND LEVEE FAILURE

Overview

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is a collapse, breach, or other failure resulting in downstream flooding.

A dam impounds water in the upstream area, referred to as the reservoir. The amount of water impounded is measured in acre-feet. An acre-foot is the volume of water that covers an acre of land to a depth of one foot. As a function of upstream topography, even a small dam may impound or detain many acre-feet of water. Two factors influence the potential severity of a full or partial dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream.

Of the approximately 80,000 dams identified nationwide in the National Inventory of Dams, the majority are privately owned. Each regulated dam is assigned a downstream hazard classification based on the potential loss of life and damage to property should the dam fail. The three classifications are high, significant, and low. With changing demographics and land development in downstream areas, hazard classifications of regulated are updated continually. The following definitions of hazard classification currently apply to dams in Indiana:

- High Hazard Dam: a structure, the failure of which may cause the loss of life and severe damage to homes, industrial and commercial buildings, public utilities, major highways, or railroads.
- Significant Hazard Dam: a structure, the failure of which, may damage isolated homes and highways or cause the temporary interruption of public utility services.
- Low Hazard Dam: a structure, the failure of which, may damage farm buildings, agricultural land, or local roads.

In Indiana, not all dams are regulated. To be regulated by the Indiana Department of Natural Resources (DNR), To be a jurisdictional structure, the dam must meet at least one of the following criteria:

- Have a drainage area above the dam of more than one square mile.
- The dam is 20 feet in height or greater.
- The dam impounds a volume of more than 100 acre-feet of water.

A dam's classification may be changed to a High-hazard classification through a successful petition by a downstream property owner. Federally owned and operated dams are not under Indiana DNR's jurisdiction. Examples of Federally regulated dams include Federal Energy Regulatory Commission (FERC) and US Army Corps of Engineers (USACE) structures. Although regulations are similar, there are additional requirements based on the regulating agency.

A levee is a flood control structure engineered and designed to hold water away from a building. Levees protect buildings from flooding as well as from the force of water, from scour at the foundation, and from impacts of floating debris. Flood protection levees principle causes of levee failure, like those associated with dam failure, include overtopping, surface erosion, internal erosion, and slides within the levee embankment or the foundation walls. Levees are designed to protect against a particular flood level and may be overtopped in a more severe event. When a levee system fails or is overtopped, the result can be catastrophic and often more damaging than if the levee were not there, due to increased elevation differences and water velocity. The water flowing through the breach continues to erode the levee and increases the size of the breach until it is repaired or water levels on the two sides of the levee have equalized. The FEMA and US Army Corps of Engineers

(USACE) remind people living and working behind levees that there is always a residual risk when living or working in a facility located behind a levee. Levees reduce the risk of a flood, but do not completely eliminate that risk.

Recent Occurrences

Within Clay County, there are 7 structures listed in the DNR dams list. Of the 7 in Clay County, five are classified as low hazard dams, two are significant hazard dams. There are no low head dams in Clay County**. Table 24** shows all the structures listed on the National Inventory of Dams (NID). According to local information and state dam safety records, there have not been any recent dam failures or incidents within Clay County.

Table 24: Dams in Clay County

Dam Name	Owner Types	State Regulated Dam	Hazard Potential Classification	IEAP Prepared
Twin Beach Dam	Private	Yes	Low	No
Izaak Walton Dam	Private	Yes	Significant	No
Lake in the Woods Dam	Private	Yes	Significant	No
Jon Bowles Lake	Private	No	Low	No
Risslers Lake Dam	Private	No	Low	No
Chinook Slurry Pond	Private	No	Low	No
Water Works Lake Dam	Local Government	No	Low	No

According to the National Levee Database (NLD) managed by the USACE, there are no certified levees systems within Clay County. The Indiana Silver Jackets Team completed a survey of levee like features also known as non-levee embankments. The non-levee embankments are not certified or engineered structures. They are earthen structures which act like levees, however, are not capable of protecting the features behind the structures adequately. In fact, non-levee embankments impose lateral constraints on flood flows, reducing the floodplain storage capacity and increasing the flood velocity. These non-levee embankments can cause stream erosion and downstream flooding. Some farms along the rivers and streams rely on these embankments to keep flood waters out of their fields. **Figure 53** shows the location of some of the non-levee embankments in Clay County.

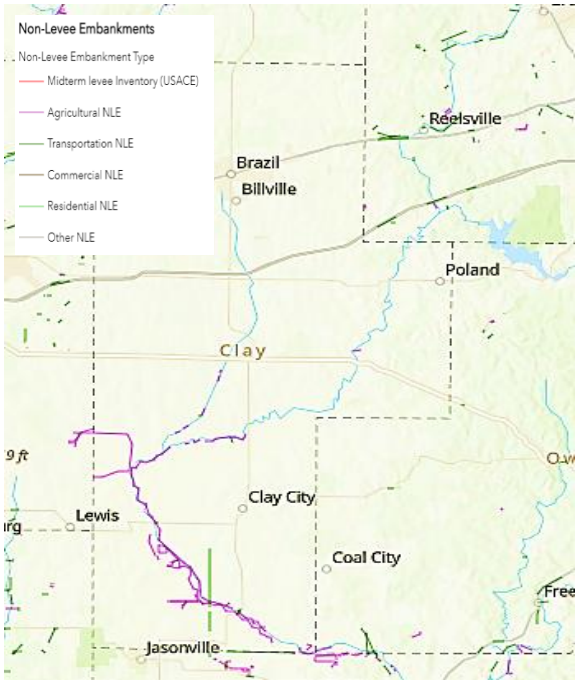


Figure 53 Non-Levee Embankments in Clay County

Based on the information provided to them and their local knowledge, experience, and expertise, the Committee determined the probability of a dam failure is “Unlikely.” The magnitude of a dam failure can have “Negligible” damages. The warning

time is under 6 hours. **Table 25** provides a summary of the Planning Committee's expectations during a dam failure.

Table 25: CPRI Summary for Dam and Levee Failure

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Clay County	Unlikely	Negligible	< 6 hours	< 6 hours	Low
City of Brazil	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Carbon	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Center Point	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Clay City	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Harmony	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Knightsville	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Staunton	Unlikely	Negligible	< 6 hours	< 6 hours	Low

Assessing Vulnerability

The actual magnitude and extent of damage due to a dam failure depends on the nature of the breach, the volume of water that is released, and the width of the floodplain valley to accommodate the flood wave. Due to the conditions beyond the control of the dam owner or engineer, there may be unforeseen structural problems, natural forces, mistakes in operation, negligence, or vandalism that may cause a structure to fail. **Figure 54** shows the inundation area during a breach of the dam.

Figure 54 Inundation Map - Breach at Water Works Lake Dam

Incident and Emergency Action Plans (IEAPs) are now required for all high hazard dams by state law, however, these plans are not mandated for the significant and low hazard structures. Dam owners are, however, encouraged to prepare an IEAP to help identify whom to notify and what actions may need to take place in the event of an incident or emergency event affecting the dam. For the state regulated high hazard dams, the Indiana DNR dam safety webpage shows areas which areas would be inundated during a dam failure.

Within Clay County, direct and indirect effects from a dam failure may include:

Direct Effects:

- Potential loss of life and severe damage to downstream homes, industrial and commercial buildings, public utilities, major highways, or railroads
- Loss of use of reservoirs for flood control, recreation, and water supply

Indirect Effects:

- Loss of land in the immediate scour area
- Increased response times due to damaged or re-routed transportation routes and/or bridges
- Long lasting economic impacts on the community due to business closures, and relocation of impacted property owners.

Estimating Potential Losses

As of July 1, 2022, the State of Indiana is requiring High Hazard dams to have Incident and Emergency Action Plans (IEAPs) developed. These plans have detailed potential dam failure inundation areas identified along with at-risk structures identified. The actual magnitude and extent of damage depends on the type of dam break, the volume of water that is released, and the width of the floodplain valley to accommodate the dam break flood wave. All dam owners are encouraged to develop an IEAP.

There are no high hazard dams in Clay County. The only dam to have an inundation area mapped for Clay County is a breach of the Water Works Lake Dam, a low hazard dam.

Utilizing GIS maps and orthoimagery, the infrastructure and other features below this dam can be identified. This imagery will show properties that would be isolated due to the inundation of the roadways leading in and out of the area as well as those properties which would be inundated.

Future Considerations

As areas near existing dams continue to grow in population, it can be anticipated that the number of critical and non-critical structures could also increase accordingly. Location of these new facilities should be carefully considered, and precautions should be taken to ensure that schools, medical facilities, municipal buildings, and other critical infrastructure are located outside of the delineated or estimated dam failure inundation areas. Also, flood-free access should be provided for these facilities. Large areas of new development have not yet occurred downstream of the dams in Clay County. Until such development or re-development downstream of a dam is prohibited, those areas remain vulnerable to losses and damage associated with a failure of that structure.

It is also particularly important to all downstream communities and property owners that dam IEAPs are developed, kept up-to-date, and routinely exercised to ensure the greatest safety to those within the hazard area. Although not mandated, this is the best management practice for Significant and Low Hazard dams as well.

The Water Works Lake Dam is managed by local government. As such it is and will continue to be maintained according to the dam safety program requirements. Although failure is always a possibility with a record-breaking extreme precipitation event, it is not anticipated to take place in the near future (next 5- 10 years). The communities downstream continue to work with the local government to reduce potential damage through outreach efforts and assuring property owners are informed on ways to mitigate their risks, such as building on higher ground, etc. These mitigation efforts are a part of the day-to-day operations of the building and zoning departments, for all dams, as they issue permits and discuss floodplain issues with nearby property owners.

Relationship to Other Hazards

With the potentially large volumes and velocities of water released during a breach, it can be expected that such a failure would lead to flooding and debris flow within the inundation areas downstream of the dam. Nearby bridges and roads are also in danger of being destroyed or damaged due to a dam failure. Bridges may become unstable, and portions of road surfaces may be washed away. Entire roads may be undermined by the forces of the water and debris. Other infrastructure such as utility poles and lines may be damaged as the water and debris flows along. Buried utility pipes may become exposed due to scouring; all of which may lead to utility failures within the area downstream of the dam failure.

Due to flood and debris flow damages, hazardous materials facilities and transportation routes may be damaged resulting in releases. If LP gas tanks are located nearby, they may be torn from their mountings and would become part of the flowing debris as well as leaking their contents from the ruptured service lines.

3.2.11 HAZARDOUS MATERIALS INCIDENT

Overview

Hazardous materials are substances that pose a potential threat to life, health, property, and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases. Despite precautions taken to ensure careful handling during manufacture, transport, storage, use, and disposal, accidental releases are bound to occur. These releases create a serious hazard for workers, neighbors, and emergency response personnel. Emergency response to a release may require fire, safety/law enforcement, search and rescue, and hazardous materials response units.

Figure 55 Potentially Hazardous Waste Drums

As materials are transported for treatment, disposal, or transport to another facility, all infrastructure, facilities, and residences near the transportation routes are at an elevated risk of being affected by a hazardous materials release. Often these releases can cause serious harm to Clay County and its residents if proper and immediate actions are not taken. Most releases are the result of human error or improper storage (**Figure *55*)**, and corrective actions to stabilize these incidents may not always be feasible or practical in nature.

Railways often transport materials that are classified as hazardous and preparations need to be made and exercised for situations such as derailments, train/vehicle crashes, and/or general leaks and spills from transport cars.

Recent Occurrences

During conversations with Committee members and through information provided by local news outlets, it was noted that numerous small and moderately sized incidents involving manufacturing facilities and transportation routes have occurred since the development of the original MHMP. However, the number of SARA Title III Tier II facilities utilizing, storing, and/or manufacturing chemicals has decreased over the years as facilities reduce the amount hazardous materials on site. Both Tier II and other chemical facilities as well as businesses and industries rely on just in time delivery which results in an increase in the number of delivery vehicles transporting hazardous materials across the county. Vehicular traffic on Interstate 70 carries materials from west to east across the United States from Cove Fort, Utah to just outside of Baltimore Maryland. State Road 59 crosses Clay County from north to south connecting to State Road 47 near Waveland to the north and

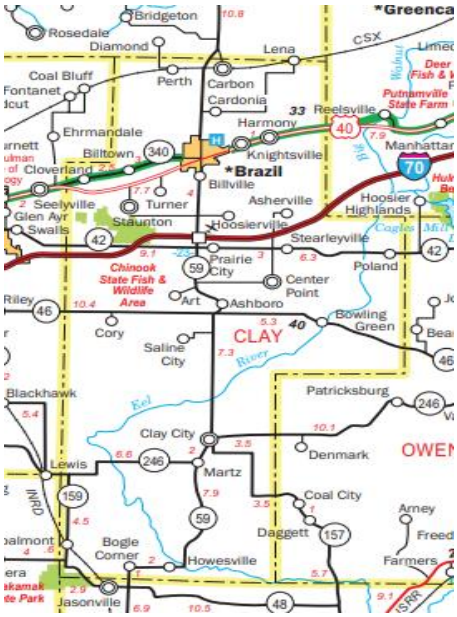


Figure 56 Transportation Map - Clay County

Sandborn to the south at State Road 58. With two major transportation arteries through the county, local roadways and state roads are often used to avoid traffic accidents, and slowdowns. The volume of traffic increases the potential for incident. (**Figure 56**) Clay County does have a hazardous materials response capacity and has mutual aid hazardous materials response capabilities in nearby Vigo County's Terra Haute Fire Department. Clay County has worked with local industry to augment the response capabilities and training.

According to the Committee, the probability of a hazardous materials release or incident is "Highly Likely" in all areas due to the number of transportation routes within and through county. "Critical" damages are anticipated to result from an incident. The level of damage is dependent upon the location of the event. As with hazards of this nature, a short warning time of less than six hours and a short duration, less than one week is anticipated in the event of a hazardous materials incident. A summary is shown in **Table 26.**

Table 26: CPRI Summary for Hazardous Materials

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Clay County	Highly Likely	Critical	< 6 hours	< 1 week	Severe
City of Brazil	Highly Likely	Critical	< 6 hours	< 1 week	Severe
Town of Carbon	Highly Likely	Critical	< 6 hours	< 1 week	Severe
Town of Center Point	Highly Likely	Critical	< 6 hours	< 1 week	Severe
Town of Clay City	Highly Likely	Critical	< 6 hours	< 1 week	Severe
Town of Harmony	Highly Likely	Critical	< 6 hours	< 1 week	Severe
Town of Knightsville	Highly Likely	Critical	< 6 hours	< 1 week	Severe
Town of Staunton	Highly Likely	Critical	< 6 hours	< 1 week	Severe

Relatively small hazardous materials incidents have occurred throughout Clay County in the past and may, according to the Committee, occur again. As the number of hazardous materials producers, users, and transporters increase within or surrounding Clay County, it can be anticipated that the likelihood of a future incident will also increase. Additionally, as the I-70 corridor increase in traffic, the international shipments will continue to increase, enhancing the potential for accidents.

Assessing Vulnerability

Within Clay County, direct and indirect effects from a hazardous materials incident may include:

Direct Effects:

- Acute or chronic health issues due to chemical exposure.
- Closure of impacted railroad crossings.
- Possible crop or livestock damage from chemical exposure.
- Damage to infrastructure from leaks, accidents, or recovery operations.
- Expense of decontamination and reconstruction of affected structures.

Indirect Effects:

- Loss of revenue or production while testing, recovery and/or reconstruction occurs.
- Anxiety or stress related to the event.
- Potential evacuation of neighboring structures or facilities.
- Evacuation and/or relocation of homeless persons living in the impacted area.

- Added expenses detouring traffic around incident location.
- Expenses incurred due to response, testing, and cleaning of the affected areas.

Figure 57 Hazardous Materials Incident

While the possibility of an incident occurring may be possible, the vulnerability of Clay County has been lowered due to the enactment of Superfund Amendments and Reauthorization Act (SARA) Title III national, state, and local requirements. SARA Title III, also known as the Emergency Planning and Community Right to Know Act (EPCRA), establishes requirements for planning and training at all levels of government and industry. EPCRA also establishes provisions for citizens to have access to information related to the type and quantity of hazardous materials being utilized, stored, transported, or released within their communities.

One local result of SARA Title III is the formation of the Local Emergency Planning Committee (LEPC). This committee has the responsibility for preparing and implementing emergency response plans, cataloging Safety Data Sheets (SDS) formerly known as Material Safety Data Sheets (MSDS), creating chemical inventories of local industries and businesses, and reporting materials necessary for compliance.

In Clay County, facilities are subject to SARA Title III provisions due to the presence of listed hazardous materials in quantities at or above the minimum threshold established by the Act. These facilities are also required to create and distribute emergency plans and facility maps to local emergency responders such as the LEPC, fire departments, and police departments. With this knowledge on hand, emergency responders and other local government officials can be better prepared to plan for an emergency and the response it would require, and to better prevent serious effects to the community involved.

Estimating Potential Losses

In addition, the very nature of these events makes predicting the extent of their damage very difficult. A small-scale spill or release might have a minor impact and would require only minimal response efforts. Another slightly larger incident might result in the disruption of business or traffic patterns, and in this situation, might require active control response measures to contain a spill or release. However, even small, or moderate events could potentially grow large enough that mass evacuations or shelter in place techniques are needed, multiple levels of response are utilized, and additional hazards such as structural fires and/or additional hazardous materials releases (or explosions) may occur. Given the unpredictable nature of hazardous materials incident, an estimate of potential losses was not generated.

Future Considerations

Additional facilities, both critical and non-critical in nature may be affected if a hazardous materials release were to occur along a transportation route. All of the state roads are traveled by carriers of hazardous materials. As businesses and industries increase in the area, the increased use of these routes will increase the number of transportation related incidents.

By restricting development within the known hazardous materials facility buffer zones, future losses associated with a hazardous materials release can be reduced. Critical infrastructure should be especially discouraged from being located within these areas. Further, by restricting construction in these zones, the number of potentially impacted residents may also be reduced, lowering the risk for social losses, injuries, and potential deaths. Future construction of hazardous materials facilities should be located away from critical infrastructure such as schools, medical facilities, municipal buildings, and daycares. Such construction would likely reduce the risk to highly populated buildings and populations with physical or social, emotional, or behavioral challenges or considerations such as children, elderly, and medically fragile individuals.

Many facilities constructed within close proximity to a hazardous materials facility are similar due to local zoning ordinances. This reduces the risk and vulnerability of some populations. However, there are several facilities and numerous transportation routes located throughout each of the communities making current and future development at risk for losses associated with a hazardous materials release.

Relationship to Other Hazards

Dependent on the nature of the release, conditions may exist where a fire or spark ignites a flammable or explosive substance. As the fire spreads throughout the facility or the area, structural and/or property damage will increase. If the hazardous substances are in enclosed containers such as railroad tank cards, cylinders or other containers, near heat generating events such as a fire, explosion becomes a risk as well. Response times to a hazardous materials incident may be prolonged until all necessary information is collected detailing the type and amount of chemicals potentially involved in the incident. Depending on the nature of the incident, further delays may take place until qualified Hazardous Materials Responders with the appropriate response and monitoring equipment can be transported to the incident location. While this may increase structural losses, it may decrease social losses such as injuries or even deaths.

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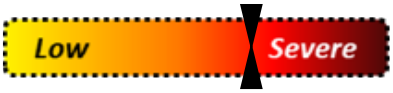
3.3 HAZARD SUMMARY

For the development of this MHMP, the Committee utilized the CPRI method to prioritize the hazards they felt affected Clay County. Hazards were assigned values based on the probability or likelihood of occurrence, the magnitude or severity of the incident, as well as warning time and duration of the incident itself. A weighted CPRI was calculated based on the percent of the county's population present in the individual communities. **Table 27** summarizes the CPRI ratings for the various hazards studied within this MHMP.

Table 27: All CPRI Ratings Combined

Type of Hazard	List of Hazards	Weighted Average CPRI Rating
Natural	Drought	
	Earthquake	
	Extreme Temperatures	
	Fire/Wildfire	
	Flood	
	Hail/Thunder/Windstorm	
	Landslide/Subsidence	
	Tornado	
	Winter Storm/Ice	
Technological	Dam & Levee Failure	
	Hazardous Materials Incident	

It is important to understand the cause-and-effect relationship between the hazards selected by the Committee. **Table *28*** can be utilized to identify those relationships. For example, a winter storm (along the side of the table) can result in a flood (along the top of the table). In a similar fashion, a hazardous materials incident (along the top of the table) can be caused by an earthquake; flood; tornado; or a winter storm or ice storm (along the side of the table).

Table 28: Hazard Reference Table

EFFECT → / CAUSE ↓	Drought	Earthquake	Extreme Temperature	Fires and Wildfire	Flood	Hailstorm/ Thunderstorm/ Windstorm	Landslide / Subsidence	Tornado	Winter Storm / Ice	Dam & Levee Failure	Hazardous Materials
Drought				X							
Earthquake				X			X			X	X
Extreme Temperature											X
Fires and Wildfire											X
Flood							X			X	X
Hailstorm/ Thunderstorm / Windstorm				X	X		X			X	X
Landslide / Subsidence/ FEH					X						X
Tornado				X						X	X
Winter Storm/ Ice					X					X	X
Dam & Levee Failure					X		X				X
Hazardous Materials				X							

As a method of better identifying the potential relationships between hazards, the community exhibits can be referenced to indicate the proximity of one or more known hazard areas such as the delineated floodplains and the locations of EHS facilities. For this reason, many of the communities in Clay County may be impacted by more than one hazard at a time, depending on certain conditions. It can be anticipated that if a flood were to occur within these areas, there would be a potentially increased risk of a facility experiencing a hazardous materials incident. These areas may also be at a greater risk of a dam or non-levee embankment failure. Future development in areas where multiple known hazard areas (dam failure inundation areas, floodplains and surrounding hazardous materials facilities) overlap should undergo careful design, review, and construction protocol to reduce the risk of social, physical, and economic losses due to a hazard incident. While it may certainly be difficult, critical infrastructure should not be constructed within these regions.

4.0 MITIGATION GOALS AND PRACTICES

This section identifies the overall goal for the development and implementation of the Clay County MHMP. A summary of existing and proposed mitigation practices discussed by the Committee is also provided.

4.1 MITIGATION GOAL

REQUIREMENT §201.6(c)(3)(i):
[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The Committee reviewed the mitigation goals as outlined within the 2016 Clay County MHMP and determined that the goals remain valid and effective. In summary, the overall goal of the Clay County MHMP is to reduce the social, physical, and economic losses associated with hazard incidents through emergency services, natural resource protection, prevention, property protection, public information, and structural control mitigation practices.

4.2 MITIGATION PRACTICES

REQUIREMENT §201.6(c)(3)(ii):

[The mitigation strategy shall include a] section that identifies and analyzed a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

REQUIREMENT §201.6(c)(3)(iii):

[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

In 2005, the Multi-Hazard Mitigation Council conducted a study about the benefits of hazard mitigation. This study examined grants over a 10-year period (1993-2003) aimed at reducing future damages from earthquakes, wind, and flood. It found that mitigation efforts were cost-effective at reducing future losses; resulted in significant benefits to society; and represented significant potential savings to the federal treasury in terms of reduced hazard-related expenditures. This study found that every $1 spent on mitigation efforts resulted in an average of $4 savings for the community. The study also found that FEMA mitigation grants are cost-effective since they often lead to additional non-federally funded mitigation activities and have the greatest benefits in communities that have institutionalized hazard mitigation programs.

A more recent (2017) study by the National Institute of Building Sciences, reviewed over 20 years of federally funded mitigation grants, not only from FEMA but also from the US Economic Development Administration (EDA) and the US Department of Housing and Urban Development (HUD). From this broadened review, it has been determined that for every $1 spent on mitigation, $6 is saved on disaster costs. In addition, by designing and construction buildings which exceed select items in the 2015 International Code, $4 can be saved for every $1 invested in those changes.

Six primary mitigation practices defined by FEMA are:

- **Emergency Services** – measures that protect people during and after a hazard.
- **Natural Resource Protection** – opportunities to preserve and restore natural areas and their function to reduce the impact of hazards.
- **Prevention** – measures that are designed to keep the problem from occurring or getting worse.
- **Property Protection** – measures that are used to modify buildings subject to hazard damage rather than to keep the hazard away.
- **Public Information** – those activities that advise property owners, potential property owners, and visitors about the hazards, ways to protect themselves and their property from the hazards.
- **Structural Control** – physical measures used to prevent hazards from reaching a property.

4.2.1 Existing Mitigation Practices

As part of this planning effort, Committee members were forwarded a copy of the prior MHMP's mitigation actions. Team members reviewed those actions and were asked to consider any and all other mitigation actions based on the hazards discussed in meeting #1. At the second planning team meeting, the Committee discussed the strengths and weaknesses of existing mitigation practices and made recommendations for improvements, as well as suggested new practices. The committee also examined practices employed by neighboring communities assessing the viability of those actions within Clay County. The following is a summary of existing hazard mitigation practices within the County. Mitigation measures that were included in the 2016 Clay County MHMP are noted as such. A list of the former mitigation actions included in the 2016 MHMP and their status may be found in Appendix 12.

<u>Emergency Services</u>

- Ensure the availability of frequency for communications/interoperability for public facilities/shelters, utilities, EMS, firehouses
- Examine existing weather alert sirens within the county, ensure there are sirens in state/local parks and reallocate use of sirens to heavily populated areas and schools
- Ensure availability of back-up generators for public facilities/shelters, utilities, EMS, firehouses
- Update emergency responders list with 4-wheel drive vehicles, citizen volunteers with 4-wheel drive. Add updated needs to the CEMP.

<u>Natural Resource Protection</u>

- Address erosion along road banks.
- Debris clean up in streams and ditches.

<u>Prevention</u>

- Update flood maps and studies with GIS, DNR study-floodplains (entire county) DNR flood maps – incorporated areas.
- Active county Floodplain management and enforcement to ensure that staff are monitoring development in floodplains.
- Improve road clearing abilities.
- Update the Clay County Commodity Flow study.

- Develop transportation evacuation plan for flood prone areas, as well as other potential evacuation needs.
- Emergency storage of food/water at shelters.
- Compile a list of citizens and assets with the county that are vulnerable to all hazards through E-911 lists, contact in cases of emergency. Add updated needs to the CEMP.
- Shelters for displaced residents.
- Elderly/Vulnerable citizens-cooling centers with water supply.
- Accurate GIS maps to identify areas/maps regarding ground failure.
- Outside source to review school plans-drills.
- Install inertial valves on gas lines to public facilities, encourage private sector to do the same.
- Fan give-away program for vulnerable population.

Property Protection

- Re-enforce public infrastructure – schools, jails, firehouses.
- Retro-fit school windows (glazing).

Public Information

- Permanent and temporary flood signs for frequently flooded areas.
- Public education/awareness to include online bulletin board communications, energy conservation, and burn bans.
- Provide alternate shelters and educate the public on livestock protection and animal care in the event of a disaster.

Structural Control

- Strong fencing for Exotic Feline Center.
- Road elevation/upgrade culverts on county roads.
- Bridge hardening and/or strengthening.
- Build stormwater drains for small communities. Current stormwater infrastructure may not exist or is in a state of deterioration and no longer accomplishes the current needs of the community.
- Assessment of current capabilities for storm shelters for schools and community and feasibility of retrofitting firehouses, county fairgrounds with shelters.
- Institute a plan to buy out buildings that are chronically affected by flood damage, then educate community.

4.2.2 Proposed Mitigation Practices

After reviewing existing mitigation practices, the Committee reviewed mitigation ideas for each of the hazards studied and identified which of these they felt best met their needs as a community according to selected social, technical, administrative, political, and legal criteria. The following identifies the key considerations for each evaluation criteria:

- **Social** – mitigation projects will have community acceptance, they are compatible with present and future community values, and do not adversely affect one segment of the population.
- **Technical** – mitigation projects will be technically feasible, reduce losses in the long-term, and will not create more problems than they solve.

- **Administrative** – mitigation projects may require additional staff time, alternative sources of funding, and have some maintenance requirements.
- **Political** – mitigation projects will have political and public support.
- **Legal** – mitigation projects will be implemented through the laws, ordinances, and resolutions that are in place.
- **Economic** – mitigation projects can be funded in current or upcoming budget cycles.
- **Environmental** – mitigation projects may have negative consequences on environmental assets such as wetlands, threatened or endangered species, or other protected natural resources.

Table 29 lists a summary of all proposed mitigation practices identified for all hazards, as well as information on the local status, local priority, benefit-cost ratio, project location, responsible entities, and potential funding sources, associated with each proposed practice. The proposed mitigation practices are listed in order of importance to Clay County for implementation. Projects identified by the Committee to be of "high" local priority may be implemented within five years from final Plan adoption. Projects identified to be of "moderate" local priority may be implemented within 5-10 years from final Plan adoption, and projects identified by the Committee to be of "low" local priority may be implemented within 10+ years from final Plan adoptions. However, depending on availability of funding, some proposed mitigation projects may take longer to implement.

As part of the process to identify potential mitigation projects, the Planning Committee weighed the benefit derived from each mitigation practice against the estimated cost of that practice. This basic benefit-cost ratio was based on experience and professional judgement and was utilized to identify the mitigation practices as having a high, moderate, or low benefit-cost ratio. Preparing detailed benefit-cost ratios was beyond the scope of this planning effort and the intent of the MHMP.

The update of this MHMP is a necessary step of a multi-step process to implement programs, policies, and projects to mitigate the effect of hazards in Clay County. The intent of this planning effort was to identify the hazards and the extent to which they affect Clay County and to determine what type of mitigation strategies or practices may be undertaken to mitigate these hazards. A FEMA-approved MHMP is required to apply for and/or receive project grants under the BRIC, HMGP, and FMA. Although this MHMP meets the requirements of DMA 2000 and eligibility requirements of these grant programs additional detailed studies may need to be completed prior to applying for these grants. **Section 5.0** of this plan includes an implementation plan for all high priority mitigation practices identified by the Committee.

The CRS program credits NFIP communities a maximum of 97 points for setting goals to reduce the impact of flooding and other known natural hazards (2 points); identifying mitigation projects that include activities for prevention, property protection, natural resource protection, emergency services, structural control projects, and public information (up to 95 points).

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Table 29: Proposed Mitigation Measures

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Lifeline Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Communications 1. Enhance communication between Schools and EMS. 2. Encourage a universal radio system for Fire Departments. 3. Encourage a joint communication center/EMA office 4. Bring together community leaders, charities, and others to help address the influx of homeless populations and how to address their needs. 5. Explore communication methods to reach rural people.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☒ Public Information ☐ Structural Control	☒ Drought ☒ Earthquake ☒ Extreme Temperature ☒ Fire ☒ Flood ☒ Hail/Thunder/Wind ☒ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☒ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☒ Energy ☒ Communications ☐ Transportation ☐ Hazardous Materials	**Proposed Enhancements –** **1.** Determine how to boost school/bus radio signals **2.** Explore a universal radio system for Fire departments as an alternative to 800 MHz which is cost prohibitive. Once a system is agreed upon secure funding (grants). **3.** Explore acquisition of either IPAWs or Hypereach. **4.** Joint communication center/EMA office to better address and fit community needs. **5.** Bring community leaders, charities, and others to help address the influx of homeless populations and their needs. Currently homeless people need shelters or services and must be taken to Greencastle or Terre Haute. This is especially challenging during disaster events. **6.** Explore communications methods to reach rural people who don't use social media.	High - #1, #2, #4, #5 Medium - #3, #6	High	911 and EMA Township, City, and Town fire departments School administrators	Community budgets IPSIC FEMA HS grant funding
Emergency Preparedness and Warning 1. Provide key structures and residents with weather radios to warn of impending hazards. 2. Examine weather alert sirens within the county. 3. Upgrade road elevations and culverts on County Roads. 4. Partner with THRIVE to explore re-open meals on wheels and rural bus service. 5. Explore the establishment of a public transportation system for the working poor, and those with transportation limitations. 6. Identify possible funding for a fan give a way program. 7. Educate the public on livestock protection and animal care in the event of a disaster.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☒ Public Information ☐ Structural Control	☒ Drought ☒ Earthquake ☒ Extreme Temperature ☒ Fire ☒ Flood ☒ Hail/Thunder/Wind ☒ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☒ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☐ Energy ☒ Communications ☒ Transportation ☐ Hazardous Materials	**Ongoing –** 1. Continue distribution of weather radios when funds or radios are available. 2. There are sirens in state/local parks. Reallocate sirens to heavily populated areas and schools. 3. Replace 70-90 culverts per year. Chip and Seal roads. **Proposed Enhancements –** 1. Replace bridges in disrepair and a problem for fire department trucks and school buses. 2. Encourage partnering with THRIVE to explore meals on wheels and rural bus service. 3. Explore public transportation for the working poor and those with limited transportation. 4. Replace bridges in disrepair and a problem for fire department trucks and school buses. 5. Encourage a fan give-away program for vulnerable population. Use food pantries to assist in distribution. 6. Ensure alternate shelters and education with Farm Bureau about livestock and animal care before, during, and after a disaster event.	High - #1 Medium - #2, #3 Low - #4, #5, #6	High to Moderate	EMA 911/ Communication Center Township, City, and Town Fire Chiefs School Administrators	General Budget Community Foundation Grants Special Interest Groups/ Fraternal Organizations
Power Back Up Generators 1. Ensure availability of back-up generators for critical facilities/shelters, utilities, EMS, and firehouses. **2.** Secure generator fuel supplies and deliveries.	☒ Emergency Services ☐ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☐ Public Information ☐ Structural Control	☐ Drought ☒ Earthquake ☒ Extreme Temperature ☒ Fire ☒ Flood ☒ Hail/Thunder/Wind ☒ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☒ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☐ Energy ☒ Communications ☐ Transportation ☐ Hazardous Materials	**Ongoing –** 1. Hospital, Jail, WWTP and nursing homes have been equipped with generators and 30% of fire stations. **Proposed Enhancements –** 1. EMS needs generators at 2 stations and Clay City needs generators for wells at the pumping station. 2. Establish an agreement with fuel provider for generators.	High - all	Moderate	EMA EMS Director Clay City Utilities	FEMA BRIC Grants State Revolving Loan Funds General Budget Donations

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Lifeline Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Stormwater 1. Address stormwater drain infrastructure needs in the county, City, and Towns. 2. Enhance storm water drainage systems to address large pockets of overland flooding.	☐ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☐ Public Information ☒ Structural Control	☐ Drought ☐ Earthquake ☐ Extreme Temperature ☐ Fire ☒ Flood ☐ Hail/Thunder/Wind ☐ Landslide/Subsidence ☐ Tornado ☐ Winter Storm/Ice ☐ Dam Failure ☐ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☐ Energy ☐ Communications ☐ Transportation ☐ Hazardous Materials	**Ongoing –** 1. Build stormwater drains for small communities. 2. Inventory of current storm-water infrastructure and identify current needs of the community. **Proposed Enhancements –** 1. City of Brazil received a stormwater planning grant to address storm water drainage needs in the northeast corner. Execute the recommendations of the plan. 2. Need to pursue more grants to cover the entire community. 3. Need more stormwater drains throughout the county – a continuous growth and maintenance challenge.	High - #2, #3 Medium - #1	Moderate to High	County and City Floodplain Managers County Surveyor County Highway Dept City of Brazil Street Dept. and Utilities Dept.	General Budget Stormwater Utility Fund
Public Education and Outreach 1. Public Education/Awareness to include online bulletin board communication, energy conservation, and burn bans. 2. Public education programs to address all hazards 3. Conduct smoke detector campaigns. 4. First Responder earthquake education planning.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☒ Public Information ☐ Structural Control	☒ Drought ☒ Earthquake ☒ Extreme Temperature ☒ Fire ☒ Flood ☒ Hail/Thunder/Wind ☒ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☒ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☐ Energy ☐ Communications ☐ Transportation ☐ Hazardous Materials	**Ongoing** – 1. Continuing outreach efforts on social media (Facebook) chatter, and EMA webpage. **Proposed Enhancements –** 1. Provide more explanatory materials to help people understand who has available services they can provide. 2. Continue the EMA webpage and county health department web page addresses food and health related topics. 3. Continue public education programs to address all hazards and establish programs on when to call 911, burn bans, personal accountability, and Be Better Neighbors (neighbor to neighbor outreach). 4. Educate citizens on smoke detectors, on having them and making sure they are working. **5.** Earthquake education similar response capabilities and planning efforts	High - #1. #2 Medium - #3, #4, #5	Moderate	EMA County EMS Health Dept. and Hospital	
Safer Rooms and Community Shelters 1. Assessment of current capabilities for storm shelters for schools and community. 2. Identify shelters for displaced residents. 3. Encourage elderly and vulnerable citizens to use cooling centers and/or warming centers. 4. Protect public infrastructure with window glazing.	☒ Emergency Services ☐ Nat. Res. Protection ☐ Prevention ☐ Property Protection ☐ Public Information ☒ Structural Control	☒ Drought ☒ Earthquake ☒ Extreme Temperature ☒ Fire ☒ Flood ☒ Hail/Thunder/Wind ☒ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☒ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☐ Health & Medical ☐ Energy ☐ Communications ☐ Transportation ☐ Hazardous Materials	**Ongoing –** 1. Feasibility of retrofitting firehouses, and county firegrounds with shelters. **Proposed Enhancements –** 1. Inventory shelters for Handicapped and Disabled capacity and update MOUs. Maintain MOUs for shelters. Update the American Red Cross Shelter Agreement. 2. Prepare an emergency housing plan for the Housing Authority using the Nursing Home plans as a foundation. 3. Encourage elderly/vulnerable citizens to use cooling and/or warming centers with water supply. 4. Encourage window glazing in City Hall, courthouse, and justice center.	High - #2, #2 Medium - #3 Low - #4	Moderate	EMA Building Commissioner City and County	

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Lifeline Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Floodplain Management 1. Active county Floodplain management. 2. Provide a road closure gate across Harmony Road. 3. Maintain river clearances. 4. Continue addressing erosion along road banks. 5. Continue with acquisition program.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☒ Public Information ☒ Structural Control	☐ Drought ☐ Earthquake ☐ Extreme Temperature ☐ Fire ☒ Flood ☐ Hail/Thunder/Wind ☒ Landslide/Subsidence ☐ Tornado ☐ Winter Storm/Ice ☐ Dam Failure ☐ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☐ Health & Medical ☐ Energy ☐ Communications ☒ Transportation ☐ Hazardous Materials	**Proposed Enhancements –** 1. Encourage Floodplain Manager Training provided by the state to ensure that staff are monitoring and enforcing development in the floodplains appropriately. 2. Encourage installing a road closure gate across Harmony Road. 3. Remove log jams and clean up debris especially in the southern part of Clay County 4. Continue to riprap problem areas listed on the county highway priority list. 5. Continue to work on buy out of buildings, identifying potential funding sources and matching funds. Clay County is in the 3rd phase of buyouts, about 75% completed.	High - #1 Medium - #2, #4, #5 Low - #3	High to Moderate	County Floodplain Administrator County Surveyor	
Building Protection 1. Reinforce fencing around Feline Center. 2. Construct a perimeter fence around the jail. 3. Installation of ADA compliant sidewalks.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☐ Public Information ☒ Structural Control	☐ Drought ☒ Earthquake ☐ Extreme Temperature ☐ Fire ☐ Flood ☒ Hail/Thunder/Wind ☐ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☐ Dam Failure ☐ HazMat Incident	☒ Safety and Security ☐ Food, Water, Shelter ☒ Health & Medical ☒ Energy ☒ Communications ☐ Transportation ☐ Hazardous Materials	**Proposed Enhancements –** 1. Work with Feline Center to better understand the existing emergency plans. Enhance plans as needed to assure safety and security. 2. Explore the possibility of installing a perimeter fence around the jail. 3. Install ADA compliant sidewalks in City of Brazil.	High - #1, #2 Medium = #3	Moderate	EMA Feline Center Sheriffs Department City of Brazil Street Department	INAFSM USDA DNR OCRA Surveyor Budget
GIS 1. Explore updating flood maps with GIS. 2. Accurate GIS maps to identify areas/maps regarding ground failure.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☒ Public Information ☐ Structural Control	☒ Drought ☒ Earthquake ☒ Extreme Temperature ☒ Fire ☒ Flood ☒ Hail/Thunder/Wind ☒ Landslide/Subsidence ☒ Tornado ☒ Winter Storm/Ice ☒ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☐ Energy ☐ Communications ☐ Transportation ☐ Hazardous Materials	**Proposed Enhancements** – 1. Explore maps using the Best Available Data Layer. No building in the floodway. 2. Explore areas where subsidence is occurring and inventory on map.	Medium - #1 Low - #2	Moderate	EMA GIS Department County Surveyor	District Health Coalition General Fund Foundation Grants
Hazardous Materials 1. Develop a new Commodity flow Study.	☒ Emergency Services ☒ Nat. Res. Protection ☒ Prevention ☒ Property Protection ☒ Public Information ☐ Structural Control	☐ Drought ☐ Earthquake ☐ Extreme Temperature ☐ Fire ☐ Flood ☐ Hail/Thunder/Wind ☐ Landslide/Subsidence ☐ Tornado ☐ Winter Storm/Ice ☐ Dam Failure ☒ HazMat Incident	☒ Safety and Security ☒ Food, Water, Shelter ☒ Health & Medical ☐ Energy ☐ Communications ☒ Transportation ☒ Hazardous Materials	**Proposed Enhancements –** 1. Develop a new commodity flow study which includes I74 and US 40.	Medium	High	LEPC Chair EMA County Hazardous Materials Team	HMEP Grants FEMA Training RAPTOR and ALICE Programs OCRA grant funding

5.0 IMPLEMENTATION PLAN

The following is a proposed plan for implementing all high priority mitigation practices identified in this Plan. It should be noted that implementation of each of these proposed practices may involve several preparatory or intermediary steps. However, to maintain clarity, not all preparatory or intermediary steps are included. Medium and low priority categories are listed but will not show implementation steps. Implementation steps for the medium and low priority actions will be developed as the actions draw closer to execution.

5.1 COMMUNICATIONS

Enhance communication between schools and buses, fire departments, EMA, leaders in the county, city, and towns, and charities. Communication is key to encouraging community resilience.

- Explore communication methods and signals for school administration and bus drivers to be able to communicate with each other. This has valuable benefits for all disaster situations as well as the safety of the students. School administrators and utility providers will need to work together to figure out the best way to provide a method and improve signal strength throughout the county.
- Explore a universal radio system for fire departments. Once a system is agreed upon explore grant funding. Create a cost benefit for the county, city, towns, and voluntary fire departments.
- Establish a joint communications center/EMA office to better address and fit community needs. Time and communication are very important in a disaster situation, therefore, having the ability to have one central point of communication makes it much easier to know what is happening, prepare, and respond to the situation.
- There is a growing number of homeless populations and there needs to be a group effort to address their needs and cares. This group includes Community leaders, elected officials, hospital personnel, local charities and organizations, places of worship, and others who can develop, train volunteers, and provide resources for the low income, homeless, and people with mental illness.

5.2 EMERGENCY PREPAREDNESS AND WARNING

Providing residents with radios, improving transportation, and additional siren locations are all items that are going to help prepare residents for an event and provide a warning of when an event is about to occur.

- Working with EMS and Fire Departments to distribute weather radios when funding is available. Prioritize residents that don't have ways to be notified by social media or local television and radio stations.
- Ensure that outside warning sirens cover state and local parks. Reallocate sirens to heavily populated areas and schools. Conduct outreach to make people aware of changes to the National Weather Service. Early warning of a disaster can help people seek shelter and prepare for disaster events.
- Improving transportation routes such as replacement of road culverts to prevent overtopping and clearance of flood waters. Replacing bridges that are in disrepair prevents fire departments and school buses from traveling over them. Seek funding through Community Crossing grants.

5.3 ENERGY SECURITY - POWER BACKUP GENERATORS

The following public and private critical facilities do not have generator power back up and encourage the acquisition and installation of a generator to serve all the facility's needs during a disaster event.

- The EMS needs backup generators at two stations and Clay City needs a generator for wells at the pump station. Thirty percent of the fire stations are equipped and need to get the remaining stations generators. Create priority listing of remaining generator needs. Identify various potential funding sources including combining funding sources for a single location. Install and maintain with regular testing and exercising of units.
- Identify and establish an agreement with fuel provider to supply back-up generators during an extended outage. Work with fuel provider to determine current emergency policies and supplies. Work with county attorney to draft an agreement that provides for fuel deliveries within set notification periods. Sign and execute contract

5.4 STORMWATER

Improving the stormwater infrastructure to help with drainage and flooding.

- City of Brazil received a stormwater planning grant to address storm water drainage needs in the northeast corner. Need to pursue more grants to cover the remainder of the community.
- Work with City Utilities and County Surveyor to explore stormwater ordinances and maintenance challenges.

5.5 PUBLIC EDUCATION AND OUTREACH

Conduct public education and outreach programs to inform residents of local hazards and emergency plans to address those hazards.

- Continue outreach efforts on Facebook, websites, and chatter. Provide more explanatory materials to help people understand who can do what. The county health department webpage also addresses food and health related topics.
- Complete an inventory of services provided in the County and City and what materials, resources, and services are available. Provide more explanatory materials to help people understand who can do what including food and water, shelters, transportation, mental health, and other social and welfare needs.

5.6 SAFER ROOMS AND COMMUNITY SHELTERS

Provide an assessment of storm shelters for schools and the community and identify shelters for displaced residents.

- Inventory shelters for Handicapped and Disabled capacity and update MOUs to provide shelter. Maintain MOUs for shelters and update the American Red Cross.
- Explore the feasibility of retrofitting firehouses and county fairgrounds with shelters.

- Prepare an emergency housing plan for the Housing Authority using the Nursing Home plans as a foundation.

5.7 FLOODPLAIN MANAGEMENT

Active county and city floodplain management and enforcement to ensure development occurs outside of the floodplain.

- Encourage Floodplain Manager Training provided by the State of Indiana. Discuss benefits of training program for both the community as well as the floodplain administrator. Present the new state law requirements. Identify ways to reward/celebrate those who complete the training coursework.

5.8 BUILDING PROTECTION HAZARDOUS MATERIALS

Work with the Feline Center to better understand the existing emergency plans.

- Enhance plans as needed to assure safety and security. Meet with the Feline Center to review the existing emergency plans. Identify ways the facility can be more resilient to disaster events. Integrate response and recovery plans into the Feline Center Plan and integrate the Feline Center needs into the emergency operations and recovery plans for the county and the surrounding communities.

5.9 GIS

This category is a medium priority. Implementation steps will be identified when the community is ready to proceed with the mitigation action.

5.10 HAZARDOUS MATERIALS

This category is a medium priority. Implementation steps will be identified when the community is ready to proceed with the mitigation action.

6.0 PLAN MAINTENANCE PROCESS

6.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

REQUIREMENT §201.6(c)(4)(i):

[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

To effectively reduce social, physical, and economic losses in Clay County, it is important that implementation of this MHMP be monitored, evaluated, and updated. The EMA Director is ultimately responsible for the MHMP. As illustrated in Section 4.2 Mitigation Practices, this Plan contains mitigation program, projects, and policies from multiple departments within each incorporated community. Depending on grant opportunities and fiscal resources, mitigation practices may be implemented independently, by individual communities, or through local partnerships. Therefore, the successful implementation of this MHMP will require the participation and cooperation of the entire Committee to successfully monitor, evaluate, and update the Clay County MHMP.

The EMA Director will reconvene the MHMP Committee on an annual basis and following a significant hazard incident. The team will examine each mitigation action within the plan to evaluate its effectiveness answering the following questions:

- Has the nature, magnitude, and/or type of risk changed? If so, what new mitigation actions are needed to address this change?
- Are the current resources appropriate for implementation? If not, what additional resources are needed to address the shortfall?
- Are there implementation problems, such as technical, political, legal, or coordination issues with other agencies? How can these issues be addressed?
- Have the outcomes occurred as expected? If not, is something else needed to achieve the desired outcome?
- Have the agencies and other partners participated as originally proposed? If not, determine why and how the action outcomes can be met?

During the annual meetings, the Implementation Checklist provided in **Appendix 10** will be helpful to track any progress, successes, and problems experienced. This will also be a tool to follow up on the progress made and effectiveness of the planned actions.

The data used to prepare this MHMP was based on “best available data” or data that was readily available during the development of this Plan. Because of this, there are limitations to the data. As more accurate data becomes available, updates should be made to the list of essential facilities and infrastructure, the risk assessment, and vulnerability analysis.

DMA 2000 requires local jurisdictions to update and resubmit their MHMP within five years (from the date of FEMA approval) to continue to be eligible for mitigation project grant funding. In Clay County, the EMA Director will once again reconvene the MHMP Committee for a series of meetings designed to replicate the original planning process. Information gathered following individual hazard incidents and annual meetings will be utilized along with updated vulnerability

assessments to assess the risks associated with each hazard common in Clay County. These hazards, and associated mitigation goals and practices will be prioritized and detailed as in Section 3.0 this MHMP. Sections 4.0 and 5.0 will be updated to reflect any practices implemented within the interim as well as any additional practices discussed by the Committee during the update process. The plan update process will incorporate new planning guidance and best practices as planning requirements are updated.

Prior to submission of the updated MHMP, at a public meeting, such as the county commissioners meeting, a representative of the planning team will present information about the plan to residents of Clay County and will provide them an opportunity for review and comment of the draft MHMP. A media release will be issued providing information related to the update, the planning process, and details of the public invitation to review and comment on the plan update.

6.2 INCORPORATION INTO EXISTING PLANNING MECHANISMS

REQUIREMENT §201.6(c)(4)(ii):

[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as the comprehensive or capital improvements, when appropriate.

Many of the mitigation practices identified as part of this planning process are ongoing with some enhancement needed. Where needed, modifications will be proposed for each NFIP communities' planning documents and ordinances during the regularly scheduled update including comprehensive plans, floodplain management plans, zoning ordinances, site development regulations, and permits. Modifications include discussions related to hazardous material facility buffers, floodplain areas, and discouraging development of new essential facilities and infrastructure in known hazard areas.

The MHMP will be used to update stormwater, subdivision and zoning ordinances based upon recommendations from the plan. For example, information in this plan provides documentation to encourage local officials to make changes to reduce release rates, protect floodplains, provide no net loss in special flood hazard areas, and manage erosion and sediment control. These measures would help mitigate flooding. New ordinances and studies could be initiated by the recommendations, such as flood studies, flood response studies, and watershed management studies to protect against floods. The information included in this plan can be very helpful in preparing comprehensive plans, transportation plans, and emergency plans to mitigate hazard material impacts and response to hazards such as tornados. These plans also illustrate the importance of planning for the unserved populations and how to develop mitigation efforts that include them in future plans.

In Clay County this is a similarly timed process. As the county embarks upon their ordinance updates, information is shared with the City of Brazil and the incorporated communities. Each community, then, evaluates the materials provided by the County and will seek adoption or incorporation on a similar schedule. This process has worked well in the past and is the anticipated method of future incorporation of materials into plan and ordinance updates. In a similar fashion the updating of comprehensive community plan, parks plans, etc. will be able to incorporate at risk population information as well as mitigation action opportunities. Table *1*Table 30 is an example of the process the communities use to incorporate planning elements into other community plans and ordinances.

Table 30 MHMP Incorporation Process

Step	Description of Process Action
1	Adopt MHMP at Commissioner Meeting, City Council Meeting, or Town Board Meeting
2	Identify document update cycles for each of the following:
	a) Comprehensive Plan b) Capital Improvement Plan c) Zoning Ordinances d) Floodplain Ordinance e) Stormwater Plans f) Other plans not listed above
3	Present Applicable data to the planning team and team leads for inclusion
4	Highlight applicable mitigation actions to be included in the plan
5	Assist with incorporation and adoption of the plans, as needed.

6.3 CONTINUED PUBLIC INVOLVEMENT

REQUIREMENT §201.6(c)(4)(iii):

[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

Continued public involvement is critical to the successful implementation of the Clay County MHMP. Comments gathered from the public on the MHMP will be received by the EMA Director and forwarded to the MHMP Committee for discussion. Education efforts for hazard mitigation will be the focus of the annual Severe Weather Awareness Week as well as incorporated into existing stormwater planning, land use planning, and special projects/studies efforts. Once adopted, a copy of this Plan will be available for the public to review in the EMA Office and the Clay County website. Periodic reminder notices will be placed on social media to continue to solicit feedback and input on changes for the future plans.

Updates or modifications to the Clay County MHMP require a public notice, reconvening the planning committee in accordance with FEMA local mitigation planning guidance and meeting with the incorporated community leaders prior to submitting revisions to the individual jurisdictions for approval and re-adoption.

The CRS program credits NFIP communities a maximum of 28 points for adopting the Plan (2 points); establishing a procedure for implementation, review, and updating the Plan; and submitting an annual evaluation report (up to 26 points).

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