RIPLEY COUNTY MULTI-HAZARD MITIGATION PLAN

March 2025

Prepared for:

Ripley County Emergency Management Agency
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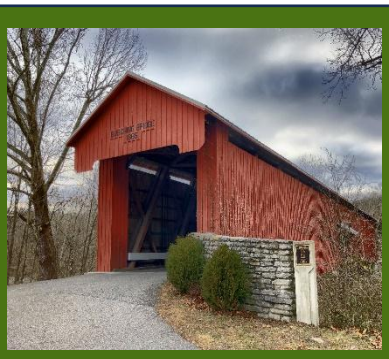
Versailles, IN

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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 *1*** 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 the majority of the disaster life cycle. The Ripley County Multi-Hazard Mitigation Plan (MHMP) update focuses on the mitigation activities that may be implemented throughout the disaster life cycle.

Figure 1 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 Ripley 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 injuries 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 improving 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 about 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 either adopt 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 Ripley County, the City of Batesville, the Towns of Napolean, Holton, Milan, Osgood, Versailles, and Sunman have provided information, attended meetings, and participated in the planning process, the planning process used to update the Ripley 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. Due to community challenges and frequent turnover in the Ripley County Emergency Management Agency (EMA), no updates were made to the 2018 plan in the past 6 years. This plan update will examine each of the hazards with data from the past 6 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 1 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 1: Comparison of CPRI Scores for All Hazards

Hazard	2024 Rank	CPRI Score	2018 Rank	Hazard
Tornado	1	3.48	3	Tornadoes
Flood - Riverine and Flash Flood	2	3.27	10	Flooding
Hazardous Materials	3	3.26	7	Hazardous Incident
Fire and Wildfire	4	3.24	5	Wildfires
Winter Weather – Ice, Snow, Blizzards	5	3.15	2	Winter Storms
Severe Storms – Hail, Thunder, Wind	6	3.10	1	Summer Storms
Drought	7	2.72	11	Drought
Extreme Temperatures – Heat, Cold	8	2.70	4	Extreme Temperatures
Dam and Levee Failure	9	2.19	13	Dam Failure
Earthquake	10	1.89	9	Earthquake
Land subsidence/Landslide/FEH	11	1.50	12	Ground Failure
			6	Infectious Outbreak
			8	Flash Flooding

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 Ripley 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, Ripley County and the incorporated communities that adopt this plan will work to complete the mitigation actions as well as regularly noting items for the 2030 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

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:

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 Ripley 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.

1.1 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 to 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 Ripley County MHMP Update is a multi-jurisdictional planning effort led by the Ripley County EMA. This Plan was prepared in partnership with Ripley County, the City of Batesville, the Towns of Napolean, Holton, Milan, Osgood, Versailles, and Sunman and a representative from the Fish and Wildlife Service. 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 Ripley 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 on 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 Batesville, and Ripley County participated in the NFIP. The towns of Holton, Milan, Osgood, Sunman, and Versailles participate in the NFIP through Ripley County participation. The Town of Napoleon does not participate in the NFIP. None of the communities currently participate in the CRS program. Throughout this Plan, activities that could count toward CRS points are identified with the NFIP/CRS logo. (**Figure 2**)

Figure 2 NFIP/CRS Logo

Funding to update the MHMP was made available through a FEMA/DHS grant awarded to the Ripley County EMA and is administered by IDHS. Ripley 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 Ripley County MHMP under the direction of an American Institute of Certified Planners (AICP) certified planner.

1.2 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 Ripley County MHMP Update began in May of 2023 when the grant request was approved by FEMA and grant funds were awarded in 2023.

The plan update process began immediately upon the hiring of Chrispher B. Burke Engineering, LLC. The planning process to update the 2018 MHMP took 17 months. This included a review period by IDHS and FEMA for the draft MHMP Update, and time for Ripley County and communities to adopt the final MHMP Update.

1.2.1 Planning Committee and Involvement of Other Interested Parties

In May of 2023, 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 2018. Dearborn, Decatur, Franklin, Jefferson, Jennings, Ohio, and Switzerland 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. In addition, the Fish and Wildlife Service was invited to attend. No comments or corrections were received from the neighboring EMA offices.

Table 1 lists the individuals that actively participated in the Committee and the entity they represented.

Table 2: Ripley County Planning Team

Name	Title	Organization	Representing
Samantha Smith	Volunteer	Ripley County EMA	Sunman
Mike Wells	Building Commissioner	City of Batesville	Batesville
Tim Maryanski	Director of Operations	City of Batesville	Batesville
Randy Jobst	Manager of WWTP	City of Batesville	Batesville
Andrea Wade	Mayors Assistant	City of Batesville	Batesville
Rich Corkhum	Admin./Weather	Ripley County EMA	Versailles
Eric Laker	Water Utility Manager	City of Batesville	Batesville
Patty Mauer	Principal	St. Louis School	Batesville
Brian Hardbeck	1st Assistant Chief	Batesville Fire Dept	Batesville
Stan Holt	Police Chief	City of Batesville	Batesville
Dusty Burress	Director of Support Services	Sunman-Dearborn Community Schools	Sunman/ School

Name	Title	Organization	Representing
Sarah Lamping	Economic Development Director	City of Batesville	Batesville
Dan Goris	SRO	Milan School	Milan
Mike Brandes	Director of Operations	Milan School	Milan
Lee Davidson	Chief Deputy	Ripley County Sheriff	Ripley County
Peggy Ehlers	Council member at large	Ripley County Council	Ripley County
Rosie Gaynor	Dispatch	Ripley County Emergency Communications	Ripley County
Rebecca Cairns	Tech Director	Ripley County	Holton
Craig Herbert	Maintenance Supervisor	Ripley County	County
Edward Rodriguez	SRO	South Ripley Schools	Schools
Elisha Forwalt	Environmental Health and Safety	Ripley County Health Dept	Osgood
Casey Mefford	Fire Tech	Big Oaks NWR - US Fish and Wildlife Service	Federal Govt
Brian Winters	Fire Management Officer	Big Oaks NWR - US Fish and Wildlife Service	Federal Govt
Randy Miller	Director	Ripley County EMA	Sunman
Rob Bradley	Sheriff	Ripley County Sheriff	Ripley County
Fiona Mauer	Forestry Tech	Big Oaks NWR - US Fish and Wildlife Service	Federal Govt
Andy Clin	SRO	Versailles School Corporation	Versailles
Adan Pietry Kowski	Principal	SCC	Schools
Wakenda Doles	Safety Coordinator	St. Nicholas School	Sunman
Candy Guenther	LPN PHA	Ripley County Health Dept	Versailles
Alexis Bushhorn	Administrator Preparedness Coordinator	Ripley County Health Dept	Osgood
Amy Copeland	Auditor	Ripley County Auditor	Versailles

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: Patty Maur – Principal at St. Louis School, Adan Pietry Kowiski – Principal at SCC, Elisha Forwalt, Alexis Bushhorn, and Candy Guenther from Health Department, and Randy Miller with the Emergency Management Agency. 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 Ripley County MHMP Update.

1.2.2 Public Involvement

REQUIREMENT §201.6(c)(1):

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

A draft of the Ripley County MHMP Update was posted to the Ripley County website (https://ripleycounty.in.gov/) for public review and comment. A media release indicating the posting of the draft MHMP and the ability to comment was submitted for release to Ripley Publishing Company, Inc. – Publishers of the Osgood Journal and The Versailles Republican. In addition, the radio station WRBI Radio – Southeastern Indiana's First Choice provides local information and events. No comments or corrections were received from the public or the Committee. The media release, 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. No comments or corrections were received from the neighboring Emergency Management Agencies in Dearborn, Decatur, Franklin, Jefferson, Jennings, Ohio, and Switzerland Counties.

1.3 PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION

During the development of the Ripley 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 Ripley County MHMP, and to assist the Committee in developing potential mitigation measures to reduce the social, physical, and economic losses associated with hazards affecting Ripley County.

For the purposes of this planning effort, the following materials (among others) were discussed and utilized:

- MHMP Ripley County, 2018
- Ripley County Comprehensive Plan, 2002
- Ripley County Comprehensive Emergency Management Plan, 2021
- Ripley County GIS data
- City of Batesville Comprehensive Plan, 1997
- Ripley County Zoning and Subdivision Ordinances
- City of Batesville Zoning and Subdivision Ordinances
- Flood Ordinances for Ripley County, City of Batesville, Town of Holton, Milan, Osgood, Sunman, and Versailles
- NFIP/FEMA Flood Maps and Studies

The Ripley County Building and Planning Department has jurisdiction over the unincorporated rural areas of Ripley County and the Towns of Holton, Milan, Napolean, Osgood and Versailles.

The City of Batesville has its own Building and Planning. The Executive Director and Flood Plain Administrator for Ripley County, City of Batesville, and the towns of Holton, Milan, Napoleon, Osgood, Sunman, and Versailles.

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
- Midwest Regional Climate Center – Climate Trends; County specific climate reports
- National Weather Service – Wilmington 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 Ripley County Location

Ripley County was established in 1816 and is named after General Eleazer W. Ripley. General Ripley was an officer in the war of 1812 and is known for the Battle of Lundy's Lane and the Siege of Fort Erie in 1814. The county is in the southeastern corner of Indiana. The land now considered as Ripley County was inhabited by Miami, Delaware, Potawatomi, and Shawnee Native tribes. Originally the county included four townships located south of Western Creek. Upon the arrival of European settlers in the region, they discovered flat woodland abundant in timber, limestone, and conveniently situated near a freshwater source. The rivers throughout the county facilitated the establishment of mills and machinery facilities, aiding in the transportation of goods to markets in the southern regions.

The Big Oaks National Wildlife Refuge covers a large area in the southwest corner of Ripley County as well as parts of Jefferson County to the south and Jennings County to the west. The Refuge is home to many rare and uncommon species of animals and plants. The area has been designated as a Globally Important Bird Area.

The county is divided into 11 townships. The Town of Versailles serves as the county seat. The location of the county within the State of Indiana is identified in **Figure *3***.

2.1 POPULATION AND DEMOGRAPHICS

The US Census Bureau estimates the 2023 population for Ripley County was 29,227 which ranks 55 of 92 in the State. Since 2020, Ripley County population has increased by 0.8%. The City of Batesville is the county's largest incorporated area, accounting for 18.4% of the county's population (5,365 people). Ripley County is a predominantly white community, making up 97% of the county's racial demographics. The county is 97.9% non-Hispanic and 2.1% Hispanic.

In 2023, the median age of the population in the county was 40.9. That is 2.7 years older than the statewide median age of 38.2. The largest demographic age group in the county is Older Adults (45 to 64), making up 26.0% of the county's population. The second largest is the Young Adult group (25 to 44) making up 23.4% of the county and the third largest age group is the Senior group (65 and older) at 18.8%. The school age group (5 to 17) follows, making up 17.7% of the population; then the college age group (18 to 24) at 8.0% and finally the preschool age group (0 to 4) at 6.2%.

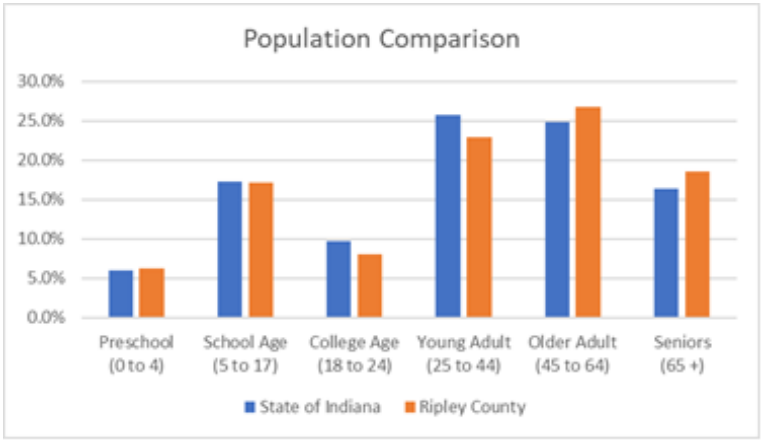


Figure 4 Age Distribution Compared to State Population

Figure 4 shows the age distribution totals compared to the state. Ripley County age distribution is similar compared to the state with similar preschool age, school age, college, young adult, older adult, and senior's age group distributions. As the senior members of the community continue to age their vulnerability to various hazards will increase as well.

The approximate median household income in 2022 was reported to be $ 63,571 while the poverty rate in the same year was reported at 12.0% county-wide. In total, 1,980 (17.8%) of households are married with children, and 3,951 (35.5%) of households are married without children. There are 865 single parents in Ripley County with the remaining 2,966 (26.7%) of the population living alone.

Within the county, 90.6% of the adults older than 25 have reportedly completed a High School education. Further, 19% of those same adults have also completed a Bachelor of Arts or higher degree.

2.2 EMPLOYMENT

US Census data indicates that of the Ripley County workforce, the private sector is the largest employment sector within the county at 85.6%, followed by the Government at 9.0% and then by Farm at 5.4%. The "Manufacturing" category represents the largest group within the Private Sector Employment category at 13.8%. "Transportation and Warehouse is the second largest employment category employing 9.4% of the workforce within the county. The total resident labor force according to estimates in 2023 is 12,664 (with 441 unemployed) and as of October 2024, unemployment rate of 3.5%. The top 10 employers within Ripley County according to Hoosiers by the Numbers are:

1. Hillenbrand Industries, Inc. (Batesville)
2. Baxter (Batesville)
3. Margaret Mary Health (Batesville)
4. Batesville Tool & Die Inc (Batesville)
5. Global Atlantic Life Insurance (Batesville)
6. Occasions Group (Sunman)
7. Kroger (Batesville)
8. City of Batesville (Batesville)
9. The Waters of Batesville (Batesville)

2.3 TRANSPORTATION AND COMMUTING PATTERNS

Several major transportation routes pass through Ripley County and the municipalities within. Interstate I-74, US Route 50 and 421, and Indiana state roads 46, 48, 62, 101, 129, 229, and 350 serve as main routes. There are two railways (Central Railroad Company of Indiana and Indiana Railroad, and CSX Transportation railroad) in the county. **Figure 5** Shows the location of each of the transportation routes.

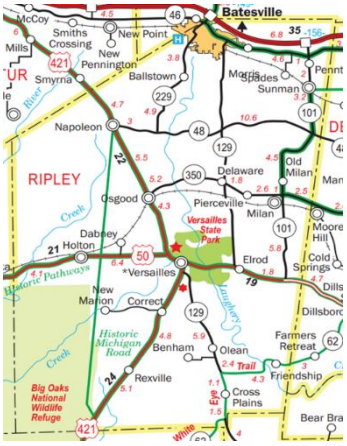


Figure 5 Transportation Routes in Ripley County

According to STATSIndiana for 2022, nearly 3,403 people commute into Ripley County daily. Approximately 38.5% travel from Franklin County. Furthermore, approximately 5,049 Ripley

County residents commute to other counties, with the State of Ohio receiving the greatest percentage of commuters from Ripley County at 19.3%.

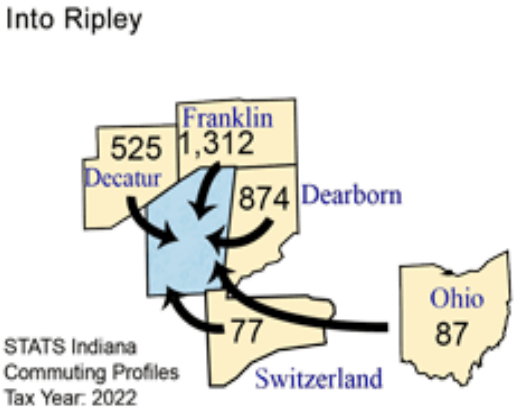


Figure 6 Commuters into Ripley County

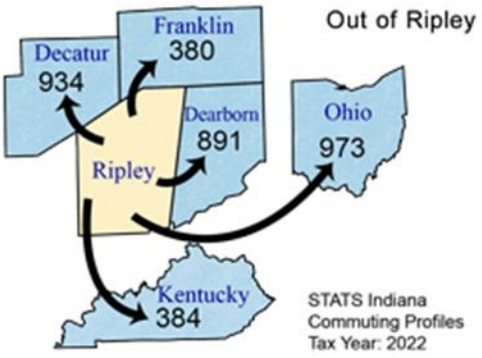


Figure 7 Commuters from Ripley County

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

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 Ripley 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. **Figure 8** shows the Ripley County Courthouse as one of the critical facilities.

The Ripley County EMA and GIS Department Offices provided the listing and locations of the following 176 critical infrastructure points for the MHMP update.

The following list identifies the number of each of the critical and essential facilities identified.

5	Airports	2	Ambulance Services	19	Power Substations
25	Churches/ Places of Worship	11	Fire Stations	1	County Courthouse
6	Communications	23	HazMat (Tier II Facilities)	19	Shelters
2	Daycare	7	Law Enforcement	7	Wastewater Plants
20	Education/Schools	7	Mobile Home Parks	1	Hospital
1	EOC	1	Petroleum	2	Water Plants

Information provided by the EMA, Ripley County GIS Provider (WTH Engineering), and the MHMP Planning Committee members was utilized to identify the types and locations of critical structures throughout Ripley 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 Ripley County and the individual municipalities. **Appendix 4** lists the critical and essential facilities in Ripley County and the community where it is located. Non-critical structures include residential, industrial, commercial, and other structures that do not meet 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 66 waterways in Ripley County, which are listed in **Appendix 5**. The county's main waterways are the Kankakee River and the Yellow River. The county lies within four 8-digit Hydrologic Unit Code (HUC): Middle Ohio-Laughery, Muscatatuck, Silver-Little Kentucky, and Whitewater. These major waterways, and others, are identified on **Exhibit 2**. There are no USGS river gauges located in Ripley County.

Figure 9 Map of Ripley County Rivers and Major Lakes

Ripley County is in the Southeastern part of the state and consists of heavily wooded areas and low rolling hills devoted to agriculture or development. The waterways provide drainage that is necessary for cropland to thrive. There are several regulated drains in Ripley County. Some of the other larger waterways in the county include Big Creek, Graham Creek, Indiana Kentucky Creek, Little Laughery Creek, Pipe Creek, and South Hogan Creek.

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. Ripley County and the City of Batesville participate in the NFIP. The Towns of Napoleon has not participated in the NFIP and is listed as sanctioned as of 9/21/1980 in the NFIP Community Status Book. The towns of Holton, Milan, Osgood, Versailles, and Sunman are not listed in the NFIP Community Status Book and participate under Ripley County. The City of Batesville has no Special Flood Hazard Area. At the time of this planning effort, according to the Indiana Department of Natural Resources, the Ripley County Planning Director is responsible for the administration of the floodplain program in the unincorporated areas of the County.

Table 2 lists the NFIP number, effective map date, and the date each community joined the NFIP program.

Table 3: NFIP Participation

NFIP Community	NFIP Number	Effective Map Date	Join Date
Ripley County	180221#	11/02/12	08/31/87
City of Batesville	180507#	11/02/12	03/09/10
Town of Napoleon	180462#	11/02/12	Not Participating
Town of Holton	180595#	11/02/12	
Town of Milan	180597#	11/02/12	
Town of Osgood	180594#	11/02/12	
Town of Versailles	180392#	11/02/12	
Town of Sunman	180596#	11/02/12	

2.7 TOPOGRAPHY

Ripley County, nestled in the southeastern corner of Indiana near the border of Ohio, consists of broad flatlands, rolling plains, steep slopes, and forested areas. Spanning an average elevation of 915 ft, the county showcases a terrain ranging from a minimum elevation of 590 ft to a maximum elevation of 1,060 ft. As of the 2020 census, the county spans 448.06 square miles, with nearly 99.63% comprising land and 0.37% water. The Muscatatuck Plateau in the north of the county dominates the topography as well as the western portions of the county and is characterized by karst topography and upland areas. The southeastern corner of the county is characterized by the Dearborn Upland plateau as it is dominated by slopes and is underlain by limestone. The Dearborn Upland plateau is also the drainage

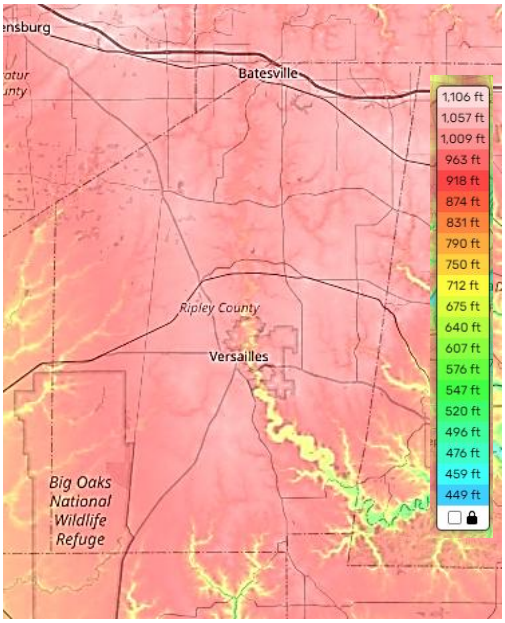


Figure 10 Topographic Map of Ripley County

basin of the Whitewater River. The eastern portion of the county is characterized by many streams. Due to the west of the Dearborn Upland is the Muscatatuck regional slope which also contributes to the sloping topography of that area. Laughery Creek, a main waterway in the county, drains 343 square miles in northwestern Ripley County then flows southwest to Napoleon and further southeast to Versailles before eventually draining to the Ohio river south of Aurora, Indiana. **Figure 10** shows the topography of Ripley County. Today, Ripley County consists of rolling hills with sections of forest and agricultural use. The geographic center is 39.137778 degrees north and -85.304444 degrees west. Ripley County is characterized by an abundance of a mix of hills, valleys, and rolling landscapes, creating a diverse geography suitable for agriculture. The dominant forest type in this region is the Central Hardwood Forest, characterized by a mix of deciduous trees. Common tree species include oak, hickory, maple, beech, and various other hardwoods. The top 3 land uses are forest, cultured crops and hay and pasture. Less than 10% of all the acreage is considered developed land.

2.8 CLIMATE

In Ripley County, the annual average maximum temperature was 63.0 degrees Fahrenheit with an average annual low (minimum) temperature of 41.8 degrees Fahrenheit. Error! Reference s ource not found. and **Figure 12** chart the maximum and minimum temperatures and show trends utilizing data from the National Centers for Environmental Information (NCEI).

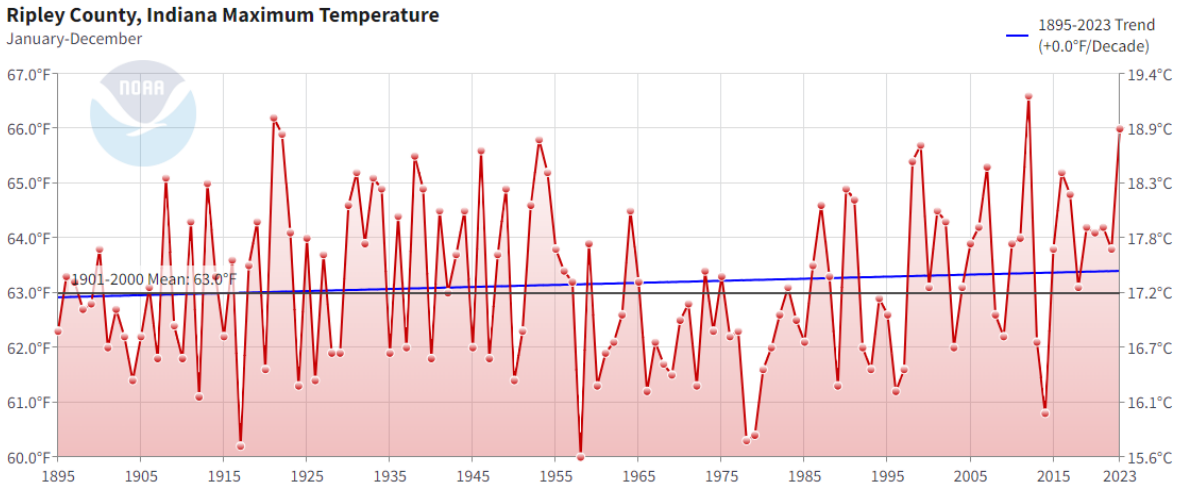


Figure 11 Maximum Temperature Trends for Ripley County 1895-2023

The coldest month based on this data is January at a mean temperature of 20.7 degrees and the warmest is July with a mean temperature of 74.5 degrees. According to the Midwest Regional Climate Center (MRCC) between February 1893 and December 2024 at the Seymour Station USC00127935, the maximum temperature was 113 degrees on July 13, 1936, and the lowest minimum temperature was -23 degrees on January 18,1977. The average monthly high was 79 degrees, which is 4.5 degrees warmer than the monthly mean within that time frame. Additionally, the lowest average monthly minimum temperature for the same period was 12.7 degrees, which is 8.0 degrees colder than the monthly mean minimum temperature within that time frame.

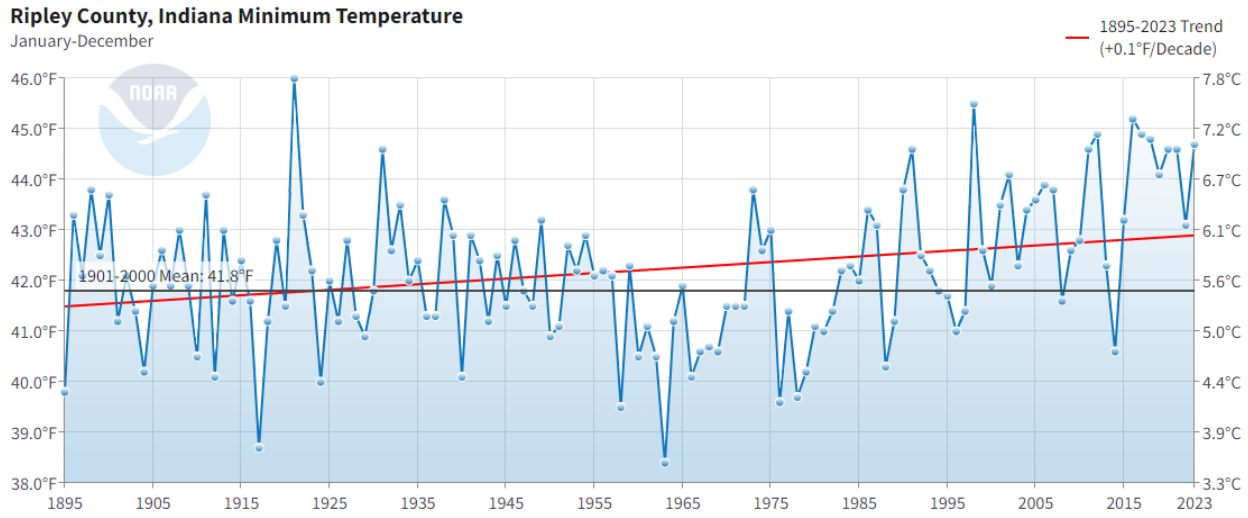


Figure 12 Minimum Temperature Trend

May is typically the wettest month of the year, with February being the driest. The average annual precipitation for Ripley County is 42.45 inches. From In the past 7 years Ripley County had a low of 37.12 inches in March of 2024 and the highest annual precipitation of 65.24 inches in June of 2019. The highest monthly precipitation rate between 2018 and 2024 occurred in June 2019 where 8.39 inches fell. That is 2.7 times the normal amount for the month of June of 4.04 inches. On the opposite end of the spectrum the driest month was September 2019 with 0.22 inches of precipitation. **Figure 13** illustrates the annual precipitation in Ripley County.

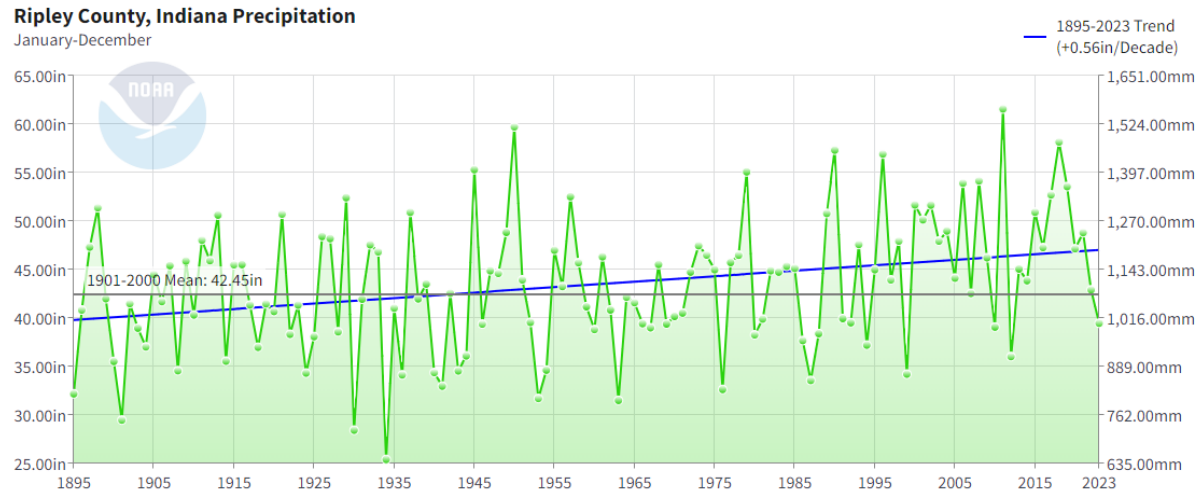


Figure 13 Precipitation Trends from 1895-2024

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.

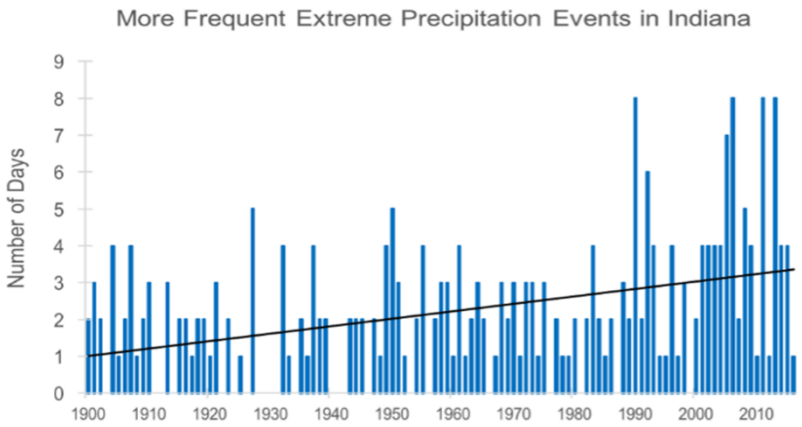


Figure 14 Extreme Precipitation Events in Indiana

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.

This is also verified in the Indiana Climate Change Assessment report from Purdue University. 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 generally 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.

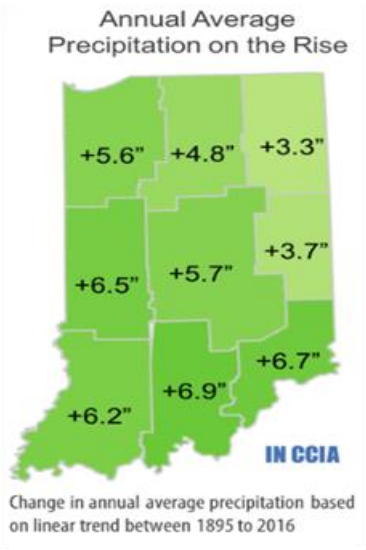


Figure 15 Annual Average Precipitation Change, Purdue University

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.

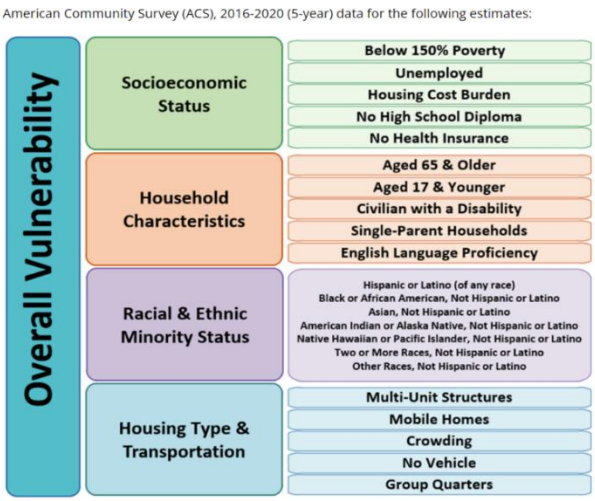


Figure 16 Social Vulnerability Factors

Figure 17 Is a map of the social vulnerabilty of each of the census tracts in Ripley 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 low to medium, however, on closer examination, at the census tract level, the City of Batesville, as well as the towns of Napoleon, Osgood, Versailles, and Sunman tends to be relatively high and relatively moderate in their social vulnerability scores. When struck by the same intensity event, the areas in blue on **Figure 17** may require, more support in responding to and recoveirng from the hazardous event.

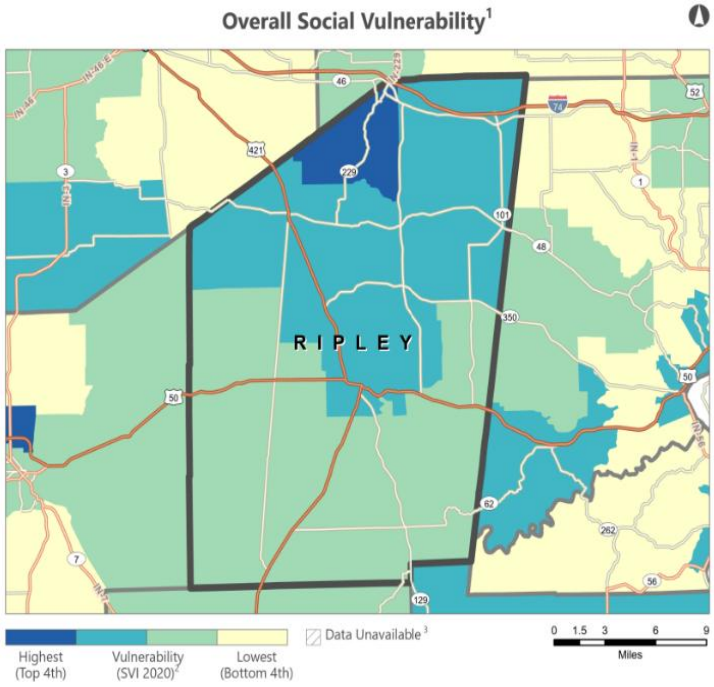


Figure 17 Ripley County Social Vulnerability by Census Tract

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.

One census tract within Ripley County is considered disadvantaged. (**Figure 18**) Each area is considered disavantaged beause the households from this area are above the 65th percentile for low income. Low income is defined as an income less than or equal to twice the federal poverty level, not including students enrolled in higher education. Additionally the area meets or exceeds one of the other criteria which includes climate change impacts, health, housing, transportation, and water and wastewater. A more detailed analysis of the area may be found in **Appendix 11**.

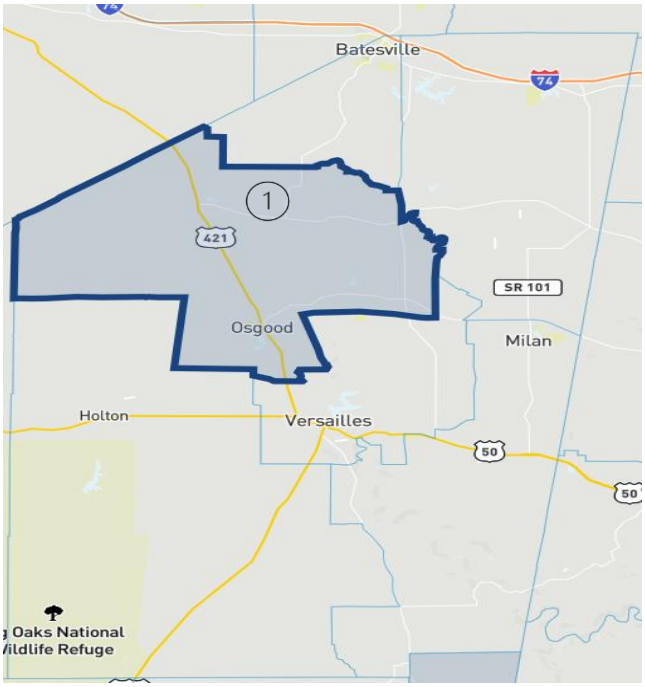


Figure 18 Disadvantaged Population Areas in Ripley County

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 Ripley County, the County and the incorporated communities do not have building and planning staff listed on their web pages. The State of Indiana Directory of Local and State Building Officials lists the State Inspector as a contact for building questions in Ripley County. **Appendix 9** lists the local building official as well as a number of other key positions in each jurisdiction.

Ripley County and the incorporated towns have digitally published their ordinances for easy access. 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 ensure 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.

The current building codes for the state of Indiana are:

- Indiana Building Codes
    - 675 IAC 13-2-6 2014 Indiana Building Code International Building Code, 2012 Edition, First Printing
    - ANSI A117.1 Accessible and Usable Buildings and Facilities, 2009 Edition, First Printing

  Indiana Residential Code
    - 675 IAC 14-4.4 2020 Indiana Residential Code 2018 International
      Residential Code for One- and Two-Family Dwellings, First Print

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 Ripley 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 on 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 2018 Ripley County MHMP, discussed recent events, and the potential for future hazard events. The Committee identified those hazards which affected Ripley County and each community selecting the hazards to study in detail as part of this planning effort. As shown in **Table 4**, 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 2018 Ripley County MHMP are included in the update except Infections Outbreak. The planning committee discussed this but did not include it in the 2024 plan. Land Subsidence, Landslide, and Fluvial Erosion as well as Extreme

Temperatures (Hot and Cold) were added to the update since they are key hazards in the most recent Indiana State Multi-Hazard Mitigation Plan. In addition, the committee discussed Criminal Mass Casualties as a hazard and concern but did not have any mitigation items for this hazard.

Table 4: Hazards Selected

Type of Hazard	List of Hazards	MHMP	
		2018	2024 UPDATE
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	Yes	Yes
	Snow / Ice Storm	Yes	Yes
	Tornado	Yes	Yes
Technological	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). 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 communication, 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 Ripley County, and then a weighted CPRI value was computed

based on the population size of each community. **Table 5** 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 5: Determination of Weighted Value for Communities

Community	Population (2022)	% of Total Population	Weighted Value
Ripley County (w/o other incorporated communities)	14,430	49.8%	0.498
City of Batesville	7,313	25.3%	0.253
Town of Holton	426	1.5%	0.015
Town of Milan	1,825	6.3%	0.063
Town of Napolean	234	0.8%	0.008
Town of Osgood	1,593	5.5%	0.055
Town of Sunman	903	3.1%	0.031
Town of Versailles	2,238	7.7%	0.077
Total	28,962	100.0%	1

3.2 HAZARD PROFILES

The hazards studied for this report are not equally threatening to all communities throughout Ripley 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.

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:

- **Hazard Overview** provides a general overview of the causes, effects, and characteristics that the hazard represents.
- **Historic Data** presents the research gathered from local and national courses to the hazard extent and lists historic occurrences and probability of future incident occurrence.
- **Assessing Vulnerability** describes, in general terms, the current exposure, or risk, to the community regarding potential losses to critical infrastructure and the implications to future land use decisions and anticipated development trends. Impacts on specific populations of communities are also addressed within this section.
- **Relationship to Other Hazards** explores the influence one hazard may have upon another hazard.

Below is a listing of the Federal disaster declarations for the past 5 years.

- **DR4704** declared on 4/15/2023 for Severe Storms, Straight-line Winds, and Tornadoes which took place from 3/31/2023 through 4/1/2023.

- **DR4515** and **EM 3456** declared on 4/3/2020 and 3/13/20 respectively, for the COVID-19 Pandemic from 1/31/20 through 5/11/23.
- **DR4363** declared on 5/4/2018 for Severe Storms and Flooding which occurred between 2/14/2018 and 3/4/2018.

US SBA Declarations in the past five years included:

- **IN-00062** declared on 5/5/2018 for Severe Storms and Flooding which occurred between 2/14/2018 and 3/4/2018.
- **IN-00064** declared on 6/12/2019 for Tornadoes, High Winds, and Severe Storms which occurred on 5/27/2019.
- **IN-00065** declared on 7/3/2019 for Tornadoes, High Winds, and Severe Storms which occurred between 6/15/2019 and 6/17/2019.
- **IN-00074** declared on 8/11/2020 for Heavy Rainfall and Flooding which occurred on 6/27/2020.
- **IN-00075** declared on 7/6/2021 for Severe Storms and Flooding which occurred between 6/18/2021 and 6/19/2021.
- **IN-00077** declared on 7/8/2022 for Derecho Windstorm which occurred between 6/13/2022 and 6/14/2022.
- **IN-00078** declared on 8/30/2022 for Severe Storms and Flooding which occurred between 7/23/2022 and 7/25/2022.
- **IN-00082** declared on 8/30/2023 for Tornadoes which occurred on 8/7/2023.
- **IN-20000** declared on 3/29/2024 for Tornadoes which occurred on 3/14/2024.
- **IN-20001** declared on 5/23/2024 for Tornadoes which occurred on 5/7/2024.
- **IN-20002** declared on 7/17/2024 for Severe Storms and Tornadoes which occurred on 6/25/2024.
- **IN-20003** declared on 7/23/2024 for Severe Storms and Tornadoes which occurred on 7/9/2024.
- **IN-20004** declared on 8/7/2024 for Severe Storms and Tornadoes which occurred on 7/15/2024.

Ripley County was included in the two COVID declarations from FEMA as well as SBA declaration IN-00075 as a contiguous county (a county adjacent to the primary damaged county).

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 virtually 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.

Figure 19 Urban Grass Affected by Drought

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 the 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 19** shows urban grassed areas affected by drought conditions.

Recent Occurrences

Data gathered from the U.S. Drought Monitor indicated that between January 1, 2017 – December 31, 2023, there were 109 weeks where some portions of Ripley County was identified as being "Abnormally Dry" or at Drought Monitor Level D0. According to the Drought Monitor, there were 44 weeks within that period where any portion of Ripley County was in a drought state higher than D0. **Figure 20** shows the distribution of weeks in drought over the 7-year time frame.

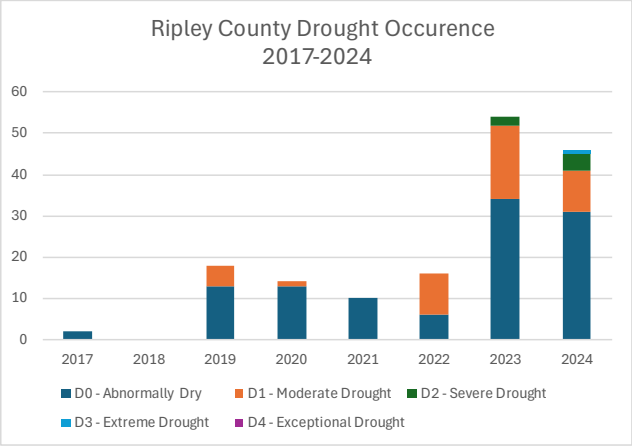


Figure 20 Drought Occurrences 2017-2024

As rain patterns change there are periodic times when the county is deemed “Abnormally Dry” or D0. Most of these instances are resolved relatively 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 2019, 2022, 2023, and 2024. During each of these years, Ripley 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 Ripley County is D3 or “Extreme Drought”. Many people will recall the summer of 2012 throughout Indiana because drought conditions had intensified and reached D2. Burn bans were common and the fire threat was so great that all July 4 fireworks events were postponed or cancelled. Most recently, December 19, 2023, through January 9th, 2024, Ripley County once again was at D2 for 4 weeks. Although not as severe as 2012, many communities, once again, considered burn bans. Figure 21, 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 21 US Drought Monitor Drought Classification Descriptions

The National Climate Data Center (NCDC) does not report any events nor property or crop losses within Ripley 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 6** depicts the number of weeks per year at each of the drought levels indicated above. Ripley County has only been at a D3 “Extreme Drought “one time on the week of September 24, 2024, during the past 7 years.

Table 6: Ripley County Percent of Time in Drought

Percent of Each Year in Drought						
Year	None	D0	D1	D2	D3	D4
2018	96%	4%	0%	0%	0%	0%
2019	100%	0%	0%	0%	0%	0%
2020	90%	10%	0%	0%	0%	0%
2021	98%	2%	0%	0%	0%	0%
2022	81%	19%	0%	0%	0%	0%
2023	34%	31%	31%	4%	0%	0%
2024	38%	40%	12%	8%	2%	0%

The Planning Committee, utilizing the CPRI, determined the overall risk of drought throughout Ripley County is "Elevated." The impact of drought was determined to be the same for all communities and unincorporated areas throughout the county due to the possible agricultural impacts and impacts to water wells. The committee agreed that a drought is "Highly Likely" except the Town of Holton has it as "Likely" (to occur within the next three years) and the magnitude of drought is anticipated to be "Negligible" for the County and Towns, but City of Batesville ranked it "Limited." 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 7.**

Table 7: CPRI for Drought

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
City of Batesville	Highly Likely	Limited	> 24 hours	> 1 week	Elevated
Town of Holton	Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Milan	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Napoleon	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Osgood	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Sunman	Highly Likely	Negligible	> 24 hours	> 1 week	Elevated
Town of Versailles	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 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 Ripley County, the Committee estimated that the probability of a drought occurring in the area is "Highly Likely;" or "Likely" and the occurrence is probable within the next three to five years. The damage anticipated throughout the county is predicted to be "Negligible" to "Limited" 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 crops 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

Drought will generally affect entire counties and even multi-county regions at one time. Within Ripley County, direct and indirect effects from a prolonged 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 result in more changes 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 increase the demand for purchasing produce and increase 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

Figure 22 Drought Effects on Corn Crop

It is difficult to estimate the potential losses associated with a drought for Ripley 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, Ripley County produced approximately 7.74M bushels of corn and 3.13M bushels of soybeans, as reported by the United States Department of Agriculture (USDA) National Agricultural Statistics Service. Using national averages of $6.58 per bushel of corn and $14.40 per bushel of soybeans, the estimated crop receipts for 2022 would be $96.0M. 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 $48.0M-$82.56M; depending on the crop produced and the market demand. Effects of drought on corn crops can be seen in **Figure 22.**

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, damage, and costs for Indiana. In comparison, in 2022 Indiana received $51,104,285 in crop insurance from 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 insects 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 in, 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 developed which create a 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 experienced a rise in the average annual precipitation between 1895 and 2016; an increase of 5.6 inches for the area of Ripley County. This increase in precipitation may lessen the likelihood or overall impact of a long-term drought in Ripley 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 expanding the municipalities, 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 Ripley 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, electricity, 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.

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.

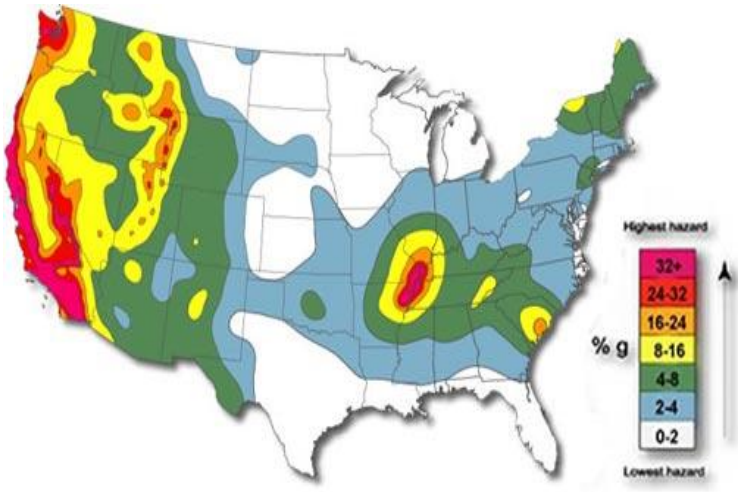


Figure 23 Earthquake Risk Areas in the US

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 23**). 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. Much of Ripley County is in an area with a high potential for liquefaction (**Figure 24)**

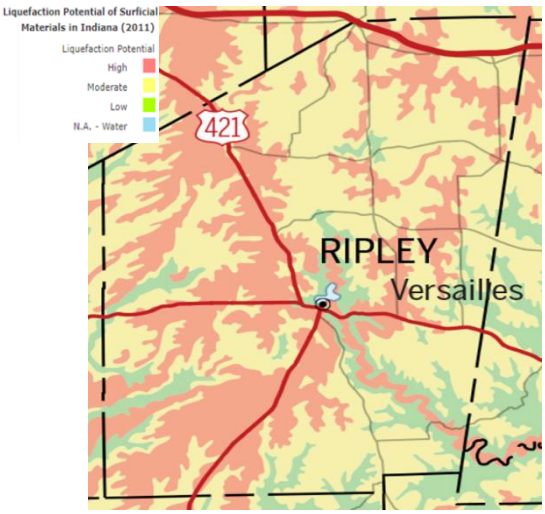


Figure 24 Ripley County Liquefaction Potential

Recent Occurrences

Indiana, as well as several other Midwestern states, lies in the most seismically active region east of the Rocky Mountains. **Figure 25** shows the 2014 Seismic Hazard for Indiana. The nearest known areas of concern for Ripley County are the Anna Fault, Wabash Seismic Zone, and 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 actually occur within the state 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.

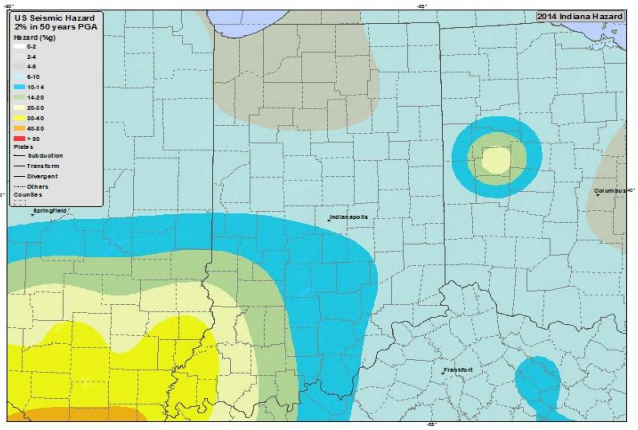


Figure 25 Indiana Seismic Zone Map

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."

Figure 26 Minor Earthquake Damage

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 Ripley County has not been directly impacted by an earthquake, the Committee determined that the probability of an earthquake occurring in Ripley County or any of the communities is "Unlikely." Should an earthquake occur, the impacts associated with this hazard are anticipated to be "Significant" and the City of Batesville to be "Negligible" in all areas of the county. As with all earthquakes, it was determined that the residents of Ripley 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 8.**

Table 8: CPRI for Earthquake

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Unlikely	Significant	< 6 hours	< 6 hours	Elevated
City of Batesville	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Holton	Unlikely	Significant	< 6 hours	< 6 hours	Elevated
Town of Milan	Unlikely	Significant	< 6 hours	< 6 hours	Elevated
Town of Napoleon	Unlikely	Significant	< 6 hours	< 6 hours	Elevated
Town of Osgood	Unlikely	Significant	< 6 hours	< 6 hours	Elevated
Town of Sunman	Unlikely	Significant	< 6 hours	< 6 hours	Elevated
Town of Versailles	Unlikely	Significant	< 6 hours	< 6 hours	Elevated

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 Ripley County is "Unlikely" to occur within the next five years.

Assessing Vulnerability

Earthquakes generally affect broad areas and potentially many counties at one time. Within Ripley 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 needs to be checked on, especially if they seek shelter under bridges or structures that are not stable.

Figure 27 Structural Earthquake Damage

Indirect Effects:

- Ripley 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 26** and **Figure 27.**

Estimating Potential Losses

To determine the losses associated with an earthquake, the HAZUS-MH software was utilized in the Ripley County MHMP update. HAZUS-MH is a nationally standardized risk modeling methodology which identifies areas with elevated 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 7.0 within Ripley County.

Per the HAZUS-MH scenario noted above, total economic losses are anticipated to be near $73.10M with moderate damage to approximately 400 buildings, of which 5 are anticipated to be damaged beyond repair. Further, there are 38 critical facilities (1 hospital, 17 schools, 1 EOC, 8 Police Stations, and 11 Fire Stations) with reduced 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 are 8 leaks, and 2 breaks anticipated for wastewater facilities and 17 leaks and 4 breaks for potable water. Residential occupancies would be anticipated to sustain the largest level of damage, representing 73.82% of total damage.

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 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 Ripley 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, Ripley County should continue to provide education and outreach regarding earthquakes and even earthquake insurance along with education and outreach for other hazards. As Ripley 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 Ripley 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 as a whole, 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 soil in these hazard areas. These types of related hazards may have greater impacts on Ripley 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 high 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 28**. 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.

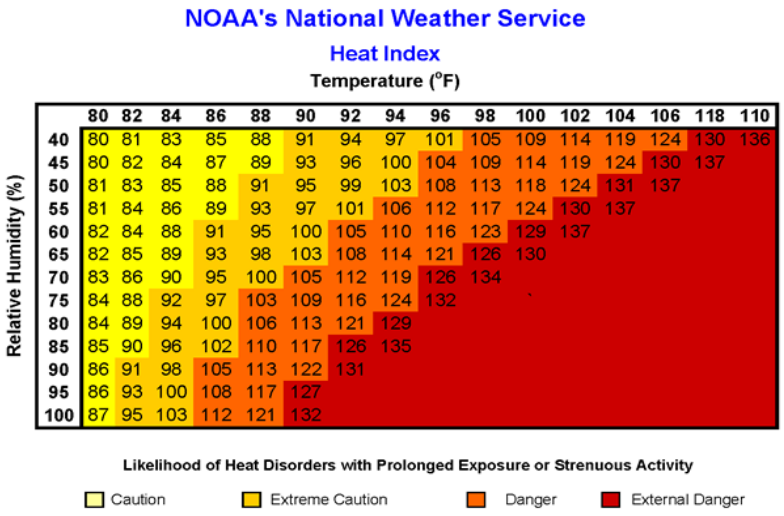


Figure 28 NWS heat Index Chart

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.

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, strong winds, particularly with very hot, dry air, can also be extremely hazardous.

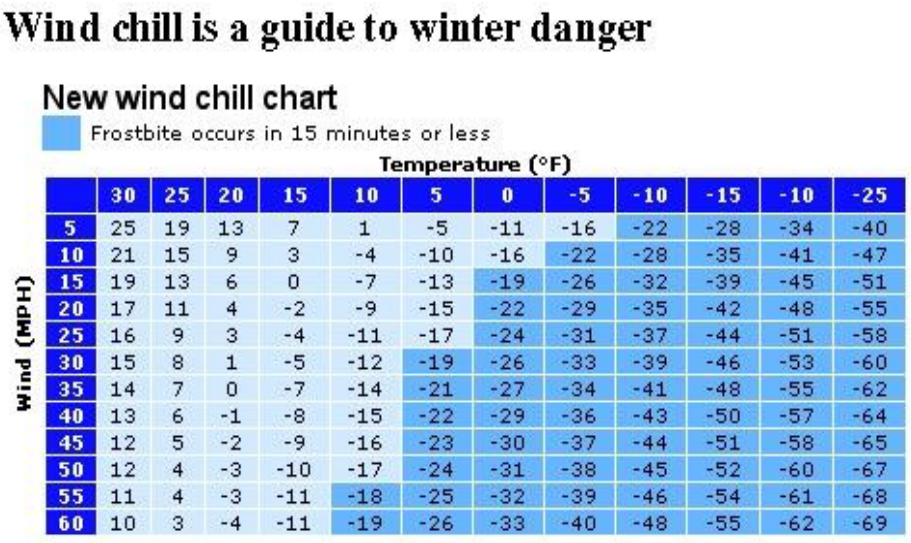
Classification	Heat Index	Effect on the body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat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

Figure 29 Extreme Heat Effects by Heat Index

As **Figure 29** 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.



Wind (MPH)	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

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.

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 have been 3 extreme heat events and 2 extreme cold events between January 1, 2017 and December 1, 2024. Local reports did not provide any additional information regarding the period of excessive heat during this time period. No reports were provided relevant to damage or losses associated with the prolonged cold temperatures.

Figure 31 Working in Extreme Cold

It is difficult to predict the probability that an extreme temperature event will affect Ripley County residents within any given year. However, based on historic knowledge and information provided by the community representatives, an extreme temperature event is "Likely" (event is possible within the next 5 years) to occur within the county and if an event did occur, it would result in "Significant" magnitude. **Table 9** identifies the CPRI for extreme temperatures-both heat and cold events for all communities in Ripley County.

Table 9: CPRI for Extreme Temperatures

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Likely	Significant	> 24 hours	< 1 week	Elevated
City of Batesville	Likely	Significant	> 24 hours	< 1 week	Elevated
Town of Holton	Likely	Significant	> 24 hours	< 1 week	Elevated
Town of Milan	Likely	Significant	> 24 hours	< 1 week	Elevated
Town of Napoleon	Likely	Significant	> 24 hours	< 1 week	Elevated
Town of Osgood	Likely	Significant	> 24 hours	< 1 week	Elevated
Town of Sunman	Likely	Significant	> 24 hours	< 1 week	Elevated
Town of Versailles	Likely	Significant	> 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 of being impacted during these conditions.

By assessing the demographics of Ripley County, a better understanding of the relative risk that extreme temperatures may pose to certain populations can be gained. In total, just over 19.0% of the county's population is over 65 years of age, 6.3% of the population is below the age of 5, and approximately 8.9% 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. The 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.

Extreme heat can affect the proper function of the organ and brain systems by elevating core body temperatures above normal levels. Elevated core body temperatures, usually in excess of 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 32.** 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.

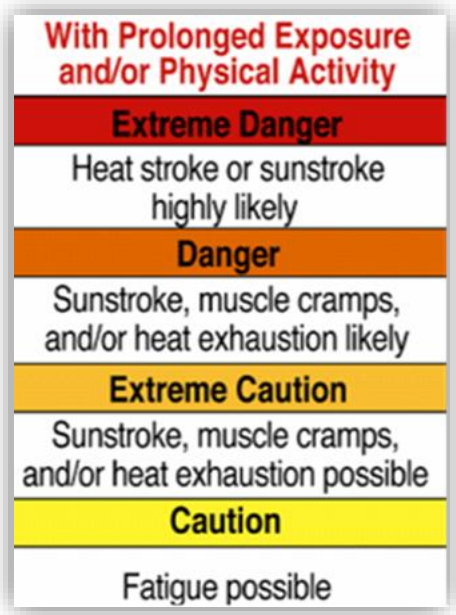


Figure 32 Heat Danger Classification

Within Ripley County, direct and indirect effects from an extended 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 Ripley 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, or as local economies are stressed, such programs may become more necessary to protect Ripley County's at-risk populations.

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.

New construction associated with the 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 developments 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 Ripley County, the Committee concluded that this type of hazard is not expected to cause any hazards studied, however, extreme temperatures can exacerbate other hazards present. It is anticipated that due to prolonged extreme temperatures, primarily prolonged periods of high 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 in 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 33***) 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 33 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, cooking, 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 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 Ripley County between January 1, 2017 to December 1, 2024. Within the same time parameter, there were 5 reported events within the State of Indiana, 2 of these events were reported in both Brown and Lake County respectively and 1 reported in Shelby County. The Lake County fire events occurred in 2020 and 2021, and the Brown County fires were reported to occur in 2022. The Shelby County fire was reported to occur in late 2022. During each of these events a total of over 500 acres were burned.

Figure 34 Residence Fire

The NCDC does not report structure fires; therefore, local sources were utilized to provide information regarding residential and business fires. These fires are the typical hazard affecting Ripley County in the last several years. Of importance is the residential fire in the Town of Osgood in 2022 that injured 2 juveniles, with a photo of the house available in **Figure 34**. Ripley County has very little managed lands aside from Big Oaks National Wildlife Refuge. Due to the expansive acreage of agricultural land within Ripley 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 10** identifies the CPRI rankings for fire in Ripley County.

Table 10: CPRI for Fire

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Ripley County	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
City of Batesville	Highly Likely	Critical	< 6 hours	< 1 day	Severe
Town of Holton	Highly Likely	Negligible	< 6 hours	< 6 hours	Elevated
Town of Milan	Highly Likely	Negligible	< 6 hours	< 6 hours	Elevated
Town of Napoleon	Highly Likely	Significant	< 6 hours	> 1 week	Severe
Town of Osgood	Highly Likely	Negligible	< 6 hours	< 6 hours	Elevated
Town of Sunman	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Versailles	Highly Likely	Limited	< 6 hours	< 6 hours	Severe

Information provided in Table *11* highlights the number of fire calls the Ripley County fire departments responded to during the time period January 2018 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 11: Ripley County Fire Runs

Fire Department	2018	2019	2020	2021	2022	2023	2024
Batesville Fire and Rescue	950	1,469	1,464	1,551	1,497	1,463	1,550
Delaware Community Volunteer Fire Dept.	135	73	75	76	92	92	74
Friendship Fire Dept.	136	102	118	128	123	129	161
Milan Volunteer Fire Dept.	220	156	160	167	167	179	205
Morris Volunteer Fire Dept.	137	89	79	78	105	82	94
Napoleon Volunteer Fire Dept.	144	106	92	135	151	131	86
New Marion Volunteer Fire Dept	38	36	47	41	38	40	71
Osgood Volunteer Fire Dept.	290	235	281	311	295	299	297
Otter Creek Twp. Volunteer Fire Dept.	33	39	39	102	145	198	180
Sunman Area Life Squad	Not available						
Sunman Rural Fire Dept., Inc.	139	123	131	119	108	114	133
Versailles Volunteer Fire Dept.	498	466	537	547	635	614	577
TOTAL	**2,720**	**2,894**	**3,023**	**3,255**	**3,356**	**3,341**	**3,428**

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 Ripley 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 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 Ripley 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 directly 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 natural disasters. Most communities in the United States have experienced flooding because of spring rains, heavy 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 that are due to 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 Ripley County 2018

Flooding and associated flood damage are most likely to occur during the spring because of heavy rain combined with melting snow and frozen soil. **(Figure 35)** However, provided the right saturated conditions, intense rainfall of short duration during rainstorms can produce damaging flash flood conditions. There are no exceptions to when floods may occur. There are times they are less likely, but given the right atmospheric conditions, even then, a flood or flash flood can take place. Climate change has had a direct impact on 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 in any given year. In other words, the regulatory flood elevation has a 1% chance of being equaled, or exceeded, in any given year 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).

Recent Occurrences

The NCDC indicates that between January 1, 2017 to December 1, 2024, there were 25 flash flood events and 39 flood events. There were two flash floods in 2017, on June 23 that resulted in $30,000 in property damage and one in November that was $25,000. Neither event resulted in any additional crop damage reported. The flood on May 8, 2024, resulted in $10,000 in property damage and a high-water rescue. No deaths were reported.

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 Advanced Hydrologic Prediction Service (AHPS) 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 Ripley County, there are no active USGS stream gauges but there are 2 nearby, pictured in **Figure 36**. One is Brush Creek near Nebraska in Jennings County and one is Indian-Kentucky Creek near Canaan in Jefferson County.

Figure 36 USGS Stream Gauges near Ripley County

The gauge is located on Brush Creek near Nebraska, major flooding is 13 feet, moderate is 10 feet and minor is 8 feet. The highest crest was recorded on June 10, 1981, at 12.99 feet. The most recent crest was March 25, 2023, at 9.07 feet.

The gauge on Indian-Kentucky Creek near Canaan, does not have a breakdown of severity of flood. The highest historical flood was on April 19, 2011, at 11.60 feet. The next highest recorded flood occurred on August 4, 2009, at 11.09 feet.

There is a privately operated stream gauge on Laughery Creek which is operated by the Friendship Fire Department. Both the fire department and the EMA check and monitor the gauge and are able to readily identify potential flooding and respond to assist community members in the area. 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 2 repetitive loss structures in Ripley County. In the Town of Napoleon there are two single family residences that are considered a repetitive loss structure. **Table 12** identifies the number of repetitive losses claims per community as well as payments made, as provided by FEMA.

Table 12: Repetitive Properties, Claims, and Payments

Community	# Repetitive Loss Properties	Total # of Losses
Ripley County	0	0
City of Batesville	0	0
Town of Holton	0	0
Town of Milan	0	0
Town of Napoleon	Total 2 2 residential	Total 6 6 residential
Town of Osgood	0	0
Town of Sunman	0	0
Town of Versailles	0	0
TOTAL		

There have been few claims made for damages associated with flooding in Ripley County since 1978. **Table 13** further indicates the premiums and coverage totals for individual communities.

Table 13: Insurance Premiums and Coverage

Community	Flood Insurance Premiums	Flood Insurance Coverage, Millions
Ripley County	$19,894	$2.88M
City of Batesville	$962	$0.35M
TOTAL	$20,856	$3.23M

As determined by the Committee, the probability of riverine based flooding occurring throughout Ripley County is "Highly Likely." This is largely based on the presence absence of rivers and streams near the communities. The Committee also determined that the warning time would be less than 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 and the City of Batesville less than a day. A summary of riverine flooding CPRI is shown in Table 14.

Table 14: CPRI for Flood - Riverine

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Highly Likely	Limited	< 6 hours	< 1 week	Severe
City of Batesville	Highly Likely	Limited	< 6 hours	< 1 day	Severe
Town of Holton	Highly Likely	Limited	< 6 hours	< 1 week	Severe
Town of Milan	Highly Likely	Limited	< 6 hours	< 1 week	Severe
Town of Napoleon	Highly Likely	Limited	< 6 hours	< 1 week	Severe
Town of Osgood	Highly Likely	Limited	< 6 hours	< 1 week	Severe
Town of Sunman	Highly Likely	Limited	< 6 hours	< 1 week	Severe
Town of Versailles	Highly Likely	Limited	< 6 hours	< 1 week	Severe

Assessing Vulnerability

Flood events may affect substantial portions of Ripley 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 Ripley 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.

The county seeks out mitigation measures whenever possible. Flood maps are a useful tool to identify and delineate the floodways and floodplains in a community. The NFIP Flood Insurance Risk Maps (FIRMs) are identified in Appendix 9 as well as being available from the Indiana DNR Floodplain Portal - https://secure.in.gov/dnr/water/surface-water/indiana-floodplain-mapping/indiana-floodplain-information-portal/.

Table 15: NFIP Participation in Ripley County

CID	Community	Init. FHBM Identified	Init. FIRM Identified	Current Effective Map Date	Reg-Emerg Date	CRS
180221	Ripley County	12/13/1974	9/1/1987	11/2/2012 (M)	9/1/1987	No
180507	City of Batesville		11/2/1995	NSFHA	3/9/2010	No
180595	Town of Holton	Under Ripley County		11/2/2012		No
180597	Town of Milan	Under Ripley County		11/2/2012		No
180462	Town of Napoleon	9/21/1979	11/2/2012	11/2/2012	Sanctioned as of 9/21/1980	No
180594	Town of Osgood	Under Ripley County		11/2/2012		No
180596	Town of Sunman	Under Ripley County		11/2/2012		No
180392	Town of Versailles	Under Ripley County		11/2/2012		No

According to the FEMA Community Status Book Report, the City of Batesville has no Special Flood Hazard Area (SFHA) within its corporate limits. All the other communities in the county have areas of concern within their corporate limits, as shown in **Table 15**. The Towns of Holton, Milan, Osgood, Sunman, and Versailles participate in the NFIP as a part of Ripley County. The Town of Napoleon does not participate in the NFIP. The floodplain administrators in Indiana are required to enforce the state approved community flood ordinance. This includes the identification of the floodplains for community members, conducting damage assessments after properties within the special flood hazard area have been damaged as well as the determination of substantial damage. Substantial damage is

defined in the Indiana Model Flood Damage Prevention Ordinance as damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. This is the standard which is used by each jurisdiction's Floodplain Administrator (Ripley County and Batesville) and Floodplain Administrators throughout Indiana.

Flood risk areas are frequently located within the boundaries of the disadvantaged and underserved population census blocks since these properties tend to be more affordable to rent or buy. However, with less financial capacity to mitigate their properties, 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. On the next page (**Figure 37**) is a map showing the county floodplains. A similar map which includes the critical and essential facilities is also available in **Exhibit 2** where it can be zoomed in for better viewing.

There are no flood inundation maps developed to identify areas impacted by a variety of flood stages on either Brush Creek or Indian-Kentucky Creek. Within Ripley 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.

Indirect Effects:

- Increased response times for emergency personnel when roads are impassable.
- Increased costs associated with personnel to carry 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 some of the underserved populations that may not have access to radio, television, or social media of evacuations.

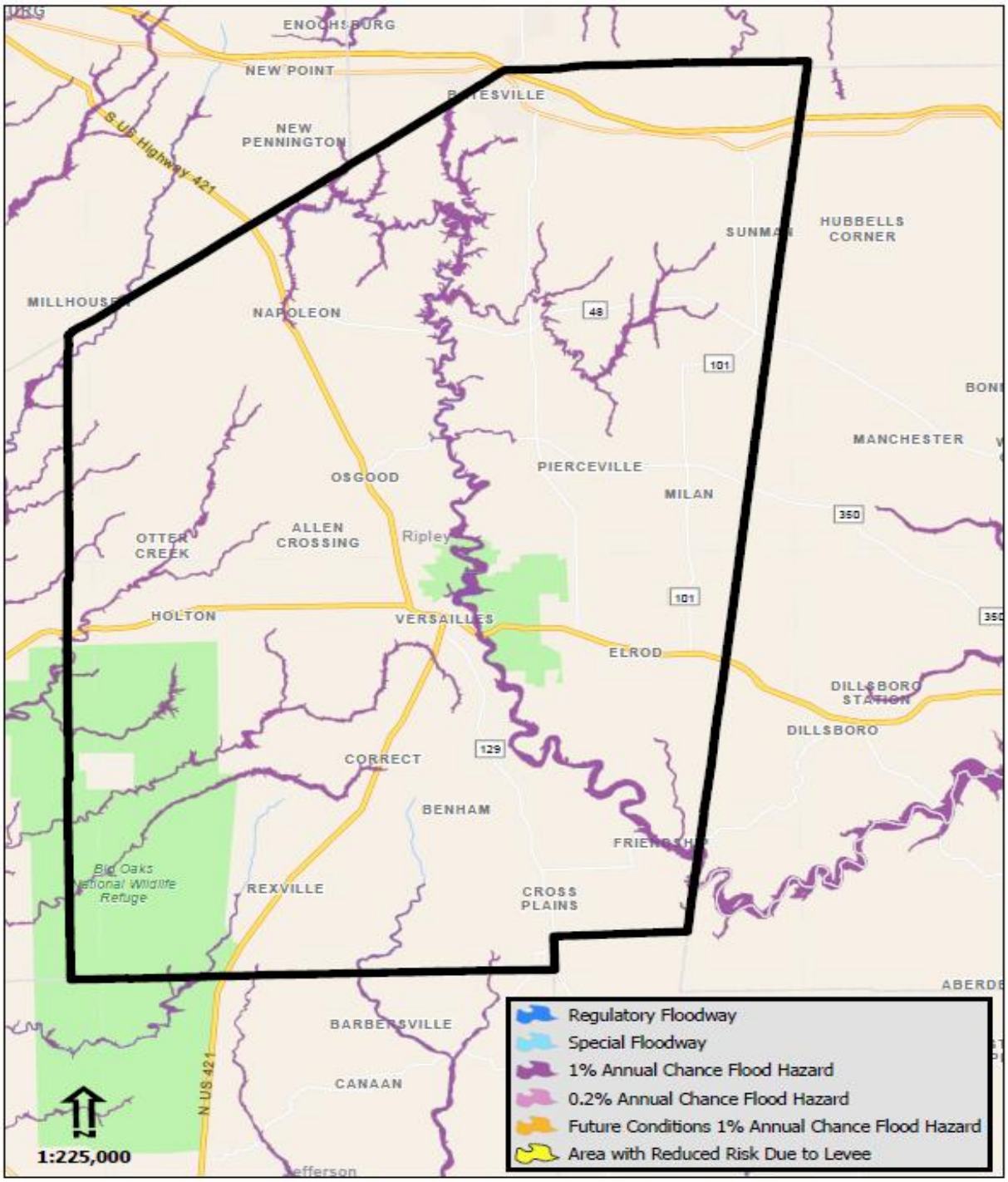


Figure 37 NFIP Flood Risk Map of Ripley County, effective 11/2/2012.

Estimating Potential Losses

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

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 Ripley 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 Ripley 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 16** 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 Ripley County.

Table 16: Ripley County Building Inventory Utilizing Best Available Data

	Floodway		1% AEP (excluding floodway)		0.2% AEP (excluding floodway and 1% AEP)		Unnumbered (excluding floodway)	
	#	$, Million	#	$, Million	#	$. Million	#	$, Million
Ripley County	922	$ 126.78	0	$ 0.00	0	$ 0.00	153	$ 19.57
City of Batesville	0	0	0	0	0	0	0	0
Town of Holton	0	0	0	0	0	0	0	0
Town of Milan	4	0.17	0	0	0	0	3	0.33
Town of Napoleon	6	0.89	0	0	0	0	13	1.38
Town of Osgood	0	0	0	0	0	0	0	0
Town of Sunman	0	0	0	0	0	0	0	0
Town of Versailles	2	0.17	0	0	0	0	0	0
TOTAL	934	128.00	0	0	0	0	169	21.28

Utilizing the same GIS information and process, critical infrastructure within each of the flood hazard areas in Ripley County was assessed and are included in **Table 17**. These buildings are included in the overall number of structures and damage estimate information provided in **Table 18**.

Table 17: Critical Infrastructure in the Flood Zones

Community	Floodway	1% AEP (excluding floodway)	0.2% AEP (excluding floodway and 1% AEP)	Unnumbered Zone (excluding floodway)
Ripley County				
City of Batesville				
Town of Holton				
Town of Milan				
Town of Napolean	Former Napoleon Volunteer Fire Dept. Station			
Town of Osgood				
Town of Sunman				
Town of Versailles				Bear Creek Baptist Church

Utilizing the information in **Table 16** 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 Ripley County. **Table 18** 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 18: Structures in the 1.0% AEP and Number of Flood Insurance Policies

Community	# Structures In 1.0% AEP(includes Floodway and Unnumbered zone)	# Policies
Ripley County	1,075	14
City of Batesville	0	1
Town of Versailles	2	0
Town of Napolean	19	0
Town of Milan	7	0
Total	0	15

Future Considerations

As the municipalities within Ripley County grow in population and redevelop, it can be anticipated that the number of critical and non-critical infrastructure will also increase accordingly. Ripley County and the Towns of Holton, Milan, Napoleon, Osgood, Sunman, and Versailles updated and adopted the County Floodplain Ordinance in 2024, whereas the City of Batesville adopted their Floodplain Ordinance in 2014. Both Ripley County and the City of Batesville and Towns of Holton, Milan, Napoleon, Osgood, Sunman, and Versailles 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 Ripley 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 approximate 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 damage 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 38**)**,** 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 Ripley 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 38: 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 may also lead to dam failure. As the water levels rise in areas protected by dams, at some point, these structures will overtop 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 become 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 39)** 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.

Figure 39 Damaging Hail on Vehicles

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, strong 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

In Ripley County, the NCDC has recorded 11 hailstorms and 88 thunderstorms/windstorm events between January 1st, 2017, to December. All the reported instances of hail have been within this time frame, ranging between February 24th, 2017, to July 2nd, 2023. The average diameter hail stone occurring throughout Ripley County ranges from approximately ¾ to 1.75 inches with the largest one for this period of interest being 2 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. 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, and August. Within Ripley County, NCDC reports only 3 instances between November 27, 2019 to March 30, 2022 where top wind speeds were greater than 58 mph.

The NCDC recorded damages for hailstorms, thunderstorms, and windstorms throughout Ripley County. From January 2017 to December 2024, there were 11 instances of hailstorms, resulting in 2 thousand property damage and no additional crop damage. In the same time frame, there were 88 instances of thunderstorms and high wind events, resulting in $430,600 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 Ripley 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 on the frequency of hailstorms, thunderstorms, and windstorms.

The Committee determined the probability of a hailstorm, thunderstorm, or windstorm occurring anywhere throughout Ripley County is “Highly Likely” and will typically affect broad portions of the county at one time resulting in potentially “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 hours, and the duration is expected to last less than six hours.

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 19**.

Table 19: CPRI for Hailstorm, Thunderstorm, and Windstorm

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
City of Batesville	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Holton	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Milan	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Napoleon	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Osgood	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Sunman	Highly Likely	Limited	< 6 hours	< 6 hours	Severe
Town of Versailles	Highly Likely	Limited	< 6 hours	< 6 hours	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."

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 Ripley County, direct and indirect effects from a hailstorm, thunderstorm, or windstorm may include:

Direct Effects:

- Damages to infrastructure (power lines)
- Damage to individual property (homes, cars)

Indirect Effects:

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

Estimating Potential Losses

Due to the unpredictability of this hazard all critical infrastructure and non-critical structures in Ripley 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 damage. However, areas where utility lines are above ground and areas where dead or dying trees have not been removed may be at 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

Figure 40: Home Damaged During Windstorm

hailstorms, thunderstorms, and windstorms if not properly anchored to the ground. Damage from falling limbs or uprooted trees such as that shown in **Figure 40.**

Future Considerations

As the population of the communities in Ripley County develops and redevelops, it can be anticipated that the number of structures will also increase. To reduce the vulnerability of damage resulting from a hailstorm, thunderstorm, or windstorm, measures such as proper anchoring is vital. This includes not only roof anchors but also mobile home anchors. Proper tree maintenance, enforcement of the International Building Codes, and burial of power lines should be completed. 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 Ripley 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 rocks 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.

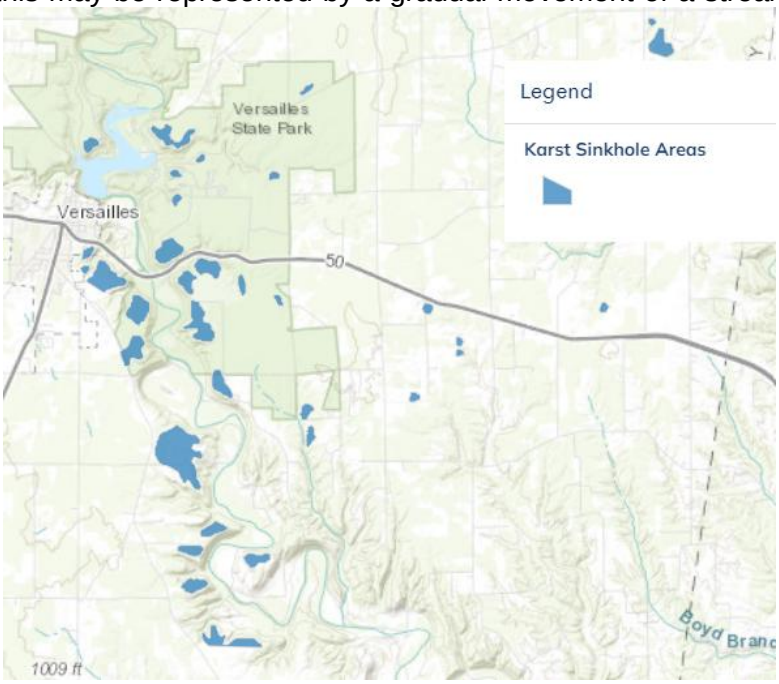


Figure 41: Karst areas near Versailles in Ripley County

Recent Occurrences

The potential for landslides or land subsidence within Ripley County was discussed by the Planning Committee. IndianaMap shows that there are several Karst Sinkhole areas in Ripley County, especially south of Versailles (see **Figure 41)** and on the western side of County near Holton and south. To the knowledge of the Planning Committee, there are no active underground mining operations within Ripley County. There have, however, been some concerns about Fluvial Erosion Hazard (FEH) along Laughery Creek and associated creeks running through the county. **Figure 42** shows the FEH corridor as it passes near the town of Versailles.

The Committee determined the probability of a landslide or subsidence occurring in Ripley County is "Unlikely". Any event is expected to result in potentially "Negligible" damages. 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 six hours to one week. These events are highly unpredictable and the risk, although very low 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 20.**

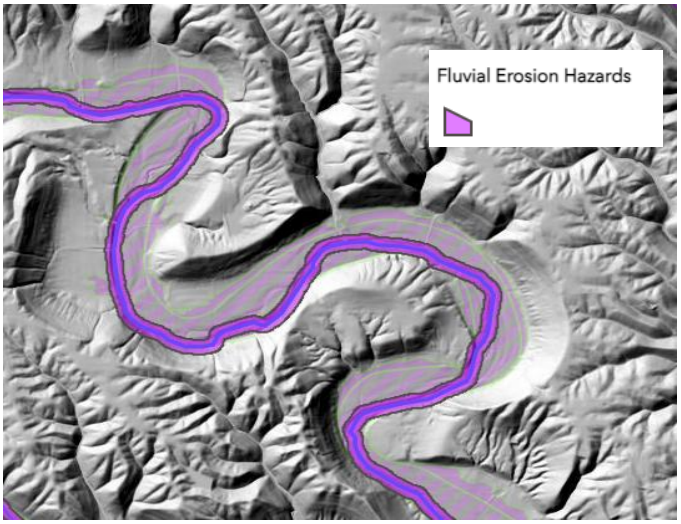


Figure 42 Fluvial Erosion Hazard along the Laughery Creek near Versailles

Table 20: CPRI for Land Subsidence, Landslide and FEH

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Unlikely	Negligible	< 6 hours	< 6 hours	Low
City of Batesville	Unlikely	Negligible	< 6 hours	< 1 week	Low
Town of Holton	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Milan	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Napoleon	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Osgood	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Sunman	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Versailles	Unlikely	Negligible	< 6 hours	< 6 hours	Low

Assessing Vulnerability

Ripley County has some Karst geology in the southern and southwestern portions of the county. They have a relatively moderate risk of landslides. The risk index considers expected annual loss as well as vulnerabilities by census tract and community resilience. The Estimated Annual Loss, a contributor to the Risk Index for Landslide in Ripley County, is shown in **Figure 43**. The Risk index does not vary for the County as all areas are still considered relatively moderate. Although identified, fluvial erosion hazard areas appear to be confined to the floodway

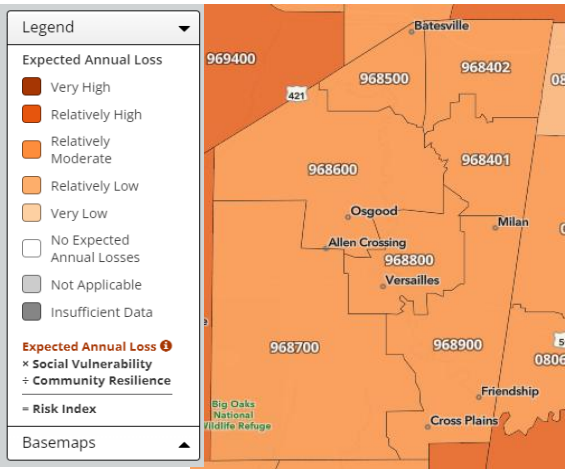


Figure 43 Expected Annual Loss from Landslide

of the streams in the county. This does not eliminate the hazard but does limit the damages to the stream banks and bluffs immediately adjacent to the streams The planning committee rated the Landslide, Land Subsidence and Fluvial Erosion Hazard as “Unlikely” according to the Planning Committee with “Negligible” severity.

Within Ripley County, direct and indirect effects may include:

Direct Effects:

- Damages to infrastructure (power lines, roads, bridges)
- Damage to individual property (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 Ripley County which are at risk of damage including temporary or permanent loss of function. **Figure 43** shows areas where the entire county is at relatively low risk due to landslides.

To prepare a community based basic “what-if” scenario, the Indiana FEH GIS layers were overlaid onto parcel data provided by the County. **Table 21** identifies the number of structures and potential damage within the FEH areas.

Table 21: Summary of Structures in the FEH Zone

Community	# of Structures	Critical or Essential Facilities
Ripley County	125	3
City of Batesville	0	0
Town of Holton	0	0
Town of Napoleon	15	2
Town of Osgood	1	1
Town of Versailles	1	0

Future Considerations

As the populations of the communities in Ripley 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 Ripley County. However, depending on the location, any development may increase the vulnerability to this hazard.

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 melting. 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 44 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 tornadoes strike between 3:00 pm and 9:00 pm but can occur at any time of day or night as shown in **Figure 44.** Tornadoes occur most frequently in the United States east of the Rocky Mountains. Tornadoes in Indiana generally come from the south through the 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.

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. According to the NCDC, Ripley County experienced 6 tornados between January 1, 2017, and December 1, 2024.

Table 22: 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

EF-Scale	Windspeed, mph	Character of Damage	Relative Frequency	Typical Damages
EF3	136-165	Severe damage	6%	Severe damage 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 Ripley County would be "Highly Likely" and the magnitude and severity of such an event to be "Significant" and "Crucial" for the City of Batesville. 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 23.**

Table 23: CPRI for Tornado

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Highly Likely	Significant	< 6 hours	< 6 hours	Severe
City of Batesville	Highly Likely	Critical	< 6 hours	< 6 hours	Severe
Town of Holton	Highly Likely	Significant	< 6 hours	< 6 hours	Severe
Town of Milan	Highly Likely	Significant	< 6 hours	< 6 hours	Severe
Town of Napoleon	Highly Likely	Significant	< 6 hours	< 6 hours	Severe
Town of Osgood	Highly Likely	Significant	< 6 hours	< 6 hours	Severe
Town of Sunman	Highly Likely	Significant	< 6 hours	< 6 hours	Severe
Town of Versailles	Highly Likely	Significant	< 6 hours	< 6 hours	Severe

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 Ripley County is "Highly Likely" (within the next year).

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 Ripley 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 dealing damages from the tornado and debris removal from high winds.
- Affected business owners may experience a 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 to the center of the tornado path, while Zone 3 is the farthest from the path and with a theoretically lower wind speed. Table *24* provides summary data for the hypothetical tornado, which is identified on **Exhibit 3**.

Table 24: Summary of Hypothetical Tornado Damages

	Zone 1		Zone 2		Zone 3		Total	
	#	$, Million	#	$, Million	#	$, Million	#	$, Million
Ripley County	116	$25.65	42	$7.86	35	$7.30	193	$40.81
Town of Holton	39	$5.84	31	$5.02	15	$2.37	85	$13.23
Town of Osgood	81	$13.41	53	$6.73	36	$5.35	170	$25.49
Town of Sunman	41	$5.87	26	$4.06	19	$3.02	86	$12.95
Totals	277	$50.77	152	$23.67	105	$18.04	534	$92.48

Utilizing the same GIS information and process, critical infrastructure within each of the hypothetical tornado zones are included in **Table 25.** These buildings are included in the above table showing the number of structures and damage estimate information.

Table 25: Critical Infrastructure within Hypothetical Tornado

Community	Zone 1	Zone 2	Zone 3
Town of Holton	Otter Creek Township - Holton Volunteer Fire Department	Voice of the Nazarene Holton Trinity Tabernacle	
Town of Sunman		Mobile Home Park Sunman Police Department Sunman Wastewater Treatment Plant	Sunman Fire Department
Town of Osgood		Walnut Grove Mobile Home Park Osgood United Methodist Church St. John's Catholic Church	Osgood Police Department

Future Considerations

Within Ripley County, there are numerous events each year as well as regular tourist attractions that attract 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. Because of the dispersed population concentration, coverage is limited to the more densely populated portions of the county. The existing siren locations are identified in **Figure 45.**

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 Ripley County will remain vulnerable, especially where the outdoor warning siren coverage is not present.

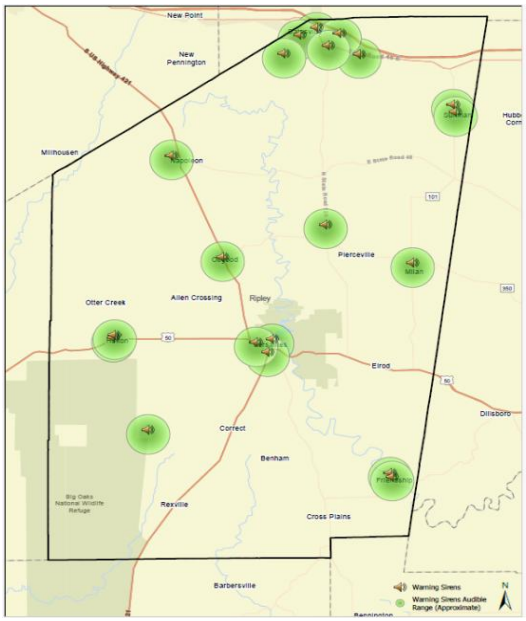


Figure 45 Siren Locations in Ripley County

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 Ripley County may be lessened through participation in mass notification programs, use of weather radios, and turning on the emergency alert feature on cell phones. The county is considering purchasing a reverse 911 system to help notify residents and visitors of severe weather and tornados. Having multiple means of warning citizens, businesses and visitors about 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 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 large 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 46 Ice Covered Powerlines

Storm effects such as extreme cold, flooding, snow and ice accumulation can cause hazardous conditions and hidden problems for people in the affected area. **Figure 46** 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 located in Southern Indiana, winter storms are somewhat common in Ripley County 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 snow 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 47** 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.

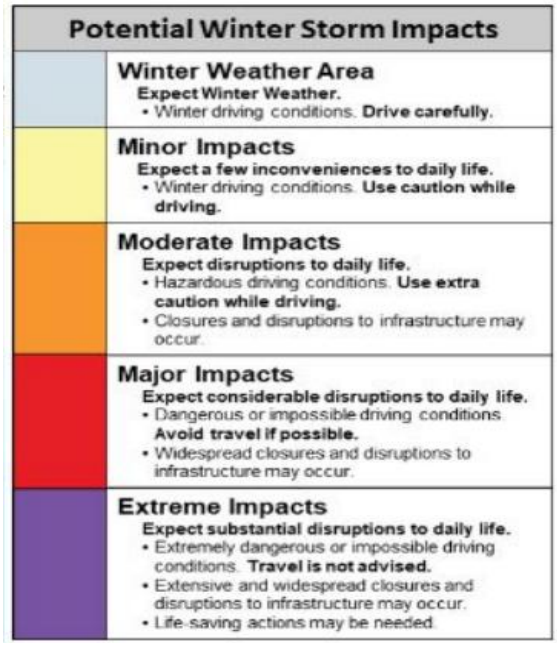


Figure 47 Winter Storm Impacts

Recent Occurrences

From January 1, 2017 to December 1, 2024, the NCDC has recorded 39 winter weather events, 1 ice storm, and 7 winter storms. NCDC reports indicated no property damage, no additional crop damage and no injuries, or deaths associated with any of the events. Many narrative descriptions indicated poor travel conditions, power outages and debris associated with similar events.

The probability, magnitude, warning times, and duration of a snowstorm or ice storm causing disruption to residents and businesses in Ripley County, as determined by the Planning Committee, is expected to be mostly consistent throughout the county and communities. It is "Highly Likely" that this type of hazard will occur in this area and will typically affect the entire county, and possibly several surrounding counties at one time, resulting in primarily "Limited to Significant" damages. The typical warning time for severe temperatures or several inches of snow associated with a winter storm is usually between 6 to 12 hours and greater than 24 hours in some parts of the county while the duration of the incident is anticipated to be less than one week. A summary is shown in ***Table 26.***

Table 26: CPRI Summary for Winter Storms and Ice

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Highly Likely	Significant	> 24 hours	< 1 week	Severe
City of Batesville	Highly Likely	Limited	> 24 hours	< 1 week	Elevated
Town of Holton	Highly Likely	Significant	6 - 12 hours	< 1 week	Severe
Town of Milan	Highly Likely	Significant	6 - 12 hours	< 1 week	Severe
Town of Napoleon	Highly Likely	Significant	6 - 12 hours	< 1 week	Severe
Town of Osgood	Highly Likely	Significant	6 - 12 hours	< 1 week	Severe

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Town of Sunman	Highly Likely	Significant	6 - 12 hours	< 1 week	Severe
Town of Versailles	Highly Likely	Significant	6 - 12 hours	< 1 week	Severe

The Planning Committee determined that the probability for a snowstorm or ice storm to occur in Ripley County and the communities within is "Highly Likely" or may occur within the calendar year. Based on historical data and the experience of the Planning Committee, snowstorms have become less common in Ripley County with the changing climate, but 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 Ripley 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 a 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

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 about 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 48**.

Figure 48 Travel Impacted During Snowstorm

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 may 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.

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 the 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 *49***) as well as within the stream or river channel. Ripley 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 Ripley 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.

Power outages and other infrastructure failures may also occur during a winter storm. Weight from snow and ice accumulation 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 properly used or may be placed too close to combustible materials resulting in fires and burn injuries or death.

Figure 49 Flooding Caused by Snow Melt

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 very 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 serious 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 under the DNR jurisdiction, 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.

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 are the 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 Ripley County, there are 24 DNR listed dams. Of the twenty-four in Ripley County, six are considered as high hazard dams, five are considered significant hazard, seven are low hazard and/or lake control structures, four are considered to be under minimum dams, one is considered a low head dam, and two have been breached. Locations of the listed dam structures are shown on **Table 27: Dams Impacting Ripley County.** According to local information, there have not been any recent dam failures within Ripley County. The County EMA is willing to participate in IEAP exercises held by local dam owners.

Table 27: Dams Impacting Ripley County

Dam Name	Hazard	Ownership	IEAP	Notes
Hardwood Lake	Low	Private		State Regulated
Versailles Lake	High	State	Yes	State Regulated,
Wood Lake	Low	Private		State Regulated
Cornetts Paradise Lake	Significant	Private		State Regulated
Broughton Lake Dam	Low	Private		State Regulated
Indian Lakes Preserve Dam	High	Private		State Regulated
Liberty Park Reservoir Dam	High	Local Government	Yes	State Regulated
Oser Reservoir Dam	Significant	Local		State Regulated
Hahn Reservoir	Significant	Local		State Regulated
Mollenkramer Reservoir Dam	Significant	Local Government		State Regulated
Milan Lake	Significant	Local Government		State Regulated
Neil Lake	Low	Unassigned		
Dale Gunter		Private		Under minimum
Ammerman Lake		Private		Under minimum
Timbers Subdivision		Private		Under minimum
Feller Reservoir Dam		Utility		Under minimum
Robinson Swales Dam	Low	Private		
Eugene Gunter Lake	Low	Private		
Bobs Creek Dam	Low			State Regulated – Low-head dam
Friendship Mill Dam				Breached
Old Timbers Lodge Dam				Breached
Old Timbers Lake	High	Federal	Yes	
Crosstie Lake Dam	High	Private		State Regulated

Dam Name	Hazard	Ownership	IEAP	Notes
Bischoff Reservoir Dam	High	Local	Yes	State Regulated,
Lake Ilene Dam	Under Minimum			Ownership unassigned

According to the National Levee Database (NLD) managed by the USACE, there are no certified levees systems within Ripley 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

Figure 50 Non-Levee Embankments in Ripley County

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. Many farms along Laughery Creek rely on these embankments to keep flood water out of their fields. **Figure 50** shows a sample of the non-levee embankments located in Ripley 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 “Critical” to “Limited and Negligible” damages in the Town of Sunman. The warning time is under 6 hours. **Table 28** provides a summary of the Planning Committee’s expectations during a dam failure.

Table 28: CPRI Summary for Dam and Levee Failure

	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Ripley County	Unlikely	Critical	< 6 hours	< 6 hours	Elevated
City of Batesville	Unlikely	Critical	< 6 hours	< 6 hours	Elevated
Town of Holton	Unlikely	Limited	< 6 hours	< 6 hours	Low
Town of Milan	Unlikely	Limited	< 6 hours	< 6 hours	Low
Town of Napoleon	Unlikely	Limited	< 6 hours	< 6 hours	Low
Town of Osgood	Unlikely	Limited	< 6 hours	< 6 hours	Low
Town of Sunman	Unlikely	Negligible	< 6 hours	< 6 hours	Low
Town of Versailles	Unlikely	Limited	< 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. Versailles Lake Dam, Liberty Park Reservoir Dam, and Old Timbers Lake Dam High Hazard dams in the county have developed an Incident and Emergency Action Plan (IEAP), two others have not. **Figure 51** shows the dam breach inundation path for Bishoff Reservoir Dam**.** The blue dots signify where data was taken from an existing IEPA, whereas the red dots are dams where an IEAP is not available. Indiana DNR did perform the necessary modelling to show the projected inundation areas.

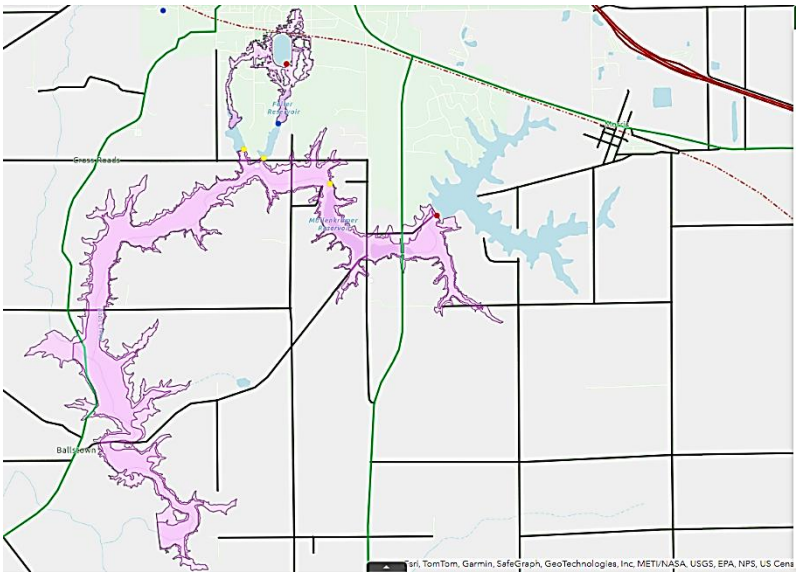


Figure 51 Breach Inundation Map, DNR

IEAPs are now required for high hazard dams by state law, however, these plans are not mandated for the 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. The Indiana DNR website shows areas which would be inundated during a dam failure.

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

Direct Effects:

- Potential loss of life and serious 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

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.

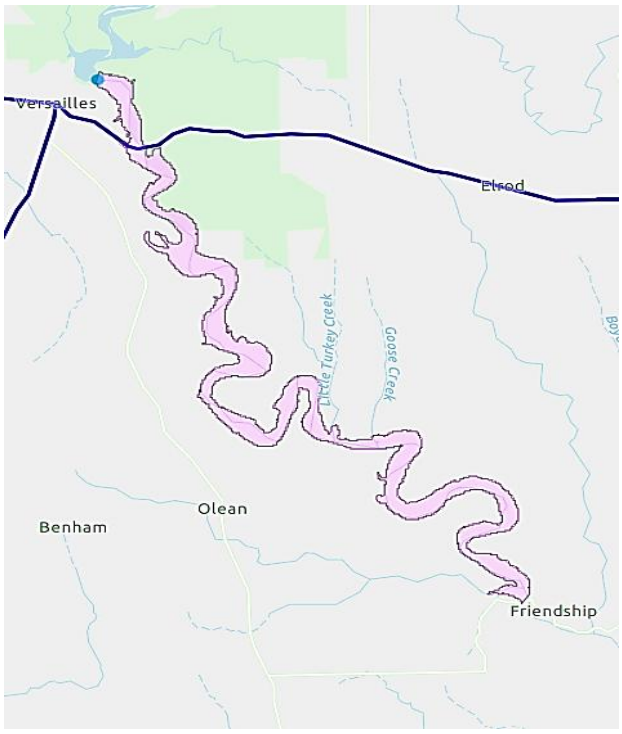


Figure 52 Breach Inundation Map for Versailles Lake Dam, DNR

The greatest impact for Ripley County is the high hazard dams located in the Town of Versailles and south of the City of Batesville. The DNR inundation map in **Figure 52** shows the area which would be impacted should the Versailles Lake Dam fail. Utilizing GIS maps and Ortho imagery, 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 Ripley County. Until such development or re-development

downstream of a dam is prohibited, those areas remain vulnerable to losses and damage associated with failure of that structure.

It is also very 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 a best management practice for Significant and Low Hazard dams as well.

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 dam failure. Bridges may become unstable, and portions of road surfaces may be washed away. Entire roads may be undermined by the forces of 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 damage, 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 responses to a release may require fire, safety/law enforcement, search and rescue, and hazardous materials response units.

Figure 53 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 hazardous materials release. Often these releases can cause serious harm to Ripley County and its residents if proper and immediate actions are not taken. Most releases are the result of human error or improper storage (**Figure 53**), 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 facilities utilizing, storing, and/or manufacturing chemicals has decreased over the years as facilities reduce the amount hazardous materials on site. However, more businesses and industries rely on just in time delivery which results in a greater number of delivery vehicles transporting the materials across the county on routes which crisscross the county. Heavier traffic on routes such as Interstate I-74 and US Highway 50 and 421 increases the potential for incidents. **(Figure 54**) Ripley County does not have a

hazardous materials team, so spills responses and cleanups are handled by District 8 hazardous materials teams or teams from Cincinnati under mutual aid agreements.

According to the Committee, the probability of a hazardous materials release or incident is “Likely” in Ripley County and the City of Batesville. The Town of Holton, Milan, Napoleon, Osgood, Sunman, and Versailles is “Possible.” This is because of the number of transportation routes within and through the 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, also less than one day to less than one week, is anticipated in the event of a hazardous materials incident. A summary is shown in **Table 29.**

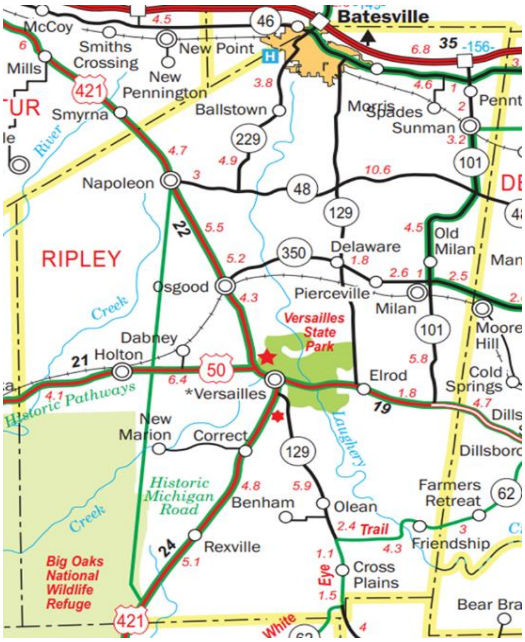


Figure 54 Transportation Routes in Ripley County

Table 29: CPRI Summary for Hazardous Materials

	Probability	Magnitude / Severity	Warning Time	Duration	CPRI
Ripley County	Likely	Critical	< 6 hours	< 1 day	Severe
City of Batesville	Likely	Critical	< 6 hours	< 1 day	Severe
Town of Holton	Possible	Critical	< 6 hours	< 1 week	Elevated
Town of Milan	Possible	Critical	< 6 hours	< 1 week	Elevated
Town of Napoleon	Possible	Critical	< 6 hours	< 1 week	Elevated
Town of Osgood	Possible	Critical	< 6 hours	< 1 week	Elevated
Town of Sunman	Possible	Critical	< 6 hours	< 1 week	Elevated
Town of Versailles	Possible	Critical	< 6 hours	< 1 week	Elevated

Relatively small hazardous materials incidents have occurred throughout Ripley 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 Ripley County, it can be anticipated that the likelihood of a future incident will also increase.

Assessing Vulnerability

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

Direct Effects:

- The more densely populated areas, including the City of Batesville, have greater potential for chemical incidents as the production and distribution facilities are nearby as well as the major crossroads as well as the CSX railroad which traverse the county.
- The rural areas may find greater amounts of agricultural chemicals, shipment and deliveries of products, and storage along with railroad crossings that are affected by such events.
- Expense of 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.
- Expenses are incurred due to response, testing, and cleaning of the affected areas.

While the possibility of an incident occurring may be possible, the vulnerability of Ripley 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.

Figure 55 Hazardous Materials Incident

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 Ripley 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 likely 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 greatly 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, the 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.

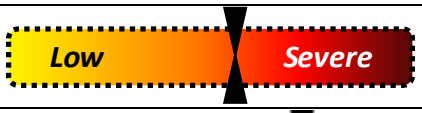
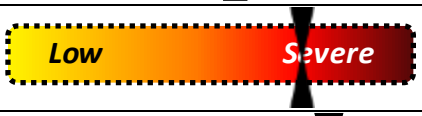
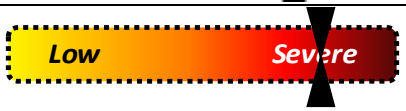
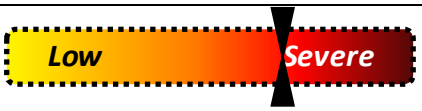
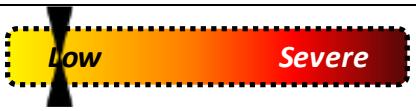
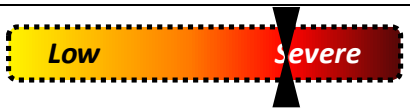
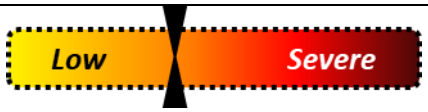
Relationship to Other Hazards

Dependent on the nature of the release, conditions may exist where an ignition source such as 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. 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.

3.3 HAZARD SUMMARY

For the development of this MHMP, the Committee utilized the CPRI method to prioritize the hazards they felt affected Ripley 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 30** summarizes the CPRI values for the various hazards studied within this MHMP.

Table 30: All CPRI Scores Combined

Type of Hazard	List of Hazards	Weighted Average CPRI
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 31** 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 31: Hazard Reference Table

EFFECT → / CAUSE ↓	Drought	Earthquake	Extreme Temperature	Fires &Wildfire	Flood	Hail, Thunder, & Windstorm	Landslide, Subsidence, & FEH	Tornado	Winter Storm & Ice	Dam & Levee Failure	Hazardous Materials
Drought											
Earthquake				X			X			X	X
Extreme Temperature											X
Fires & Wildfire											X
Flood							X			X	X
Hail, Thunder, & 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 Ripley 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 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 Ripley 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 2018 Ripley County MHMP and determined that the goals remain valid and effective. In summary, the overall goal of the Ripley 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. The overall goal is supported by the three overall plan goals.

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.

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 floods. 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, the Committee discussed the strengths and weaknesses of existing mitigation practices and made recommendations for improvements, as well as suggested new practices. The following is a summary of existing hazard mitigation practices within Ripley County. Mitigation measures that were included in the 2018 Ripley County MHMP are noted as such.

Emergency Services

- Maintaining lists of available medical personnel and their associated skills in handling hazardous situations. Implementing training based on needs identified.
- Purchased and installed emergency power backup generators at police stations, fire stations, and schools.
- Ripley County has some warming centers and advises community members where the centers are located.
- Ripley County continues to improve communication systems for all Emergency Services within the County.
- Ripley County is actively using outdoor warning sirens where present. The City of Batesville has 8 sirens, the Town of Versailles has 2 sirens, and others are manually activated by the Fire Departments.
- Ripley County continues to distribute weather radios for all public buildings and mobile homes, as funding permits.

- The County EMA is working with USGS to pursue the additional stream gauge(s).

Prevention

- The county continues to implement the “Turn Around Don’t Drown” campaign.
- An IEAP for the City of Batesville was developed.
- Continuing to observe the structural stability of Highway 62 and making necessary repairs.
- Continue compliance with NFIP by restricting new development from the Special Flood Hazard area.

Property Protection

- The CSX rail line was fixed in Milan.
- Napoleon Fire Station and Friendship Volunteer Fire Department have been moved from the floodplain.

Public Information

- Continuing to inform the community through informational brochures/magnets, etc. to make people aware of the risks of potential hazards.
- Continued to sign up community members for the mass emergency notification system, Nixle.

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.

Error! Reference source not found. lists a summary of all proposed mitigation practices i dentified 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 Ripley 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 Ripley County. The intent of this planning effort was to identify the hazards and the extent to which they affect Ripley 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 with 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 32 Proposed Mitigation Actions

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Emergency Preparedness and Warning 1. Create lists of available medical personnel and their associated skills in handling hazardous situations; implement more training as necessary. (on-going) 2. Implement and improve communication systems for all Emergency Services within the County including improve cellular phone access within the county (on-going) 3. Install new sirens in communities where they do not currently exist. 4. Purchase weather radios for all public buildings and mobile homes through joint funding. 5. Identify and procure a single or multiple designated storage facility for logistical staging. 6. Recruit, train and equip a CERT Team for the County. 7. Explore alternative transportation for people in remote locations for medical care and evacuations. 8. Encourage use of the Hyperreach system with Nixle as a backup. Include identifying maintenance costs and funding sources.	☒ 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	**Proposed Enhancements –** 1. Create and maintain lists of available medical personnel and their associated skills in handling hazardous situations; implement more training as necessary. 2. Encourage installation of signal boosters for both cell and emergency communication signals. There has been some improvement over the years, but there are many "dead" areas due to terrain. This also hampers public information via EAS and social media. 3. Identify the need for and install outdoor warning devices with a focus on large outdoor venues/ gatherings. 4. Continue to identify areas of need and distribute weather radios as funding permits. 5. Secure a place to store equipment and material. 6. Continue to recruit and train professionals. 7. Assemble information on current transportation available within the county, including how to access services, cost, scheduling, etc. Share information using a variety of methods. (Catch-a-ride program, hospital pickups for medical appointments, etc.). 8. Encourage use of the Hyperreach system with Nixle as a backup. Include identifying maintenance costs and funding sources.	High #1, #2, #5 Medium #4, #6 Low #3, #7	Moderate	EMA Ripley County EMS Hospital Fire Departments Police	FEMA HMGP Grants and Materials District Health Coalition Donations Foundation Grants
Public Education and Outreach 1. Identify warming centers throughout Ripley County. 2. Identify warming centers throughout Ripley County. 3. Inform the community through informational brochures/ magnets, as well as public safety television commercials on the risks of potential hazard. 4. Encourage the public to sign up for the mass emergency notification system, Nixle. 5. Continue with implementation of the “Turn Around Don’t Drown” campaign. 6. Continue providing outreach materials at health department vaccine clinics for families and jail inmates. 7. Explore ways to provide swimming lessons and life jackets for those swimming at local parks. Distribute information about lessons and the importance of personal floatation devices when recreating on or near local lakes and rivers.	☒ 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	**Proposed Enhancements –** 1. Keep an updated inventory of warming center locations. 2. Identify warming center needs, conduct public awareness campaign advising people where the centers are located and what services they may expect at the centers. 3. Continue to keep community informed through informational brochures/ magnets, as well as radio commercials and social media posts on the risks of potential hazards. Hand out materials at county fairs and other events. 4. Continue to encourage the public to sign up for the mass emergency notification system. 5. Post on social media, Identify high water locations for health department. Have high water signs on hand and possibly replace or add Turn Around Don’t Drown signs. 6. Continue providing outreach materials at health department vaccine clinics for families and jail inmates. 7. Distribute information about lessons and the importance of personal floatation devices when recreating on or near local lakes and rivers.	High #2, #4 Medium #1, #3, #5, #6, #7	Moderate	EMA Health Department Floodplain administrators 911 Communications Center Highway and Street Departments Town of Patriot Utilities	General Budget Insurance Company (refunds) IDHS HMGP Grants

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Safer Rooms and Community Shelters 1. Explore window glazing and hardening at all county schools. 2. Develop infrastructure for emergency warnings.	☒ 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	**Proposed Enhancements –** 1. Explore window glazing and other ways to protect students and faculty. 2. Identify potential shelter's locations and update the agreement for Red Cross shelters. 3. Develop outreach materials and share regarding how to identify a good place of refuge .	High #1 Medium #2, #3	High to Moderate	All County Schools Red Cross EMA	INAFSM USDA DNR OCRA Surveyor Budget
Energy Security – Power Backup 1. Ensure that police stations, fire stations, and schools have emergency generators	☒ 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	**Proposed Enhancements –** 1. During the renovation of the courthouse encourage the installation of electrical generator connections, at a minimum. 2. Encourage schools to install emergency power backup generators. (St. Louis school and 2 of the 4 Batesville Schools still need generators)	High #1 Medium #1	High	Police Stations Fire Stations Schools (St. Louis and Batesville) County Commissioners	Tire II Funding HMEP Grants FEMA Training
Floodplain Management 1. Stream gage along Laughery Creek (Friendship). 2. Continued compliance with the NFIP by restricting new development from the special flood hazard area. 3. Enhance the relationship with the Railroad, get good contact information to assure 2-way communications on crossing closures, repairs, etc. 4. Survey Floodplain areas to identify changes in streams. Consider relocation or changing structures. FEH study, solutions, physical actions such as possible reinforcement. 5. Identify and acquire flood prone properties as community interest and funding are available. 6. Conduct more outreach for flood insurance and be aware of floodplains and weather events. 7. Encourage Town of Napolean to join the NFIP and adopt the current Flood Insurance Rate Maps (FIRM) and ordinances.	☒ 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	**Proposed Enhancements –** 1. Work with USGS to pursue the acquisition of an updated stream gage on Laughery Creek. The current gage is not connected to USGS or NOAA. It is used by local FD, EMA and County Commissioners. If the cell signal is poor, then they cannot get readings. There are thousands of people attending shoots in Friendship that are adversely impacted when it rains. Flooding is MAJOR. 2. Continue to maintain compliance with the NFIP by restricting new development from the special flood hazard area. 3. Edit local maps with railroad crossing ID# which is needed when reporting or discussing crossings. Issues are caused due to no notice closures. 4. Survey Floodplain areas to identify changes in streams. Consider relocation or changing structures. FEH study, solutions, physical actions such as possible reinforcement. 5. Identify and acquire flood prone properties as community interest and funding are available. 6. Conduct more outreach for flood insurance and be aware of floodplains and weather events. 7. Explore ways to assist and encourage the Town of Napolean to participate in the NFIP.	High #1, #2, #3, #4 Medium #7 Low #5, #6	High	EMA Floodplain Administrators County Surveyor Railroad companies County Commissioners Town of Napoleon	Health Grants DNR Grants Assistance to Firefighter Grants Foundation Grants IPSIC(State Communication Lead) General Fund Budget

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Management of High Hazard Dams 1. Update and exercise the IEAP regularly (City of Batesville)	☒ 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	**Proposed Enhancements –** 1. Encourage the City of Batesville to continue to update and exercise the IEAP.	High #1	Moderate	EMA City of Batesville	General Budget Donations
Hazardous Materials 1. Update 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	**Proposed Enhancements –** 1. Update Commodity Flow Study	High #1	Moderate	EMA LEPC	General Budget HMEP Grant Donations
Land Subsidence/FEH 1. Determine the structural stability of Highway 62 and make necessary improvements (County & Friendship).	☒ 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	**Proposed Enhancements –** **1.** South of Versailles State Park Laughery Creek causes road slippage and scour at the bridge at Friendship. Monitor continued slippage of SR 62. Research potential long-term solution for slippage.	High #1	High	Highway Department EMA	General Budget FEMA Revolving Loan Funds
Cybersecurity **1.** Develop and maintain a plan to address cybersecurity issues.	☒ 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	**Proposed Enhancements –** 1. Develop and maintain a plan to address cybersecurity issues.	High	High	EMA County Commissioners	General Budget CISA Indiana State Information Technology

Mitigation Practice	Mitigation Strategy	Hazard Addressed	Status	Priority	Benefit-Cost Ratio	Responsible Entity	Funding Source
Emergency Response and Recovery 1. Continue assisting in connecting underserved people with services before, during, and after hazardous events. 2. Update the Continuity of Government plans.	☒ 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	**Proposed Enhancements –** 1. Work to assist all residents during, before, and after all events. 2. Continue using the continuity of government plans already in place and enhance and edit to meet current needs and standards.	Medium - #1, #2	Moderate	EMA Service Organizations	General Budget Donations NGO funding Health Dept. Funding
Land Use Planning and Zoning 1. Review state and local building codes and revise as necessary, especially regarding tie-downs for mobile homes.	☒ 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	**Proposed Enhancements –** 1. Working with state regulations, adding new codes as needed. Consider codes addressing mobile home tie downs and potential funding mechanisms	Low	High	Building and Planning Departments County and Batesville	General Budget BRIC grant

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.

5.1 EMERGENCY PREPAREDNESS AND WARNING

Create lists of available medical personnel and their associated skills in handling hazardous situations.

- Generate a questionnaire to send to every police department, fire department, EMS, and hospital about the availability of personnel and skills training for each hazardous situation.
- Compose a list of equipment available for hazard events.
- Implement training scenarios with various county and municipal departments.

Continue to provide weather radios for all public buildings and mobile homes as funding allows.

- Continue to identify critical facilities as well as mobile home residents and the underserved population that need to have weather radios.
- Identify possible funding sources and number of radios to be funded. Acquire radios.
- Distribute radios and make recipients aware of additional ways to receive emergency information as a backup mechanism.

Encourage installation of signal boosters for both cell and emergency communication signals. There has been some improvement over the years, but there are many "dead" areas due to terrain. This also hampers public information via EAS and social media.

- Reach out to cell service providers to identify “dead” zones where signal boosting would be advised. Identify as well where the “dead” zones are for emergency communications channels.
- Identify the best solutions to address the situation and associated costs to rectify the situation.
- Identify funding sources and partnership opportunities to reduce the costs for each of the entities involved.

5.2 PUBLIC EDUCATION AND OUTREACH

Continue to encourage mass notification.

- Working with the EMA, the Health Department and first response organizations share create an informational flyer about the benefits of the mass notification systems and how to access them.
- Share the flyer with all community members including the underserved population through various outreach means including social media, newsletters, handouts, etc.
- Explore the use of yard signs with a phone number or web address to sign up for the notification systems (Hyperreach and Nixle)

- Continue to keep community informed through informational brochures/ magnets, as well as radio commercials and social media posts on the risks of potential hazards. Hand out materials at county fairs and other events.

Identify the location and availability of warming centers to residents.

- Keep an updated inventory of these locations.
- Provide a public awareness campaign, social media, newsletters, utility bills, etc. to advise people about warming centers and what services they may expect at the warming centers.
- Whenever centers are open, remind people about the locations, services and hours of operation via social media, radio stations, community organizations etc.

5.3 SAFE ROOMS AND COMMUNITY SHELTERS

Explore window glazing and hardening for all county schools.

- Identify the types of window glazing available to best protect students and staff at the schools and the associated costs.
- Identify the number, size and locations where glazing is needed within each school structure. Create a prioritization if funding is limited to glaze the highest priority locations first.
- Work with community leaders, school boards and local businesses to secure funding to complete glazing at all the schools.

5.4 ENERGY SECURITY – POWER BACKUP

Encourage the acquisition and installation of battery backup generators for all the schools and the installation of a generator connection in the renovation of the courthouse.

- Identify the power needs for each of the schools and the courthouse renovation and include future potential power needs above and beyond current needs.
- Determine the size and number of generators needed to meet the needs of all the facilities and identify potential funding sources to include but not be limited to specialized grant funding, companion programs and investments, etc.
- Prioritize installation of electrical system hookups, generator acquisition and installation of permanent affixed generators or secured locations for portable units.

5.5 FLOODPLAIN MANAGEMENT

Work with USGS to pursue the acquisition of a stream gauge on Laughery Creek near Friendship.

- Identify costs for a USGS gage on Laughery Creek to serve the Friendship area. Include initial installation costs and long-term maintenance costs for annual budgeting.
- Work with local organizations which would benefit from the gage and determine if they could possibly contribute to the annual maintenance costs for the gage. Work with DNR to identify any possible grants or assistance available for the initial costs.

- Determine if gage data will help in any watershed studies to better prepare community members for flash flooding events. If so, combine efforts to help spread the costs for the gage installation.

Continue compliance with NFIP and restricting development from the Special Flood Hazard Area.

- Continue to work with building and planning departments to comply with DNR model ordinance for development in the Special Flood Hazard Area.
- Assist Batesville in updating their current floodplain ordinance to the new model ordinance to help with future ordinance updates.
- Explore ways to ensure assistance is available when flood events occur in documenting damage and making substantial damage determinations.

Enhance the relationship with the railroad to get good contact information to ensure there is communications on railroad crossing closures and repairs.

- Contact railroad officials to determine the correct identification of railroad crossings in the county. Edit county maps with railroad crossing numbers so closures may be reported using common reference points.
- Determine the best way to receive notifications for any crossing closures and/or rail repairs that would impact public safety, traffic detours, or special needs in the area.
- Monitor communications and hold regular meetings/briefings to keep communication channels open.

Work on surveying floodplain areas to identify changes in streams.

- Using recent LIDAR data along with the newest data to identify changes in the streams and floodplain areas. Identify any trends or sources of changes.
- Identify any structures or critical or essential facilities which may be impacted by stream and floodplain changes.
- Re-evaluate the FEH zones based on recent changes and determine if the changes may cause future impacts that may be mitigated in the near future.

5.6 MANAGEMENT OF HIGH HAZARD DAMS

Continue to update and exercise training on IEAP regularly.

- Reach out to the dam owner to identify any data needs to keep the IEAP up to date.
- Annually conduct a tabletop exercise, at a minimum, testing different aspects of the IEAP.
- Consider the development of an evacuation plan as a companion to the IEAP. Also, explore ways to notify residents of a dam breach.

5.7 HAZARDOUS MATERIALS

Update the Commodity Flow Study.

- Identify roadways with the greatest amounts of traffic moving materials through the county. Include roads leading to and/or out of industrial areas where chemicals will be used.
- Identify who will be doing the traffic counts, local volunteers, LEPC members, contractors, etc. Assure all participants are using the same mechanisms to record the number and type of vehicles and placard identifications.
- Contact police departments to advise them when and where the counts will take place and seek out advice on best locations for observers to position themselves for visibility and safety.
- Request railroad commodity information for the same time period to identify the most common hazardous materials being shipped by rail.

5.8 CYBERSECURITY

Develop and maintain a plan to address cybersecurity issues.

- Work with County Commissioners, Mayor, and IT department to research plans for cybersecurity issues. Reach out to the Indiana Information Technology Office to determine if they have any programs or recommendations that would be a good fit for Ripley County.
- Identify offsite storage locations to assure the security of county and community digital information.
- Establish and install backup procedures, user training and periodic testing to ensure protocols are being followed.

5.9 EMERGENCY RESPONSE AND RECOVERY

This is a medium-ranked priority. Implementation strategies will be assembled when the actions rise to the high priority ranking.

5.10 LAND USE PLANNING AND ZONING

This is a medium and low ranked priority. Implementation strategies will be assembled when the actions rise to the high priority ranking.

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 Ripley 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 Ripley County MHMP.

The EMA Director will reconvene the MHMP Committee on an annual basis and following a significant hazard incident to determine whether:

- the nature, magnitude, and/or type of risk have changed.
- the current resources are appropriate for implementation.
- there are implementation problems, such as technical, political, legal, or coordination issues with other agencies.
- the outcomes have occurred as expected.
- the agencies and other partners participated as originally proposed.

During the annual meetings, the Implementation Checklist provided in **Appendix 10** will be helpful to track any progress, successes, and problems experienced.

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 Ripley 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 Ripley 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, a public meeting will be held to present the information to residents of Ripley County and to provide them with 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 meeting.

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.

Although not integrated by name, the MHMP has been used to inform community growth plans and efforts in the past 7 years. Due to staff limitations and limited community growth, written plans are updated on a less frequent basis. For this reason, direct integration of the last plan was minimal. The community does anticipate some plans and ordinances will be updated during the five-year tenure of this plan. The committee will work to include plan materials and references where appropriate.

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 Ripley 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 Ripley County website.

Updates or modifications to the Ripley County MHMP will require a public notice and/or meeting prior to submitting revisions to the individual jurisdictions for approval.

The CRS program credits NFIP communities with 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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