RESOLUTION NO. 2024-02

A RESOLUTION OF THE TOWN COUNCIL OF THE TOWN OF WHITESTOWN, INDIANA, ADOPTING THE 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town Council ("Town Council") of the Town of Whitestown, Indiana ("Town") recognizes the threat that natural hazards pose to people and property within the Town; and

WHEREAS, Boone County, Indiana, has prepared a multi-hazard mitigation plan, known as the "2023 Boone County Multi-Hazard Mitigation Plan" (the "Mitigation Plan"), attached hereto and incorporated herein as Exhibit A, according to federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended, and the National Dam Safety Program Act, as amended; and

WHEREAS, the Mitigation Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Town of Whitestown from the impacts of future hazards and disasters; and

WHEREAS, as part of its commitment to hazard mitigation and achieving the goals outlined in the Mitigation Plan, the Town Council desires to adopt the Mitigation Plan and the goals therein for the Town.

NOW, THEREFORE, BE IT RESOLVED by the Town Council of the Town of Whitestown, Indiana, that the 2023 Boone County Multi-Hazard Mitigation Plan, attached hereto as Exhibit A, is hereby adopted as the Multi-Hazard Mitigation Plan for the Town.

PASSED AND ADOPTED BY THE WHITESTOWN, INDIANA TOWN COUNCIL THIS ____ DAY OF February, 2024, by a vote of ____ in favor and _____ against.

TOWN COUNCIL OF THE TOWN OF WHITESTOWN, INDIANA

_____

Dan Patterson, President

ATTEST:

_____

Matthew Sumner, Clerk-Treasurer
Town of Whitestown, Indiana

4705720

EXHIBIT A

2023 Boone County Multi-Hazard Mitigation Plan

2023 Multi-Hazard Mitigation Plan

Boone County

Updated October 2023

Mike Martin
EMA Director
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Lebanon, IN 46052
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The Polis Center
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Indianapolis, IN 46202
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Acronyms

(in alphabetical order)

AEGLs	Acute Exposure Guideline Levels
CPRI	Calculated Priority Rating Index
CAC	Community Assistance Call
CAV	Community Assistance Visit
CRS	Community Rating System
CFO	confined feeding operations
EAP	Emergency Action Plan
EMAC	Emergency Management Advisory Council
EHE	extreme heat event
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FHE	Fluvial Erosion Hazard
HMGP	Hazard Mitigation Grant Program
IBOAH	Indiana Board of Animal Health
IN CCIA	Indiana Climate Change Impacts Assessment
IDEM	Indiana Department of Environmental Management
IDLGF	Indiana Department of Local Government Finance
IDNR	Indiana Department of Natural Resources
IDNR	Indiana Department of Natural Resources
INDOT	Indiana Department of Transportation
IDOH	Indiana State Department of Health
IUPUI	Indiana University-Purdue University Indianapolis
LOC	Level of Concern
MHMP	Multi-Hazard Mitigation Plan
NCEI	National Centers for Environmental Information
NEHRP	National Earthquake Hazards Reduction Program
NFIF	National Flood Insurance Fund
NFIP	National Flood Insurance Program
NHD	National Hydrography Dataset
NRI	National Risk Index
NWS	National Weather Service
NLE	Non-Levee Embankments
PDSI	Palmer Drought Severity Index
Ppm	parts per million
PFL	Public Freshwater Lakes
RMSF	Rocky Mountain spotted fever
SFHAs	Special Flood Hazard Areas
USACE	U.S. Army Corp of Engineers
APHIS	U.S. Department of Agriculture’s Animal and Plant Health Inspection Service
USDM	U.S. Drought Monitor
ALOHA	U.S. EPA’s Areal Locations of Hazardous Atmospheres
SBA	U.S. Small Business Administration
WCT	Wind Chill Temperature

1 Overview

1.1 Introduction

The Boone County Multi-Hazard Mitigation Plan (MHMP) serves as a guide for the county's assessment of hazards, vulnerabilities, and risks and actively incorporates the participation of a wide range of stakeholders and the public in the planning process. This plan aids the county, cities, and towns in preventing, protecting against, responding to, and recovering from disasters that may threaten the community's economic, social, and environmental well-being. This plan documents historical disasters, assesses probabilistic disasters through Hazus-MH and GIS analyses, and addresses specific strategies to mitigate the potential impacts of these disasters.

The Boone County Emergency planning team and The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) originally developed the Boone County MHMP in 2018. The MHMP is not a static document but must be updated over time to reflect shifting conditions. This 2023 MHMP update represents a collaborative effort to ensure that the planning document accurately reflects changes within the community and addresses each jurisdiction's unique needs.

With the development of the Federal Disaster Mitigation Act of 2000, FEMA requires counties to have an MHMP to be eligible for mitigation grants, such as the Hazard Mitigation Assistance Program (HMGP) and the Building Resilient Infrastructure and Communities (BRIC) grant program. All jurisdictions must have in place an MHMP and update the plan within a five-year time span. This plan update addresses changes in development, hazard effects on vulnerable communities, local climate change impacts, progress in local mitigation efforts, and alterations in priorities. This plan update will remain effective for 5 years from the date of the first community adoption.

The procedures outlined in the plan are based upon guidance provided by FEMA and are consistent with the requirements and procedures defined in the Disaster Mitigation Act of 2000. The analysis includes three components: 1) profile and analysis of hazard events, 2) inventory of vulnerability assessment of community assets, and 3) development of hazard mitigation strategies.

1.2 Hazard Mitigation

Hazards are events that are potentially dangerous or harmful and are often the root causes of unwanted outcomes. Both natural and human-caused hazards threaten loss of life and property.

As Figure 1 shows, hazard mitigation is a part of the disaster management cycle and is defined as any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards.

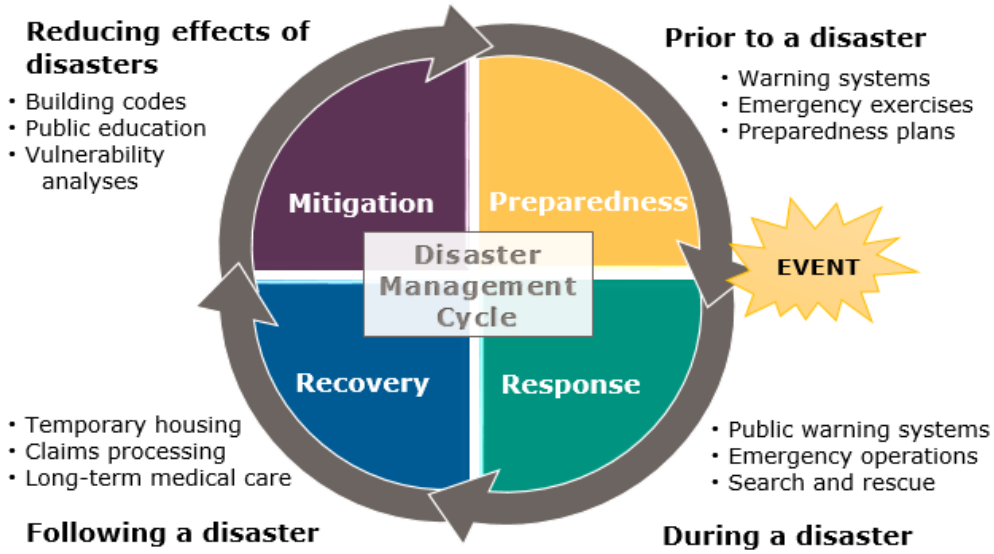


Figure 1. An Integrated Planning Process

Hazard mitigation planning and the subsequent implementation of the projects, measures, and policies developed as part of this plan are the primary mechanisms in achieving FEMA's goal of reducing effects of disasters. Removing any normalcy, or optimism, biases is essential for mitigation planning. Normalcy bias is the tendency to downplay the probability or effects of a disaster. To properly achieve FEMA's goals, we must look beyond the normal mindset of "this will never happen to me" to plan and implement strategies that are best for communities. Local governments have the responsibility to protect the health, safety, and welfare of their citizens. This plan recognizes the importance of mitigation for the following goals:

- Protect public safety and prevent loss of life and injury.
- Reduce harm to existing and future development while considering climate change and other future conditions.
- Prevent damage to a community's unique economic, cultural, environmental assets, and vulnerable communities.
- Minimize operational downtime and accelerate recovery of government and business after disasters.
- Reduce the costs of disaster response and recovery and the exposure to risk for first responders.
- Help accomplish other community objectives, such as leveraging capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Developing and putting into place long-term strategies that reduce or alleviate loss of life, injuries, and property resulting from natural or human-caused hazards accomplish these goals. These long-term strategies must incorporate a range of community lifelines that can make a community more resilient to disaster.

2 Public Planning Process

2.1 Planning Team

The Boone County MHMP planning team is composed of individuals representing the county and its participating jurisdictions. The Boone County Emergency Management Agency (EMA) acted as the designated responsible entity and coordinated the development of the planning team. Each community jurisdiction was encouraged to engage in the planning process, and invitations were sent to a wide range of community leaders and involved stakeholders. Each jurisdiction and their participation status are summarized in Table 1.

Table 1. Boone County Stakeholder and Jurisdictions Participation

Jurisdiction Name	Jurisdiction Type	2018 Participants	Received Invitation to Participate	2023 Participant
Boone County	County	Yes	Yes	Yes
Lebanon	City	Yes	Yes	Yes
Advance	Town	Yes	Yes	Yes
Jamestown	Town	Yes	Yes	Yes
Thorntown	Town	Yes	Yes	Yes
Ulen	Town	Yes	Yes	Yes
Whitestown	Town	Yes	Yes	Yes
Zionsville	Town	Yes	Yes	Yes
Lebanon Community School Corporation	School District	No	Yes	Yes
Trader's Point Christian Academy	School District	No	Yes	Yes
Western Boone County Community School Corporation	School District	No	Yes	Yes
Zionsville Community Schools	School District	No	Yes	Yes
Boone County Soil & Water Conservation District	SWCD	No	Yes	Yes

Each chapter of the MHMP was reviewed, revised, and expanded using current information and includes new feedback from taskforce members with an emphasis on updating the goals, objectives, and strategies. The mitigation planning requirements identified in 44 CFR 201.6 call for all incorporated jurisdictions participating in a multi-jurisdictional MHMP to take part in the planning process. All members of the planning committee were actively involved in attending meetings, providing available GIS data and historical hazard information, reviewing, and providing comments on the draft plans, assisting in the public input process, and coordinating the county's formal adoption of the plan. The hazard mitigation planning team members are

summarized in Table 2. Appendix A includes the sign-in sheets listing which meetings each team member attended along with the meeting minutes.

Table 2. Hazard Mitigation Planning Team

Name	Title	Organization	Jurisdiction
Mike Martin	Director	EMA	Boone County
Russ Dulin	Deputy Director	EMA	Boone County
Rachel Hanson	Administrative Assistant	EMA	Boone County
Abby Messenger	Environmental Director	Health Department	Boone County
Max Mendenhall	Director	Capital Investments	Boone County
Sean Horan	Director	IT	Boone County
Jeff Spidel	Team Lead	Highway Department	Boone County
Sam Sorter	Deputy	Sherriff's Office	Boone County
Mike Beard	Chief Deputy	Sherriff's Office	Boone County
Traci Hoffman	Co-Director	Love INC	Boone County
Marcia Overfield	Co-Director	Love INC	Boone County
Chuck Batts	Fire Chief	Lebanon Fire Department	Lebanon
Jason Hendricks	Deputy Chief	Lebanon Fire Department	Lebanon
Derek Warren	Deputy Director	Planning	Lebanon
Jason Pots	Deputy Chief	Fire Department	Zionsville
Lance Lantz	Director	Department of Public Works	Zionsville
Marvis Klykken	Captain	Police Department	Zionsville
Shari Johnson	Clerk-Treasurer	Clerk-Treasurer	Advance
Jim Caldwell	Chief	Fire Department	Advance
Carol Leeke	Councilor	Town Council	Jamestown
James Hieston	Assistant Fire Chief	Fire Department	Jamestown
Shane Childress	Councilor	Town Council	Jamestown
Clint Jackson	Chief Deputy	Police Department	Jamestown
Aaron Clapp	Marshall	Police Department	Jamestown
Mary Ann Herny	Clerk-Treasurer	Clerk-Treasurer	Ulen
Josh Westrish	Fire Chief	Fire Department	Whitestown
John Jurkash	Captain	Police Department	Whitestown
Sara Fanfield	Councilor	Town Council	Thorntown
Steve Smith	Chief of Police	Lebanon Schools Police Department	Lebanon Community School Corporation
Chad Martin	Director of Operations	Lebanon Community School Corporation	Lebanon Community School Corporation
Kraig Cox	Director of Operations	Trader's Point Christian Academy	Trader's Point Christian Academy

Name	Title	Organization	Jurisdiction
Rob Ramey	Superintendent	Western Boone County Community School Corporation	Western Boone County Community School Corporation
Chad Smith	Director of Safety	Zionsville Community Schools	Zionsville Community Schools
Sheryl Vaughn	District Admin	Boone County Soil & Water Conservation District	Boone County Soil & Water Conservation District

The EMA Directors of surrounding counties were invited to participate in the planning process. The surrounding EMA managers were included on the invitation emails sent to the planning team. Table 3 shows which surrounding counties participated in the process.

Table 3. Surrounding County EMAs Invited

County	Name	Attended
Hamilton	Shane Booker	No
Marion	Jake Spence	No
Hendricks	Dawn Mason	No
Montgomery	Shari Harrington	No
Clinton	Darrell Sanders	No

2.2 Review of Existing Plans

Boone County and the local communities utilize land use plans, emergency response plans, municipal ordinances, and building codes to direct community development. The planning process incorporated the existing natural hazard mitigation elements from these previous planning efforts. Table 4 lists the plans, studies, reports, and ordinances used in the development of the plan. Additional information related to jurisdiction capabilities is discussed in Chapter 5.

Table 4. Planning Documents Used for MHMP Planning Process

Author(s)	Year	Title	Description	Where Used
The Polis Center at IUPUI	2018	All-Hazard Mitigation Plan, Boon County, Indiana	Latest multi-hazard mitigation plan	Sections 1-6
The Polis Center at IUPUI	2019	2019 State of Indiana Standard Multi-Hazard Mitigation Plan	Latest multi-hazard mitigation plan for State of Indiana	Section 3

Author(s)	Year	Title	Description	Where Used
Boone County Area Plan Division	1998	Zoning Ordinance of Boone County, Indiana	An ordinance for the development through zoning of Boone County	Sections 3&4

2.3 Planning Process Timeline and Steps

The Boone County planning team met on December 1, 2022, for the MHMP update kickoff. During this meeting, the planning team learned about the MHMP and the process for updating the county's plan. The team updated the hazard ranking for the county and the local communities, reviewed the locations of essential facilities within Boone County, and discussed the location of the hazardous materials release and the tornado track used in this plan. The public was invited to participate in the meeting through a notice in the local newspaper two weeks prior to the meeting. Boone County EMA does not have social media. This is how all public notices are advertised. There was no participation from the public in this meeting. A representative of Love INC (Love In the Name of Christ) attended the meeting. Love INC is a network of churches and agencies that respond to needs of ordinary people in difficult times. Love INC's work includes assisting vulnerable communities to prevent affects from disasters and help rebuild after.

The planning team met again on February 15, 2023. As with the first meeting, the public was invited to participate through a notice in the local newspaper. Boone County EMA does not have social media. This is how all public notices are advertised. During this meeting, the overall purpose of the plan was reiterated, and public input was sought. There was no participation from the public in this meeting. A representative from Love INC attended the meeting. The group reviewed a copy of the draft plan and was provided with a presentation on the risk assessment and mitigation strategies. The draft plan was revised based on comments from the planning team following the meetings.

Boone County EMA held one-on-one meetings to ensure all jurisdictions could participate in this plan. Appendix A includes meeting minutes, invitations to participates, and one-on-one attendees and meeting minutes. Appendix B includes the published announcements of the meeting.

The county continually works to engage with the public by posting community meetings and training opportunities on the county website as well as on the county's social media resources. In addition, a final copy of the plan will be available online through the county's website.

3 Community Profile

To provide a basic understanding of the characteristics of the community, this section offers a general overview of Boone County including the physical environment, population, and identification of available services.

3.1 General County Description

Boone County is in central Indiana and is situated approximately 30 miles northwest of the capital city of Indianapolis. According to the 2020 US Census, the county covers 423 square miles and has a population of 66,875. The City of Lebanon is the county seat and the largest incorporated community in the county, containing approximately 24% of the population in 2020. Figure 2 displays a general map of Boone County and its incorporated communities while the Boone County townships and their respective incorporated communities are outlined in Table 5. Boone County Townships and Incorporated Communities .

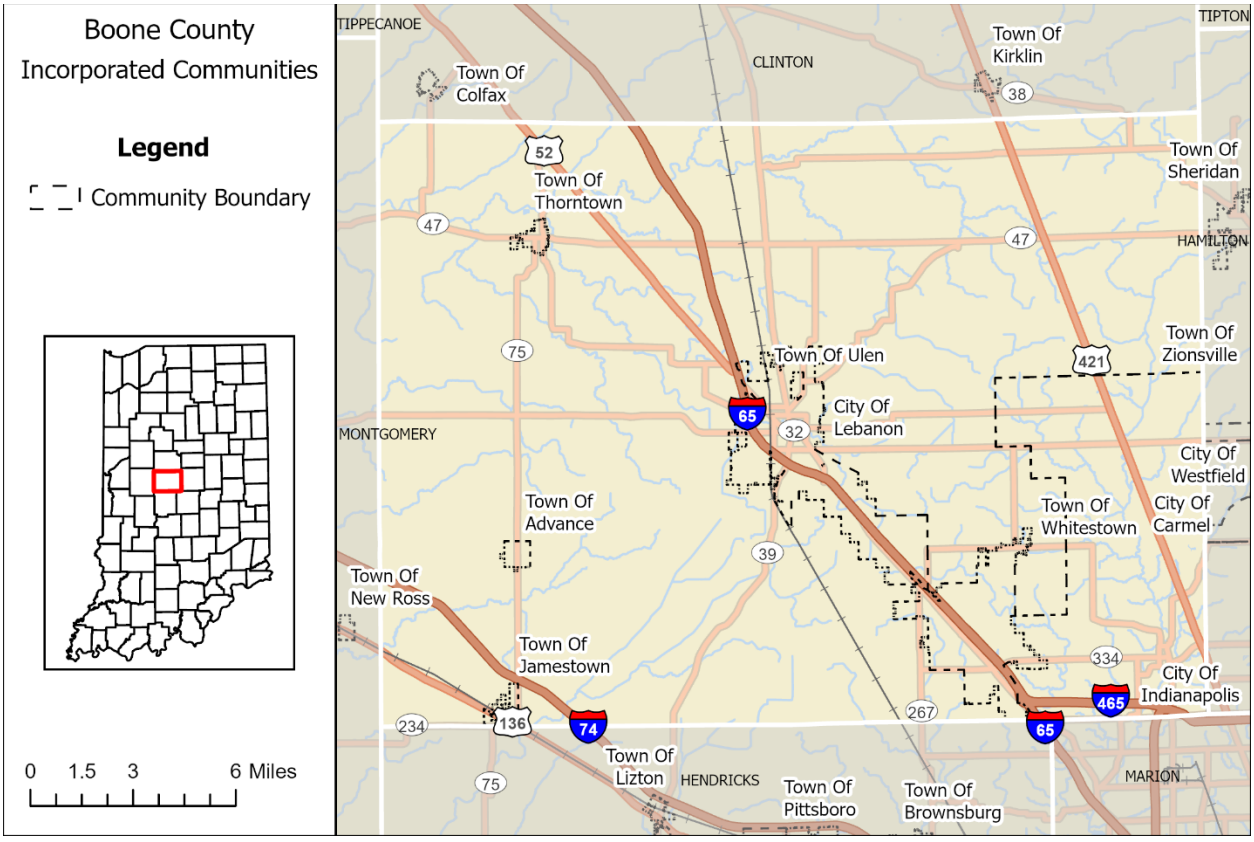


Figure 2. Boone County Incorporated Boundaries

Table 5. Boone County Townships and Incorporated Communities

Township	Communities within Township
Sugar Creek	Thorntown
Washington	
Clinton	
Marion	
Jefferson	
Center	Lebanon, Ulen
Jackson	Advance, Jamestown
Harrison	
Perry*	Zionsville, Whitestown, Lebanon
Eagle*	Zionsville
Union*	Zionsville
Worth	Whitestown
*Townships do not have a governing body, but fall under communities listed	

3.2 Historical Setting

Boone County was formed by an Act of the Indiana General Assembly in 1830 and was named in honor of Daniel Boone, an American pioneer, explorer, and frontiersman. Prior to the European settlement, the Delaware, Miami, and Potawatomi Native Americans established villages, navigated the river, and hunted on the land that is now Boone County. Even after European immigration, the Miami tribe continued to occupy approximately 52,000 acres in the northwest corner of the county until forcibly removed in 1834. Early European immigrants were attracted to the area's abundant wildlife, rich farmland, and numerous water sources, arriving predominately from Kentucky, North Carolina, and Pennsylvania.

Before drainage techniques were introduced, Boone County settlers built ditches to divert water flow from the bogs and wetlands created by Prairie Creek and Sugar Creek. This provided more soil for farming and prevented flooding in developing towns. During the 1830s the historic Michigan Road was constructed through the northeastern portion of the County, which connected the county to the Ohio River and Lake Michigan. This connection provided Boone County residents access to trade routes, commerce, and attracted settlers. The first railroad was laid through Boone County in the 1850s, enabling further transportation.

3.3 County Characteristics

3.3.1 Climate and Precipitation

The table below summarizes data based on the National Centers for Environmental Information (NCEI) norms from 1981 to 2010 and 1991 to 2020. Temperatures in Boone County have

increased over the last three decades. The later subsections explore the variations in greater depth.

Table 6. Average Climate Based on the National Centers for Environmental Information

Measure	1981-2010 Average	1991-2020 Average
Winter Temperature Min.	19.3° F	22.5° F
Winter Temperature Max.	36.6° F	36.6° F
Summer Temperature Min.	61.1° F	62.5° F
Summer Temperature Max.	82.5° F	81.8° F
Annual Precipitation	42.84 inches	41.27 inches

3.3.2 Future Climate Trends for Indiana and their Effects

Much like the rest of the world, Indiana is facing more and more challenges as the climate continues to shift. The Indiana Climate Change Impacts Assessment (IN CCIA) from 2018 found that the climate in the state is predicted to change within the century. The main findings from this study are listed below:

- Temperatures are projected to rise about 5-6°F by mid-century.
- The number of extremely hot days will rise.
- Extreme cold events will decline.
- The frost-free season will lengthen.

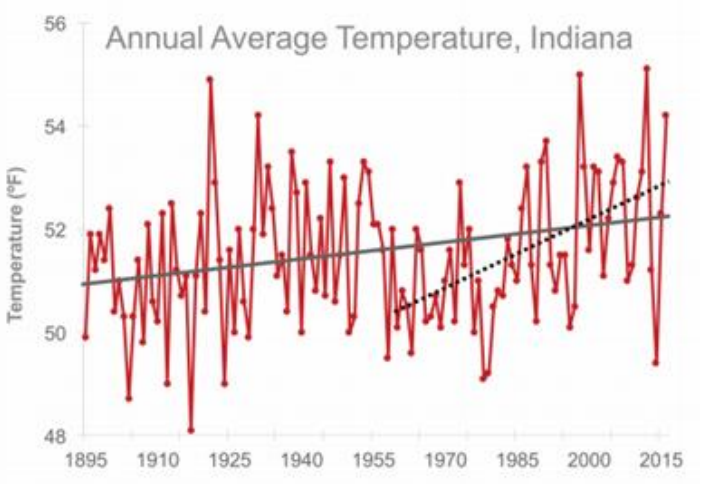


Figure 3. Annual Average Temperature (Widhalm M. H., 2018)

There is an indication that the number of tornadoes affecting Indiana may increase, putting more residents and property at risk while increasing response and recovery costs.

3.3.2.1 Temperature

The IN CCIA indicates that Indiana has warmed 1.2°F since 1895 and temperatures will rise by about 5°F to 6°F by mid-century, with the number of extreme heat days projected to rise to 100 days per year in southern Indiana by late century. This has multiple impacts for Indiana, including changes to the timing and length of the frost-free season, and the occurrence of temperature extremes. These shifts will impact air quality, extend the growing season and the allergy season, and create more favorable conditions for some pests and invasive species.

An increase in extreme temperatures—hot and cold—put Indiana residents at health risks, such as heat stroke, frost bite, and even death.

Indiana's growing season is expected to increase by 33 days for the central part of the state.

Warming temperatures in the winter months will affect the types of plants and pests that can thrive in Indiana and alter the amount of energy needed to heat and cool homes and businesses. Socially, populations more at risk from heat-related illnesses includes children, the elderly, low-income households, those with pre-existing medical conditions, and people working in temperature-exposed occupations.

3.3.2.2 Precipitation

Since 1895, average annual precipitation in Indiana has increased by about 15%, or about 4.5 inches, based on a linear trend. This trend is projected to continue, though the type of precipitation and when it falls are changing and will continue to do so.

The southern and west-central regions of the state have observed the largest increases in precipitation, while the east-central and northeast regions observed the smallest. Spring and fall increases were smallest in the north and largest in the south. The opposite was true in summer when increases were larger in the north and west.

With Boone County's location in the central portion of the state, predictions show that the region experienced an increase of 5.7 inches of precipitation annually in the past century. With increasing temperatures, it is expected that rain will replace snow in the cold season. Fewer snow days would save municipality and state funding for plowing and salting roadways. However, wetter winters and springs will increase the risk of flooding and combined sewer system overflows, resulting in decreased water quality.

Extreme and heavy rainfall events have increased in the past century, and this is expected to continue. These events contribute to soil erosion and nutrient runoff, affecting both water quality and crop productivity. Heavy rainfall increases a community's risk to flash flooding, drowning crops and hindering social characters of the community, such as economic downfalls and increased opportunities for health concerns.

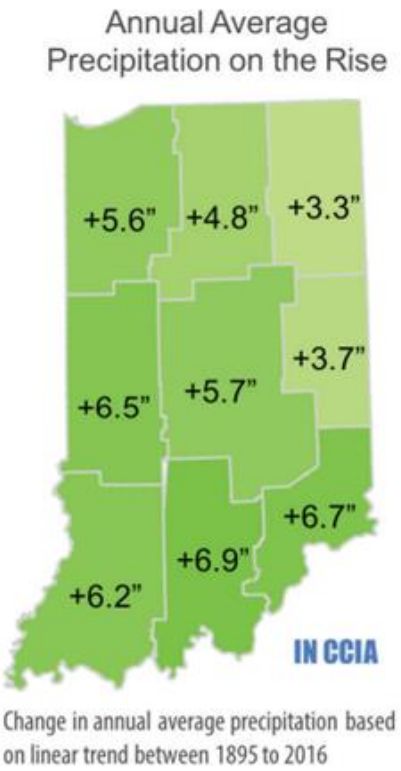


Figure 4. Average Precipitation Increase (Widhalm M. H., 2018)

3.3.2.3 Predicted Changes in Temperature and Precipitation

NOAA's Climate Explorer provides climate observations and predictions from 1950 to 2090. Future trends are grouped by decade (e.g.: 2020s, 2030s, 2040s). Table 7. Table of Average Temperatures and Precipitation based on NOAA's Climate Explorer summarizes the average annual temperatures (minimum and maximum) and precipitation for the 2020s, 2050s, and 2090s for the higher emissions predictions. Based on the climate findings from Section 3.3.2, Boone County does not quite meet the projected 5-6 degree increase by mid-century but will be seen by late century. The predicted temperature increases will lead to environmental and social effects as described in the paragraphs above. The effects from these change in climate will continue to disproportionally affect vulnerable populations who are least able to prepare for and recover from hazards.

Table 7. Table of Average Temperatures and Precipitation based on NOAA's Climate Explorer

Decade	Average Daily Temperature		Average Annual Precipitation
	Minimum	Maximum	
2020s	43.2° F	64.4° F	41.9 inches
2050s	46.0° F	67.5° F	42.5 inches
2090s	50.6° F	72.3° F	44.0 inches

Figure 5 summarizes NOAA's Climate Explorer average annual precipitation for Boone County between 2020 and 2098.

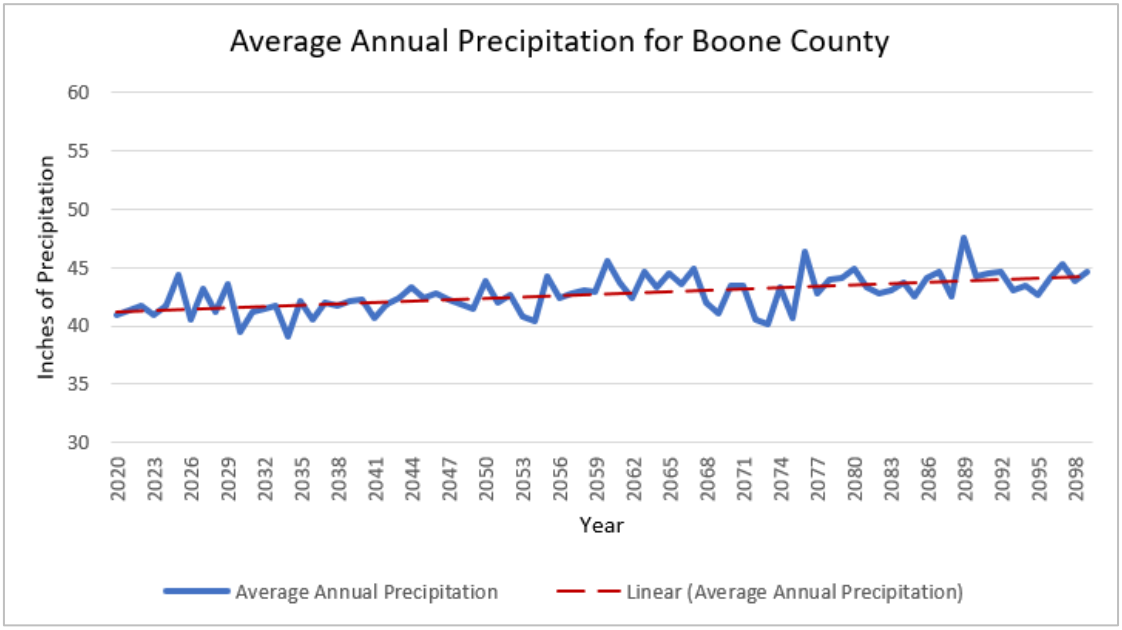


Figure 5. Average Annual Precipitation for Boone County

Although the amount of increase in precipitation seems almost negligible, intermixing other changes in climate with precipitation leads to an increase in natural disaster events, continually impacting residents.

3.3.3 Population and Demographics

The US Census Bureau Decennial Census and Population Estimate states that Boone County's population was 56,640 in 2010 and 66,875 in 2020 as displayed in Figure 6. The population increased by about 18% between 2010 and 2020. The population density in 2020 was 158.1 people per square mile.

The 2020 median age of Boone County is 38.1 compared to the state median of 37.8. The age distribution of Boone County is shown in Figure 7. Of the population age 25 and older, 95% have completed a high school education or higher while 51% have completed a bachelor's degree or higher, compared to 89% and 27% for the state.

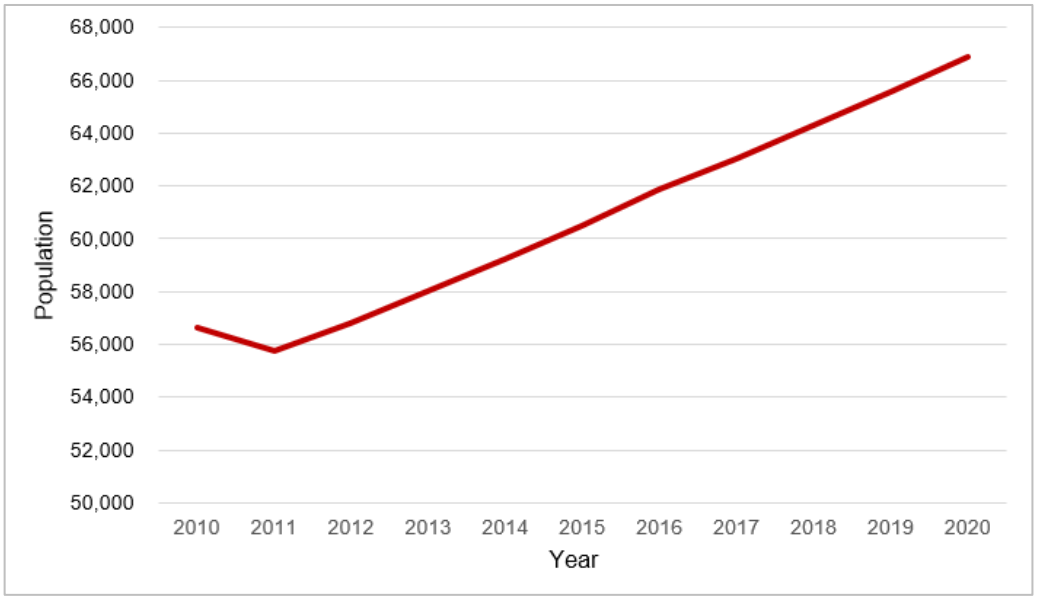


Figure 6. Boone County Yearly Population 2010 to 2020 (US Census Bureau Decennial Census and Population Estimate)

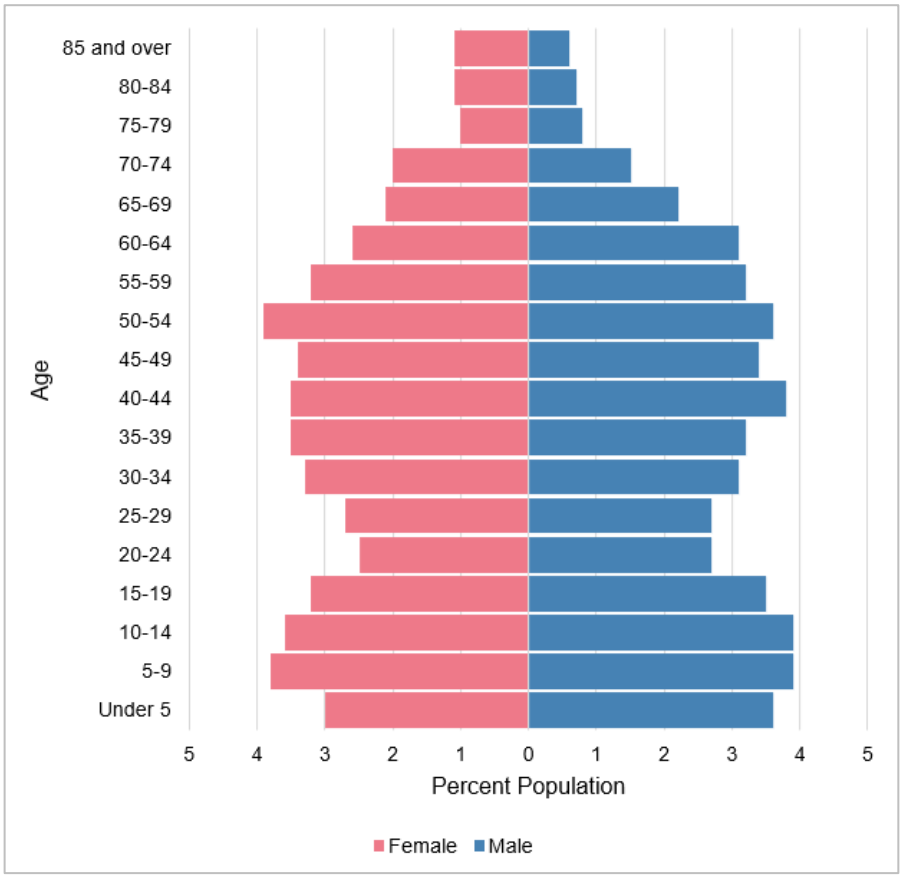


Figure 7. Distribution of Ages in Boone County (2020 American Community Survey 5-Year Estimates)

Some populations may require special attention in mitigation planning because they may suffer more severely from the impacts of disasters. It is important to identify these populations, termed vulnerable populations, and develop mitigation strategies to help them become more disaster resilient. Although there are numerous types of vulnerable populations, there are five focus groups: population age 65 and over, population 25 years and over with less than a 9th grade education, population for whom poverty status is determined, population with a disability, and the population 5 years and over that speaks a language other than English at home. Figure 8 compares Boone County to its surrounding counties, as well as to Indiana, by the percent population of each vulnerable population category within the county/state.

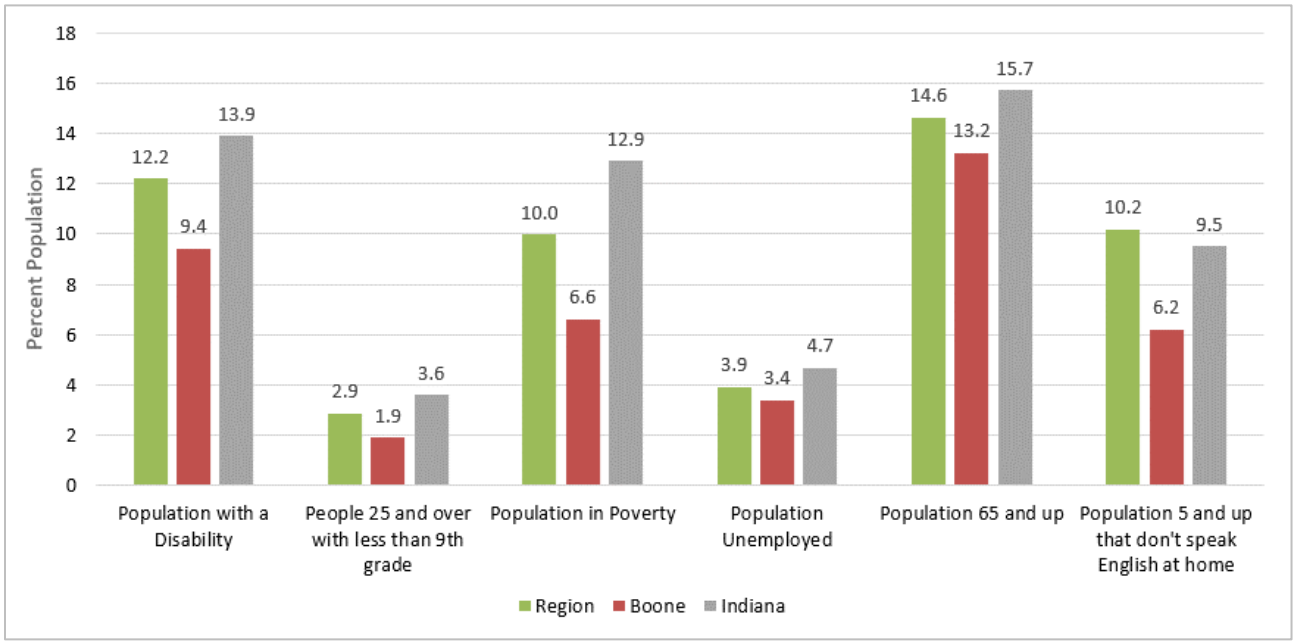


Figure 8. Vulnerable Populations (American Community Survey 5-Year Estimates)

Compared to the surrounding counties, Boone County has a relatively low percentages in all categories with the largest deviation in the percentage of population in poverty and the population 5 and up that do not speak English in the home.

3.3.4 Economy and Employment

According to the Indiana Institute for Working Families, 7 in 10 jobs in Indiana are projected to be low-income for a family of three by 2026. The 2020 annual per capita personal income in Boone County was $48,835, compared to an Indiana per capita income of $30,693. The median household income is $89,444, which is greater than the state median household income of $58,235. Of the Boone County workforce, 16.2% are employed in the manufacturing industry while educational services, and health care and social assistance accounts for 23.2% of industry. The major employers in Boone County according to HoosierData Business Lookup are listed in

Table 8. Major Employers in Boone County (HoosierData Business Lookup). Some recent development in Whitestown and Lebanon may include large employers not yet recorded.

Table 8. Major Employers in Boone County (HoosierData Business Lookup)

Company Name	Location	Number of Employees
Amazon Fulfillment Ctr	Whitestown	2,500
Fukai Toyotetsu	Jamestown	1,695
Witham Hospital	Lebanon	2,495
CNH America	Lebanon	500
Witham Health Svc Audiology	Lebanon	500
Hendrickson Trailer Coml	Lebanon	450
Meijer	Zionsville	300
Jet Star Inc	Zionsville	250
Weber Concrete Construction	Lebanon	200

The Indiana Broadband Office has designated Boone County and the Town of Zionsville as an official Broadband Ready Community. During the COVID-19 pandemic, the globe recognized broadband as an important part of quality of life, emphasizing convenience and connectivity. In addition, high-speed, reliable broadband enhances community development and enables businesses to grow. A Broadband Ready Community informs the telecommunication industry that the community has taken steps to reduce barriers to broadband infrastructure investment.

3.3.5 Housing

Approximately, 73% of Boone County households consist of families with the county averaging a household size of 2.56 people.

When it comes to extreme heat, research has shown temporary cooling mechanisms, such as a fan, do not cool an individual's internal temperature leaving them at risk of heatstroke or death. Housing cooling systems reduces the internal body temperature. According to the IDLGF, 4% of the housing in Boone County does not have central air. Similarly, heating systems protect individuals from effects of extreme cold temperatures. 99% of the dwellings in Boone County have a form of heating.

Basements provide a safe place for refuge from tornadoes and limits flooding damage during extreme rainfall events. According to IDLGF, 45% of dwellings in Boone County have a basement. 51% of those dwellings have a full basement. The remaining 49% have a partial basement.

Trailer parks are at higher risk of natural hazard due to less resources for safety from natural hazards, such as tornado shelters, and vulnerability of a trailer home to disaster due to less

stable material used to manufacture a trailer home. IDLGF data shows there are 17 parcels with mobile homes in Boone County.

3.3.6 Building Codes

Indiana does not have hazard-resistant building codes, as shown in Figure 9, although one of the most effective ways to help reduce the impacts of natural disasters is the updating and enforcing of better building codes. Studies show that by increasing the standards for building codes, the overall negative impact of natural disasters can be reduced.

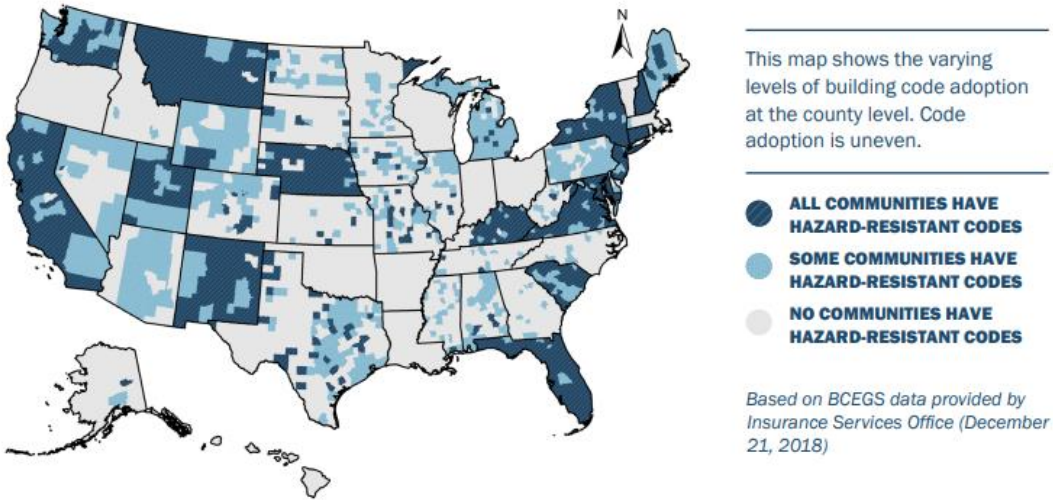


Figure 9. Nationwide Building Code Adoption (Source: FEMA, 2020)

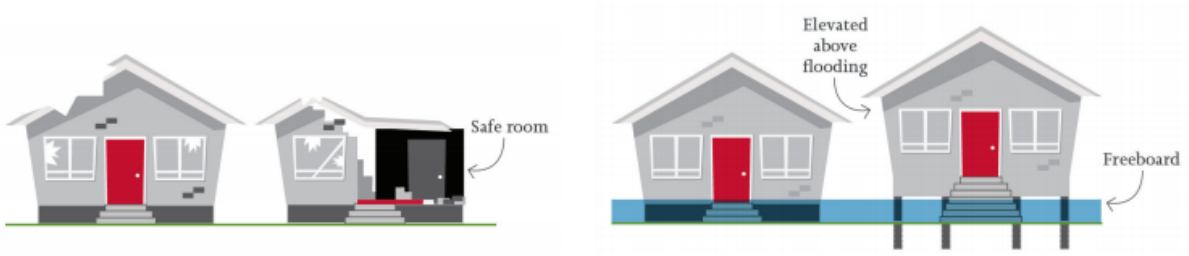
The National Building Code Adoption Tracking Portal by Stantec lists the building codes for each incorporated community in the country. The latest Indiana state building code is based on an outdated 2012 edition of the International Building Code (IBC) and the 2018 International Residential Code (IRC) and is mandated statewide. Indiana weakens flood and seismic resilience by removing or exempting multiple codes under each hazard. However, Indiana has higher regulatory standards for structures located in the Special Flood Hazard Areas (SFHA) and requires a 2-foot free board for all new construction.

Per state law that went into effect in July 2023, communities are required to use the State Building Ordinance. The 2023 Indiana General Assembly passed HEA 1575 that greatly modified the Building Commission's structure and process to updating codes. This law states only three codes can be updated per year and local building codes cannot exceed the State's codes. Since this is state law, the county and towns do not have the ability to adjust for mitigation purposes in excess of State regulations.

Boone County's building code is included in the Zoning Ordinance, updated in 1998. The City of Lebanon, Town of Whitestown, and Town Zionsville adopted state codes set forth by IDHS.

Building codes are designed to establish minimum requirements that ensure life safety. Figure 10 provides examples of how Greensburg, Kansas and Cedar Rapids, Iowa, have adopted more disaster-resistant building codes to protect their communities from tornadoes and flooding.

While more robust building codes cannot guarantee complete safety in the event of a disaster, they can go a long way to protecting the citizens of Boone County.



GREENSBURG, KS

In 2007 a powerful tornado took 11 lives and destroyed 90% of the buildings in Greensburg. With a view to rebuilding to a higher standard of sustainability, the City of Greensburg worked with the community, the state, and the federal government on the preparation of a Sustainable Comprehensive Master Plan. They also adopted a modern, hazard-resistant building standard (ICC 600-2008) for residential and commercial structures. Greensburg has become a national leader in building resilient communities and a model that the state of Kansas could replicate.

CEDAR RAPIDS, IA

As part of its 2008 flood recovery, the City of Cedar Rapids worked closely with state officials to increase their resilience to inland flooding. They implemented a variety of measures, including re-assessing flood risks, buying high-risk properties to create a new greenway, building a new levee, and most importantly, adopting modern building codes. This comprehensive package of measures was put to the test in 2016 by the second-highest flooding on record. Cedar Rapids performed well, with much less damage than during the 2008 flood.

Figure 10. Example of Building Codes (FEMA)

3.3.7 Transportation and Commuting Patterns

According to the American Community Survey 2016-2020, 3% of households in Boone County are without a vehicle. A mode of transportation is essential for daily use, such as attending work and grocery shopping, as well as a means to evacuate when natural hazards threaten the county. Figure 11 identifies the major transportation features of Boone County.

According to the Federal Railroad Administration, rail transportation is recognized as the safest method for moving large quantities of hazardous material over long distances. Boone County is home to one rail provider, CSX, that runs north and south through the county through the City of Lebanon and at the southwest corner of the county passing through Jamestown. The large rail companies allow for rail service to anywhere in the continental United States and Canada.

The largest commercial airport is the Boone County Airport-6I4. The nearest international air transportation is the Indianapolis International Airport located 33 miles from Lebanon.

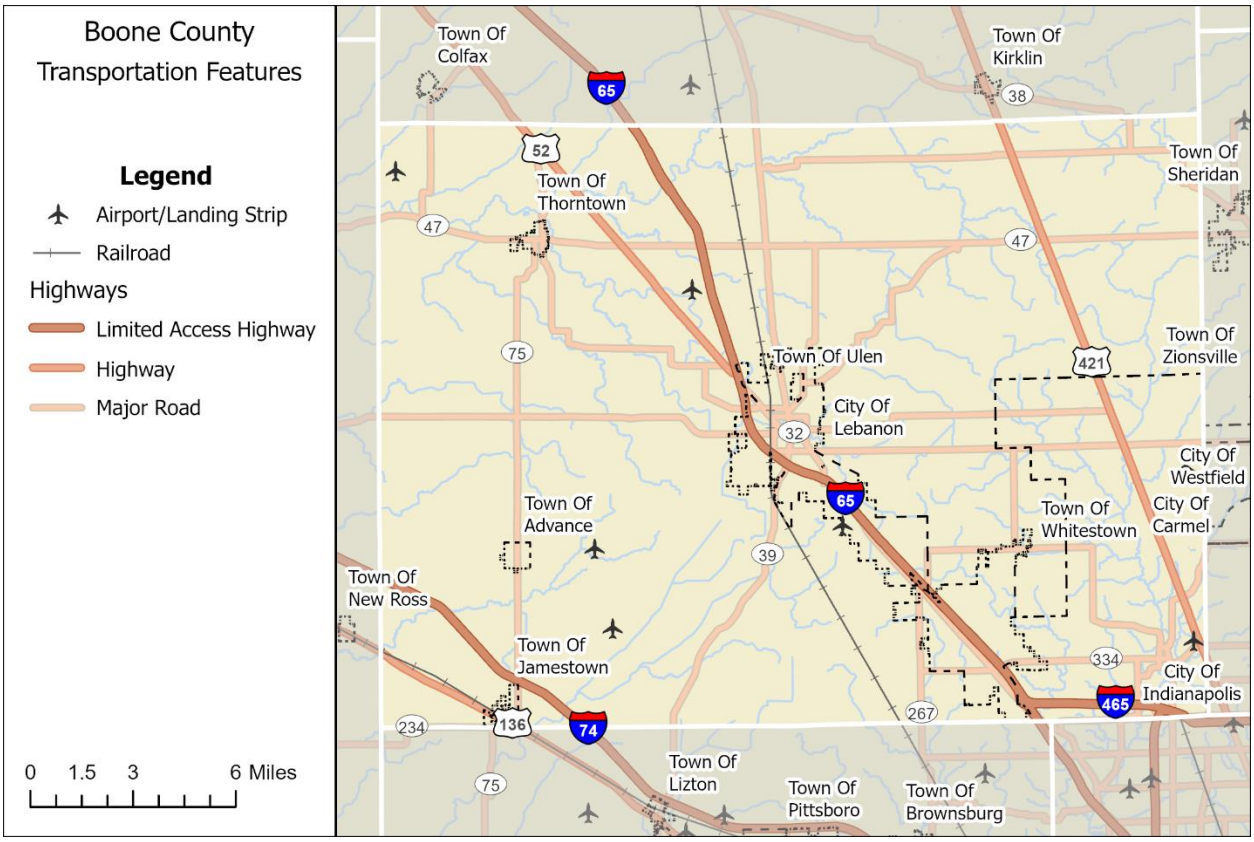


Figure 11. Boone County Major Transportation Features (Indiana Department of Transportation)

3.3.7.1 Commuting Patterns

County-to-county commuting patterns provide a gauge of the economical connectivity of neighboring communities. According to STATS Indiana 2020 data, 30,872 Boone County residents work within the county and 17,850 work outside the county. An additional 8,608 people living in 5 other counties commute to Boone County for work. Figure 12 indicates the number of workers 16 and older who commute to or from Boone County for work.

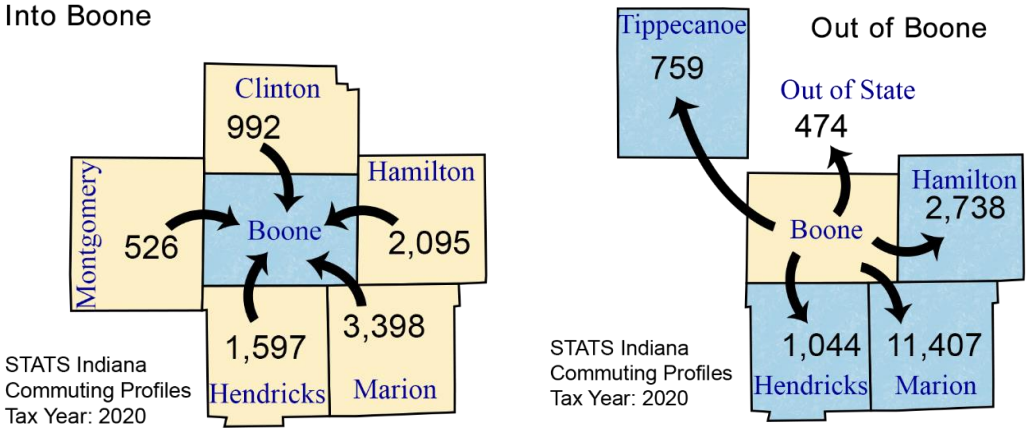


Figure 12. STATS Indiana commuting data in and out of Boone County

3.3.8 Land Use and Ownership

3.3.8.1 Agriculture

The 2017 U.S. Census of Agriculture reports that there are 626 farms in the county with an average size of 367 acres per farm. Of this farming land, 96% is cropland. Figure 13 displays the agricultural areas in Boone County along with confined feeding operations (CFO). CFOs are defined by the Indiana Department of Environmental Management (IDEM) as "the confinement of animals in buildings or lots with less than 50 percent vegetation or ground cover for 45 days or more over a 12-month period" and a certain number of animals, based on the type of animal. These types of operations are regulated at the state level but can also be regulated at the county level in terms of siting through a zoning ordinance. Indiana's focus on CFOs is on effective storage and application of manure and related wastes generated by those CFOs. CFOs are prone to and enhance flash flooding and associated damages because of the increased area for runoff due to flattened lands from no vegetation and trampled ground.

A subset of producers per farm were surveyed totaling 1,042 producers. Based on this subset, Boone County producers are 65% male and 35% female. The largest age group of producers is 35-64 accounting for 61% of producers in the County. Besides white, Boone County producers include a small percentage of farmers of more than one race. 90% of farms have access to internet.

Figure 13. Boone Agricultural Areas

3.3.8.2 Managed Lands

The Indiana Department of Natural Resources (IDNR) maintains an inventory of managed properties. These natural and recreation areas are managed by either the IDNR Fish & Wildlife, IDNR Nature Preserves, federal, local, or non-profits and is maintained by the Indiana Natural Heritage Database. By establishing conservation areas and parkland, the county can preserve plant and animal species and combat air pollution, land pollution, and water quality issues. Boone County has 147 acres of managed lands depicted in Figure 14.

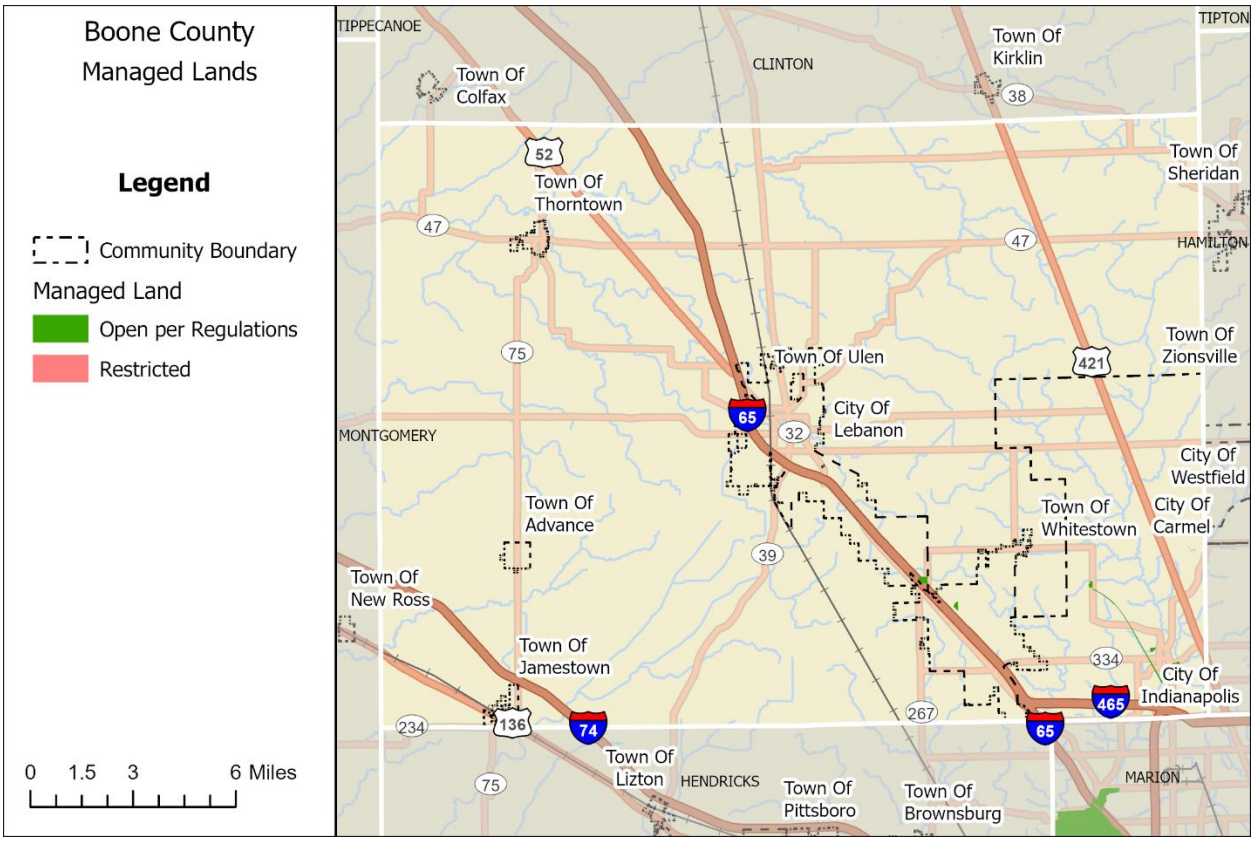


Figure 14. Boone County Managed Lands

3.3.9 Major Waterways and Watersheds

Water resources are vital to the county because they provide enhanced recreational and economic opportunities and can be a form of hazard mitigation. Important water resources include surface and groundwater from aquifers, watersheds, lakes, rivers, and wetlands. Water resources provide for riparian habitats, fish, wildlife, household, livestock, recreation, aesthetic, and industrial uses.

3.3.9.1 Watersheds

Boone County is located within four major watersheds: Sugar (05120110), Upper White (05120201), Eel (05120203), and Middle Wabash-Little Vermilion Watersheds (05120108) as shown in Figure 15. Most of Boone County is in the Sugar Watershed, in the northern portion of the county. The second largest portion of county is in the Upper White Watershed located in the east, southeast area of the county. The Eel and Middle Wabash-Little Vermilion Watersheds lie in the southwest portion of the county.

3.3.9.2 Rivers and Streams

The major streams and rivers in Boone County are displayed in Figure 15. Lebanon and Thorntown lie near Prairie Creek. The Town of Thorntown also lies near Sugar Creek. The Big

Walnut Creek runs near Jamestown to the east and south of the town limits. The Town of Zionsville is near Eagle Creek, Advance is near Raccoon Creek, and Zionsville is near Boone Creek. According to the Indiana Natural Resources Commission, no waterway has been declared navigable or non-navigable.

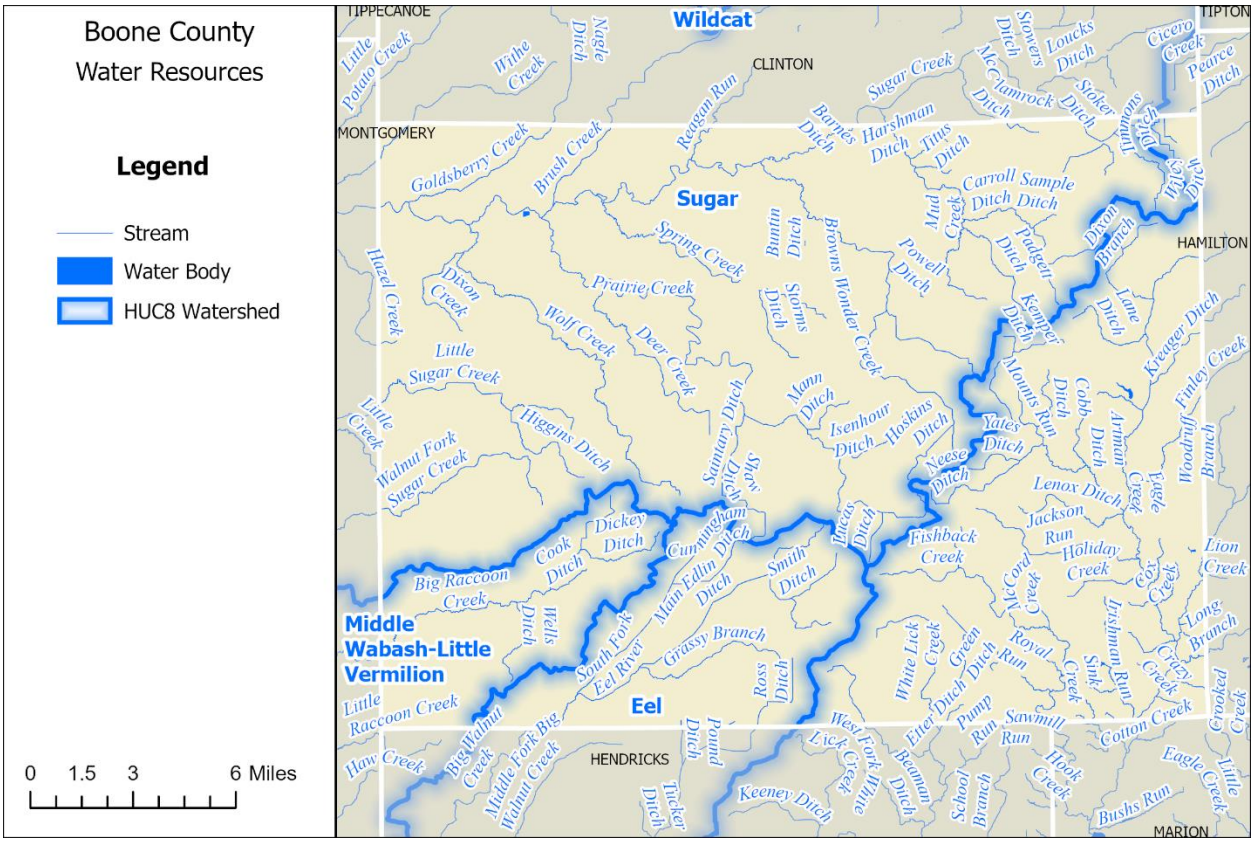


Figure 15. Boone County Water Resources (Water resource data courtesy of IDNR)

3.3.9.3 Wetlands

The EPA and IDEM have identified Indiana's wetlands and other aquatic resources as important features to protect and wisely use for the benefit of present and future generations. Wetlands are vital features of the Indiana landscape that provide beneficial services for people and wildlife including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during droughts and dry periods. Figure 16 displays the lakes and wetlands in Boone County.

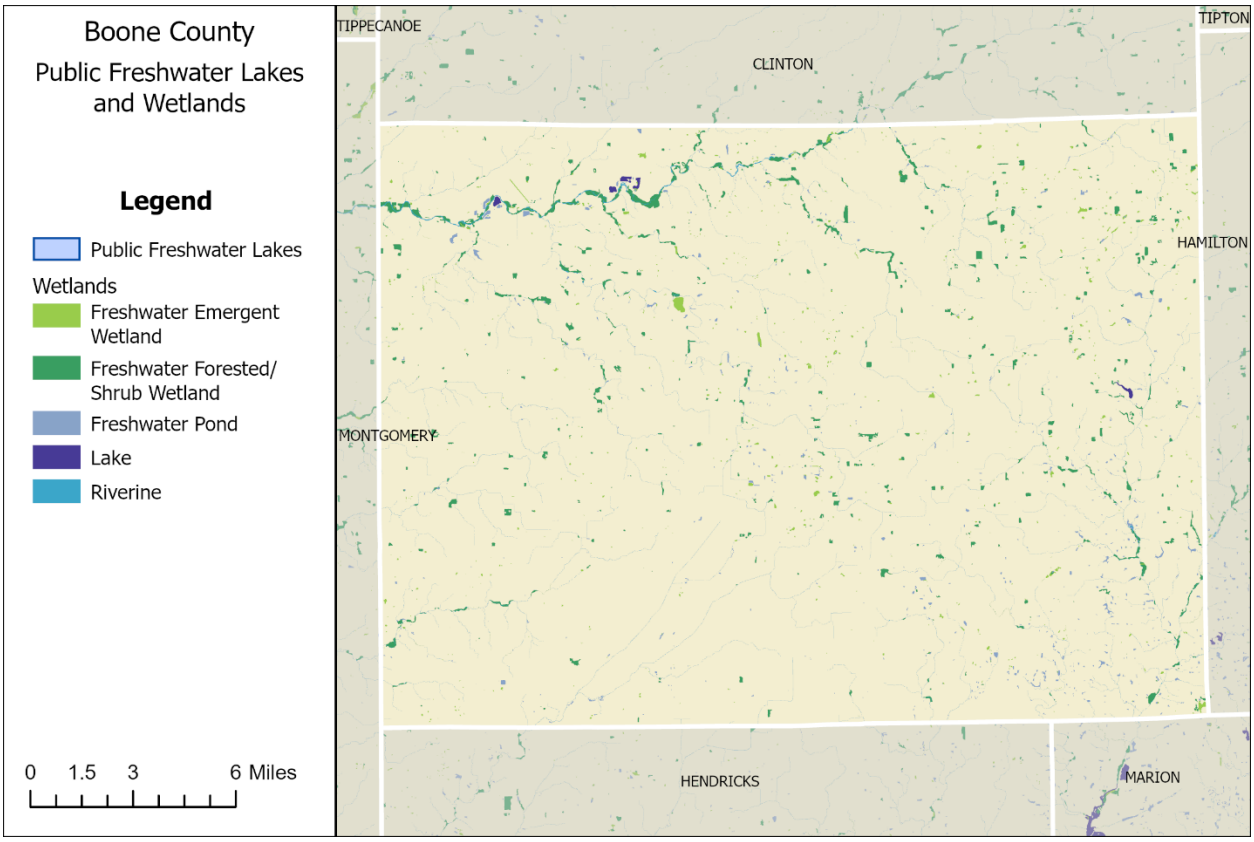


Figure 16. Public Freshwater Lakes and Wetlands (Water resource data courtesy of IDNR)

Wetlands promote human well-being in many ways including improvements to water purification, increased water supply, climate regulation, flood regulation, and opportunities for recreation and tourism. According to a report by the US EPA, a one-acre wetland can store approximately three-acre feet of water, which is equal to one million gallons. Furthermore, trees and other wetland vegetation slow the speed of flood waters, ultimately lowering flood heights and naturally mitigating potential flood-related destruction.

4 Risk Assessment

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation practices must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people. A risk assessment consists of three components: hazard identification, vulnerability analysis, and risk analysis.

4.1 Hazard Identification and Records

4.1.1 Existing Plans

Identifying and prioritizing the hazards the community is exposed to are the first steps before conducting a risk assessment. The previous Boone County MHMP identified the major hazards to which Boone County is exposed. The following sections present historical data regarding hazard incidents and resultant costs in Boone County.

4.1.2 Historical Hazards

Historical storm event data was compiled from the NCEI. NCEI records are estimates of damage reported to the National Weather Service (NWS) from various local, state, and federal sources. It should be noted that these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events.

The NCEI data included 430 reported events in Boone County between 1950 and December 31, 2021. The counts of these events by category are represented in Figure 17. NCEI reports 31 events since 2018 when the last plan was adopted. These recent events and their counts are reported in Figure 18. A table listing all events and their injury, death, and property loss statistics are included in Appendix C.

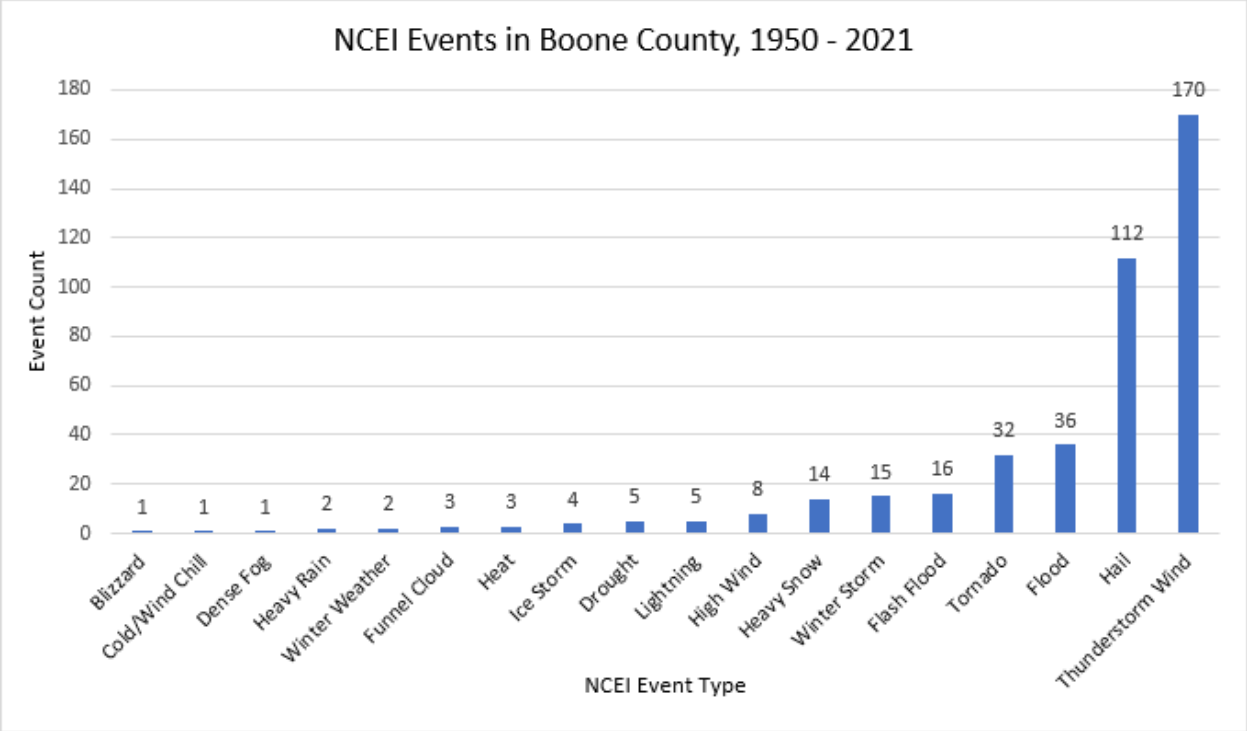


Figure 17. Count of NCEI Events in Boone County (1950-2021)

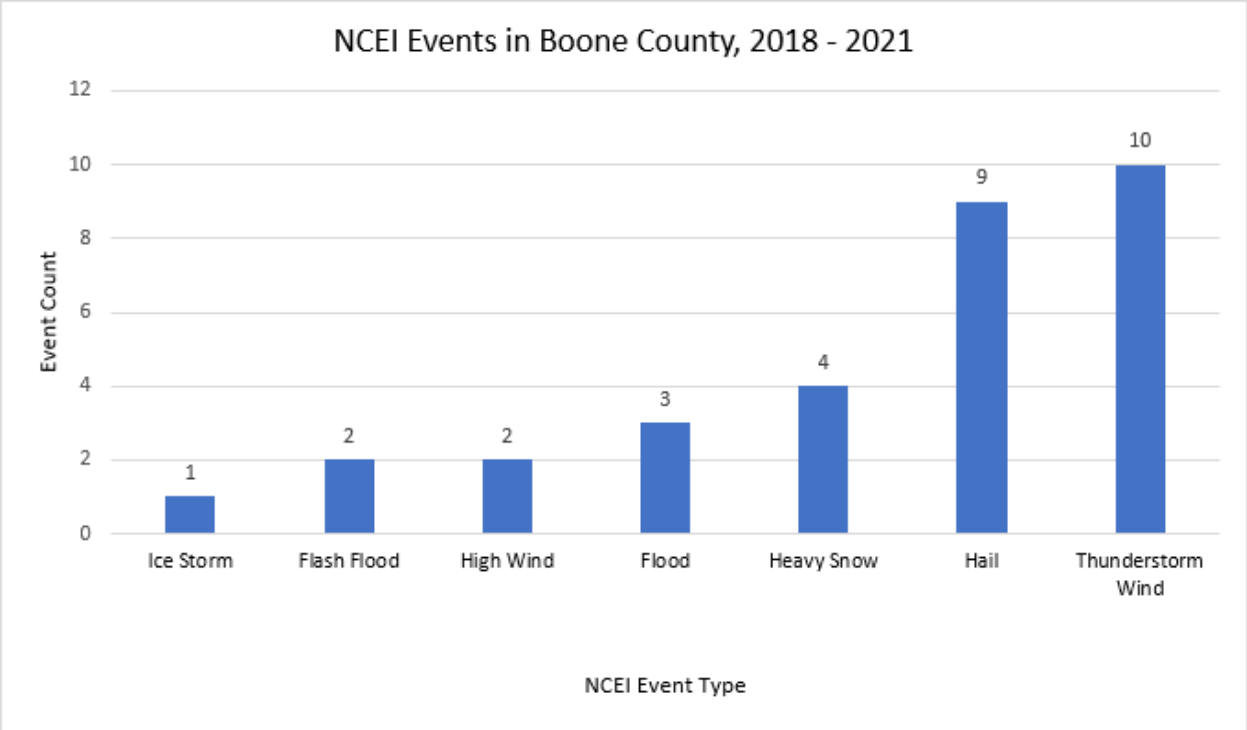


Figure 18. NCEI Events in Boone County since Previous MHMP (2018-2021)

4.1.3 FEMA's National Risk Index

FEMA's National Risk Index (NRI) can be used to better understand the disproportionate risks facing certain residents of Boone County. The NRI utilizes source data for 18 different natural hazards along with social vulnerability indices and community resiliency rankings. By combining these 3 risk factors, the NRI applies an overall Risk Rating that considers the likelihood and impact of natural disasters, the social vulnerability of the area, and the measured community resilience. This ranking is meant to be used to aid communities in better understanding the risk to their populations as well as a tool to help make better policies.

Social vulnerability is the susceptibility of social groups to the adverse impacts of natural hazards. A component of the NRI, a Social Vulnerability score and rating represent the relative level of a community's social vulnerability. A higher Social Vulnerability score results in a higher Risk Index score. According to NRI, Boone County has a Very Low social vulnerability.

Community resilience is the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. Another component of the NRI, a Community Resilience score and rating represent the relative level of a community's resilience. A higher Community Resilience score results in a lower Risk Index score. Boone County has a Relatively High community resilience ranking.

Expected Annual Loss represents the average economic loss in dollars resulting from natural hazards each year. It is calculated for each hazard type and quantifies loss for buildings, people, and agriculture. The third and final component of the NRI, an Expected Annual Loss score and rating represent a community's relative level of expected losses each year. An Expected Annual Loss score is proportional to a community's risk; thus, a higher Expected Annual Loss score results in a higher Risk Index score. Boone County has a Relatively Low expect annual loss ranking.

The overall risk rating for Boone County is shown in Figure 19. In general, the unincorporated and incorporated areas of Boone County have low risk with the exception of the City of Lebanon that has a relatively high rank and the Town of Zionsville that has a Relatively Moderate to Relatively High rank. Figure 20 shows the social vulnerability rank for Boone County. This shows that much of the county has a low social vulnerability ranking with the exception of the City of Lebanon that has a Relatively Moderate social vulnerability rating.

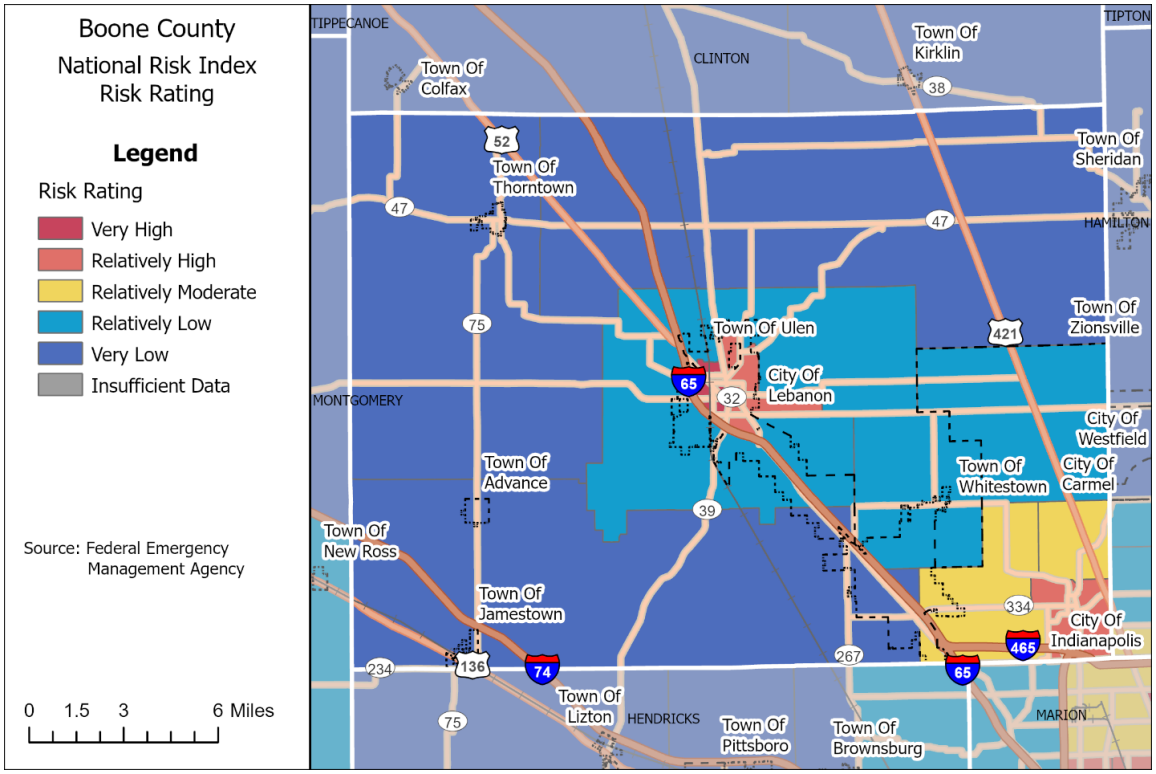


Figure 19. NRI Risk Rating

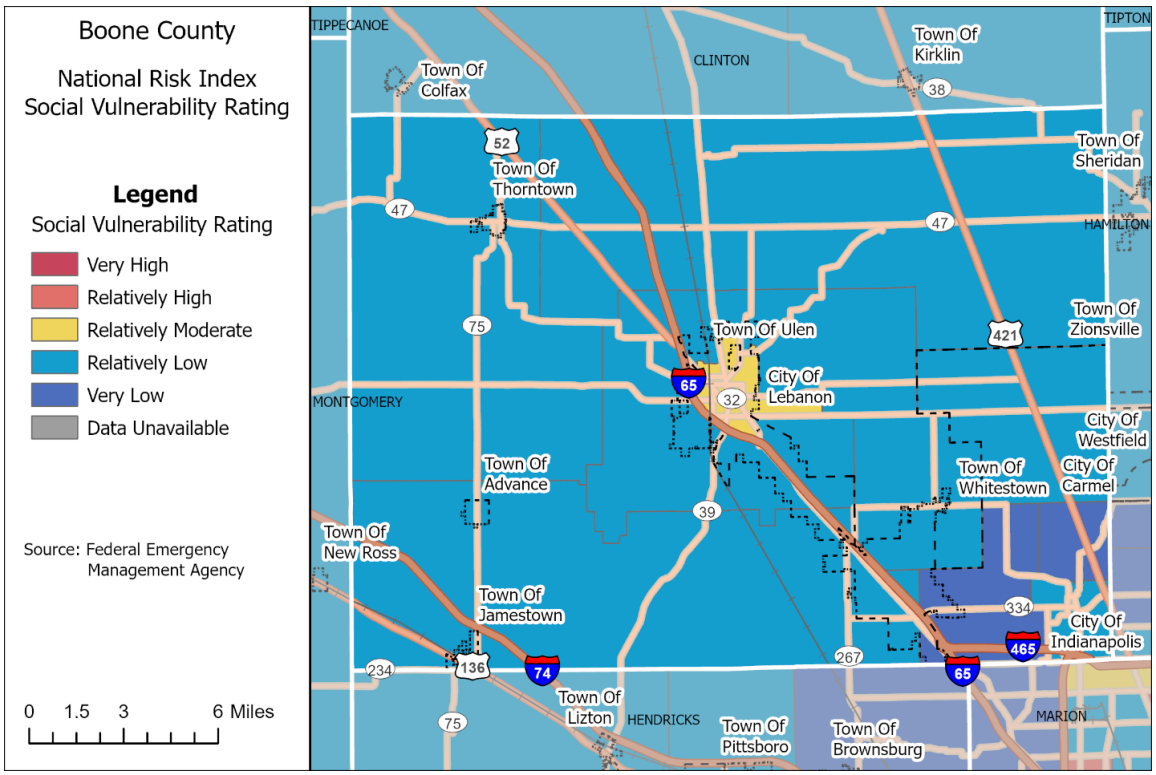


Figure 20. NRI Social Vulnerability Rating

4.1.4 FEMA Declared Disasters

Since 2000, FEMA has declared 20 disasters for the state of Indiana. Figure 21 shows the number of disaster declarations by county. Table 9 shows the details of the major disaster declarations for Boone County, including FEMA hazard mitigation funding and total assistance. Boone County has received federal aid for 7 declared disasters.

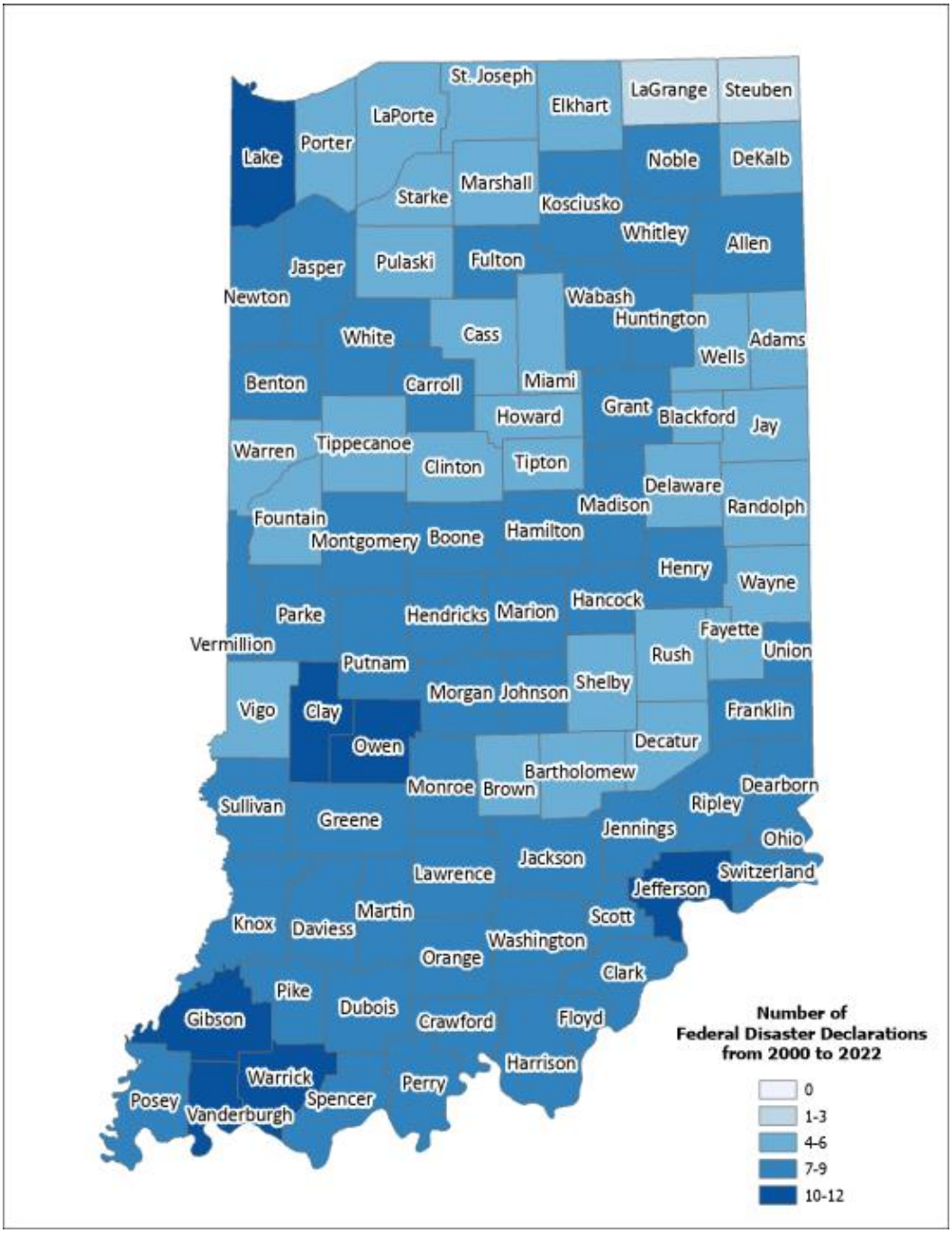


Figure 21. Federal Disaster Declarations for Indiana

Table 9. FEMA-Declared Disasters and Emergencies for Boone County (2000-2022)

Disaster Number	Date of Incident	Date of Declaration	Disaster Description	Type of Assistance*
1476	7/4/2003 – 8/6/2003	7/11/2003	Severe storms, tornadoes, & flooding	IH, IA, HMGP
1487	8/26/2003 – 9/15/2003	9/5/2003	Severe storms, tornadoes, & flooding	IH, IA, HMGP
1520	5/25/2004 – 6/25/2004	6/3/2004	Severe storms, tornadoes, & flooding	IH, IA, HMGP
1573	1/1/2005 – 2/11/2005	1/21/2005	Severe winter storms & flooding	IH, IA, PA, HMGP
1766	5/30/2008 – 6/27/2008	6/8/2008	Severe storms, flooding, & tornadoes	PA, HMGP
4173	1/5/2014 – 1/9/2014	4/22/2014	Severe winter storm & snowstorm	PA, HMGP
4515	1/20/2020 – 5/11/23	4/3/2020	COVID-19 pandemic	IH, PA, HMGP

*PA = Public Assistance Program, IA = Individual Assistance Program, IH = Individual and Household Assistance Program, HMGP = Hazard Mitigation Grant Program

The type of payments following a disaster help with ranking the severity of disasters and a guide to developing mitigation activities and projects. For example, Indiana highway departments have claimed significant damages from flooding and fluvial erosion, and rural electrical cooperatives have historically been vulnerable to ice storms and high winds. Figure 22 provides a breakdown of the public assistance to Boone County.

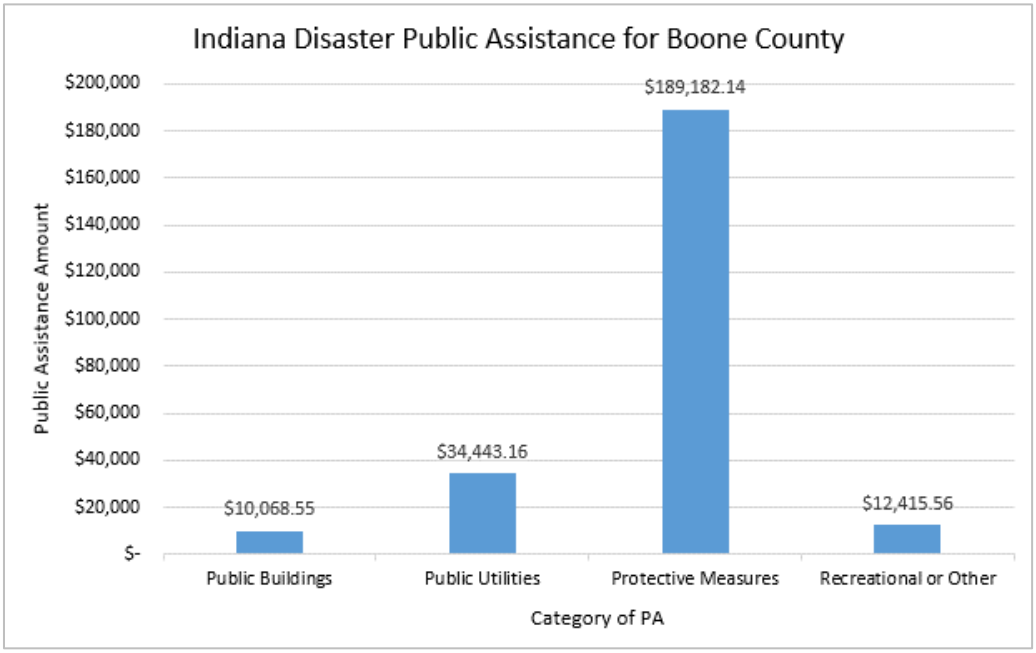


Figure 22. Indiana Disaster Public Assistance for Boone County (2008-2018)

4.1.5 Other Disaster Relief

In addition to potential state funding, homeowners and businesses can be eligible for low-interest and long-term loans through the U.S. Small Business Administration (SBA). SBA was created in 1953 as an independent agency of the federal government to aid, counsel, assist, and protect the interests of small business concerns. The program also provides low-interest, long-term disaster loans to businesses of all sizes, private nonprofit organizations, homeowners, and renters following a declared disaster. The loans can also provide resources for homeowner associations, planned unit developments, co-ops, condominiums, and other common-interest developments. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Through the disaster loan program, SBA provides loan data, including FEMA and SBA disaster numbers, type (business or home), year, and various reporting amounts on the verified and approved amount of real estate and contents. Table 10 outlines the SBA data for the county. The most recent SBA Loans available for Boone County was 2005. No SBA Loans have been declared since the last plan.

Table 10. SBA Declaration Data for Boone County

Year	FEMA Declaration	SBA Disaster Number	Community	Total Number Zip Codes Declared	Type	Total Verified Loss	Total Approved Loan Amount
2005	1573	IN-00001	Lebanon	1	Business	$15,459	$15,500

Indiana State Disaster Relief Fund

The Indiana State Disaster Relief Fund (SDRF) is a state disaster recovery fund for events that have seriously impacted communities, but that do not rise to the level of a federal declaration. Although established in 2003 to provide infrastructure damage assistance, the Indiana SDRF was not funded until 2007. This funding is very limited as it is tied to the public safety fund and is dependent on the state's fireworks sale. In 2007, the SDRF was expanded to provide Individual Assistance for homeowners and renters whose primary residence was damaged/destroyed.

Boone County has not received SDRF funds since the last plan.

4.1.6 Hazard Ranking

The Calculated Priority Rating Index (CPRI) is a process that evaluates the probability, consequence, warning time, and duration of a hazard to develop a hazard priority rank. Using the previous plan's rankings, the definitions shown in Table 11, and an overview of the NCEI storm events, the planning team reviewed the probability and consequence of each natural

hazard for the county and came to a consensus as to the county-wide rankings shown in Table 12.

The following formula and table provide information on the weighted factors considered when determining a CPRI score for each hazard.

Table 11. Summary of Calculated Priority Risk Index (CPRI) Categories and Risk Levels

CPRI Category	DEGREE OF RISK			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001	1	45%
	Possible	Rare occurrences with at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001.	2	
	Likely	Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability that is greater than 0.1.	4	
Consequence	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid and there are no deaths. Negligible quality of life lost. Shutdown of critical facilities for less than 24 hours.	1	30%
	Limited	Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours		4	15%
	6 to 12 hours		3	
	12 to 24 hours		2	
	More than 24 hours		1	
Duration	Less than 6 hours		1	10%
	Less than 24 hours		2	
	Less than one week		3	
	More than one week		4	

CPRI Risk Factor Score = [(Probability*.45) + (Consequence*.30) + (Warning Time*.15) + (Duration*.10)]

- **Probability** – a guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.
- **Consequence/Impact** – indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability assessment gives information that is helpful in making this determination for each community.
- **Warning Time** – plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.
- **Duration** – relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

Table 12 displays the county's CPRI results for each hazard and their resultant rank.

Table 12. Calculated Priority Risk Index for Boone County

Natural Hazard	Probability	Consequence	Warning Time	Duration	Risk Factor
Summer Storms	4 - Highly Likely	2 - Limited	4 - <6 hours	1 - <6 hours	3.1
Tornadoes	3 - Likely	3 - Critical	4 - <6 hours	1 - <6 hours	2.95
Hazmat Incident	3 - Likely	2 - Limited	4 - <6 hours	2 - <24 hours	2.75
Environmentally Harmful Organisms	3 - Likely	2 - Limited	4 - <6 hours	2 - <24 hours	2.75
Flash Flooding	3 - Likely	2 - Limited	3 - 6-12 hours	3 - <1 week	2.7
Winter Storm	3 - Likely	2 - Limited	3 - 6-12 hours	3 - <1 week	2.7
Drought	3 - Likely	2 - Limited	1 - >24 hours	4 - >1 week	2.5
Flooding	3 - Likely	2 - Limited	1 - >24 hours	4 - >1 week	2.5
Infectious Disease Dangerous to Public Health	3 - Likely	2 - Limited	1 - >24 hours	4 - >1 week	2.5
Earthquake	2 - Possible	2 - Limited	4 - <6 hours	2 - <24 hours	2.3
Wildfire	2 - Possible	2 - Limited	4 - <6 hours	2 - <24 hours	2.3
Extreme Temperatures	2 - Possible	2 - Limited	1 - >24 hours	4 - >1 week	2.05
Dam Failure	1 - Unlikely	2 - Limited	4 - <6 hours	2 - <24 hours	1.85
Ground Failure	1 - Unlikely	2 - Limited	4 - <6 hours	2 - <24 hours	1.85
Levee Failure	1 - Unlikely	2 - Limited	4 - <6 hours	2 - <24 hours	1.85

The ranking methodology in the previous Boone County plan is similar to the current methodology. The previous plan marked Summer Storms, Tornadoes, and Hazardous Incident as the three hazards with the highest risk factor, and Ground Failure, Dam Failure, and Levee Failure as the three lowest risk factors. The greatest difference since the last plan is separating

Infectious Diseases Dangerous to Public Health from Environmentally Harmful Organism. These hazards are combined in the last plan.

4.1.7 Hazard Risk Assessment by Jurisdiction

The risk assessments identify the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. While some hazards are widespread and will impact communities similarly (e.g., winter storms), others are localized, leaving certain communities at greater risk than others (e.g., flash flooding, exposure to a particular high-risk dam). The following table illustrates each community's risk to flooding/flash flooding, dam/levee failure, hazardous materials incidents, and ground failure and are highlighted within the risk assessment.

Table 13. Localized Hazards for Incorporated Jurisdictions

Community	Flooding	Flash Flooding	Dam Failure	Levee Failure	Hazardous Incident	Ground Failure
Advance	1 - Unlikely	1 - Unlikely	1 - Unlikely	1 - Unlikely	2 - Possible	2 - Possible
Jamestown	2 - Possible	4 - Highly Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Lebanon	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Thorntown	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	2 - Possible	1 - Unlikely
Ulen	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Whitestown	1 - Unlikely	2 - Possible	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Zionsville	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Lebanon Community School Corp	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Trader's Point Christian Academy	1 - Unlikely	3 - Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Western Boone Co Community School Corp	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	2 - Possible	1 - Unlikely
Zionsville Community Schools	3 - Likely	3 - Likely	1 - Unlikely	1 - Unlikely	3 - Likely	1 - Unlikely
Boone CO SWCD	2 - Possible	2 - Possible	1 - Unlikely	1 - Unlikely	2 - Possible	2 - Possible

In addition, to participation from each incorporated jurisdiction within Boone County, and several of the unincorporated areas, Lebanon Community School Corporation, Trader's Point Christian Academy, Western Boone County Community Corporation, and Zionsville Community Schools participated in the plan update process. Their facilities are spread across all of Boone

County and as such, representatives from each school corporation ranked their overall vulnerability to hazards on a county basis. None of the listed schools fell within the 100-year flood boundary or the Fluvial Erosion Hazard (FHE) area mapped in section 4.3 of this plan. In general, the school facilities face the same vulnerability to hazards as the rest of the County.

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends. Determining the hazard rank is pertinent to determining the area of vulnerability. The county infrastructure and facilities inventories are a critical part of understanding the vulnerability at risk of exposure to a hazard event.

The assets presented in the analysis results are broken into two main groupings, Facilities Inventory and Building Inventory. The facilities inventory is reviewed and updated by the county before the analysis begins. The building inventory is created by the analysis team using assessor data combined with either parcel centroids or building. The creation and update process for these two asset groups are described below.

4.2.1.1 Facilities Inventory

Of the approximately 15 facility categories, five are essential for emergency preparedness: schools, police and fire stations, medical facilities, and emergency operation center(s). The remaining facilities are referred to as critical and include a variety of facility types that are critical to the everyday operations of the county. The local planning team updates these critical facilities using the previous plan as the starting point. The essential facilities and their counts for the county are listed in Table 14. At the beginning of the planning process these facilities were reviewed by the planning team and updates were provided as needed to the analysis team. These updated facilities are provided to the county as well as being maintained in a statewide database by The Polis Center.

Table 14. Number of Essential Facilities in Boone County

Facility Type	Number of Facilities
Care Facilities	33
Emergency Operations Centers	1
Fire Stations	12
Police Stations	7
Schools	62

4.2.1.2 Building Inventory

In 2018, Microsoft released 125 million building footprints for the United States that were generated from imagery using machine learning (https://github.com/Microsoft/USBuildingFootprints) and in 2021, Microsoft released an updated nationwide dataset. This data is licensed through the Open Data Commons Open Database License. The Polis Center extracted the building footprints for the State of Indiana and created point centroids of each building. Each building centroid was then joined spatially to the state's land parcels provided by the Indiana Geographic Information Office in 2022. This process provided the parcel identifier for each building and was then linked to the statewide Real Property Tax Assessment Data provided by the Indiana Department of Local Government Finance (IDLGF) from 2022. Indiana counties annually submit an extract of property appraisal data to the IDLGF that contains detailed building information such as square footage, construction type, year built, foundation type, and building replacement cost. The IDLGF data allows Polis Center to identify the occupancy class of each building based on the parcel within which it is located. Approximately 1% of the buildings were not located in a parcel and were not included. Table 15 provides the summary of building counts and replacement costs joined to the IDLGF data for Boone County summarized by occupancy type. In the case IDLGF does not have a replacement cost reported, Polis provided an amount via calculations using the fields outlines above. NOTE: The assessor records often do not include nontaxable parcels and associated building improvements; therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

Table 15. Building Counts and Estimated Replacement Costs for Boone County

Occupancy Code	Count	Replacement Cost
Residential	115,325	$21,465,868,880
Commercial	4,734	$1,899,183,693
Industrial	1,067	$3,981,497,361
Agriculture	6,723	$473,771,040
Religious	1,049	$422,245,890
Government	614	$380,714,819
Education	150	$339,284,830
Total	**129,662**	**$28,962,566,513**

4.2.2 Hazus-MH

Potential impacts from flooding and earthquake hazards were quantified using FEMA's Hazus-MH Risk Assessment tool (https://www.fema.gov/hazus) and other forms of GIS analysis that leveraged this data.

It is important to note that Hazus-MH is not a substitute for detailed engineering studies. Rather, it serves as a planning aid for communities interested in assessing their risk to flood, earthquake, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project.

4.2.3 Past and Future Development

Recent or proposed development, especially in Special Flood Hazard Areas (SFHAs), must be carefully evaluated to ensure that no adverse impacts occur as a result. Development, small or large, can result in large amounts of fill and other material being deposited in flood storage areas or other vulnerable locations.

As the county's population shifts and develops, the residential and urban areas may extend further into unincorporated county, placing more pressure on existing transportation and utility infrastructure while increasing the rate of farmland conversion. Boone County addresses specific mitigation strategies in Chapter 5 to alleviate such issues.

Because Boone County is vulnerable to a variety of natural and technological threats, the county government, in partnership with the state government, is committed to preparing for the management of these type of events for better emergency management and county response.

Table 16. Land Use Change from 2018 to 2022 for Boone County

Property Class	Deeded Acres in 2018	Deeded Acres in 2022	Percentage Change from 2018 to 2022
Residential	32,675	35,172	7.64%
Commercial	4,760	4,944	3.88%
Industrial	2,871	3,828	33.32%
Agriculture	220,172	215,894	-1.94%
Exempt	8,263	9,240	11.83%
Utility	206	245	18.52%
Mineral	--	--	--

Boone County's only decrease in acreage was in agriculture. Industrial, exempt, and utility classes saw the greatest increases with industrial increasing by 33% over what was reported in 2018. The planning team indicated Zionsville and Whitestown had significant development of all property class types in the past 5 years. Corridors along I-65 saw significant industrial growth since then. The planning team stated this development is expected to continue, including expected growth in Lebanon.

According to the IDLGF, 3,784 of Boone County's parcels have experience some sort of construction since 2018. Parcels in every jurisdictional participant included a parcel with

construction. Major projects are listed in the paragraph above. Of those, 190 are located within the special flood hazard areas, 4 are located in the hypothetical tornado path area, and 532 in the toxic plume area, identified in Sections 4.3.1, 4.3.4, and 4.3.8 of this plan. While this construction might have increased the vulnerability of the county to those hazards, they are only a small portion (19%) of the recent years' development. Table 16 below summarizes the changes in deeded acres by property class.

Communities are acknowledging the shifts in weather patterns and climate, prompting proactive planning to ensure that construction, development, and ultimately citizens are not exposed to unnecessary risks. Officials at the county, city, and town levels are actively advocating for developers, homeowners, and business leaders—anyone involved in construction or development—to prioritize incorporating effective mitigation strategies for optimal and safer development.

4.3 Hazard Profiles

The following hazard profiles outline the hazard risk exposure for the county. The hazard is first described and then reviewed in the historical context of the county. In many cases, an analysis subsequently follows the hazard context that analyzes the facility and building inventory risk.

4.3.1 Flash Flood and Riverine Flood

4.3.1.1 Hazard Definition for Flooding

Flooding is a significant natural hazard throughout the US. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry of the catchment, and flow dynamics and conditions in and along the river channel. Floods in Boone County can be classified as one of two types: flash floods or riverine floods.

Flash floods generally occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage and, sometimes, loss of life due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person, while another 18 inches might carry off a car. Generally, flash floods cause damage over relatively localized areas, but they can be quite severe in the areas in which they occur. Urban flooding is a type of flash flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Flash floods can occur at any time of the year in Indiana, but they are most common in the spring and summer months.

Riverine floods refer to floods on large rivers at locations with large upstream catchments. Riverine floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for riverine floods than for flash floods, generally providing ample warning for people to move to safe locations and, to some extent, secure property against damage. Riverine flooding on the large rivers of Indiana generally occurs during either the spring or summer.

4.3.1.2 Stream Gages

The USGS, in cooperation with many state agencies and local utility and surveyor offices, help maintain stream gages. Stream gages provide the capability to obtain estimates of the amount of water flowing in streams and rivers. IDNR and IDEM use the stream gage data for water quantity and quality measurements. Local public safety officials use the data at these sites, along with the resources from the NWS, to determine emergency management needs during periods of heavy rainfall. The location of stream gages in the county are shown in Figure 23.

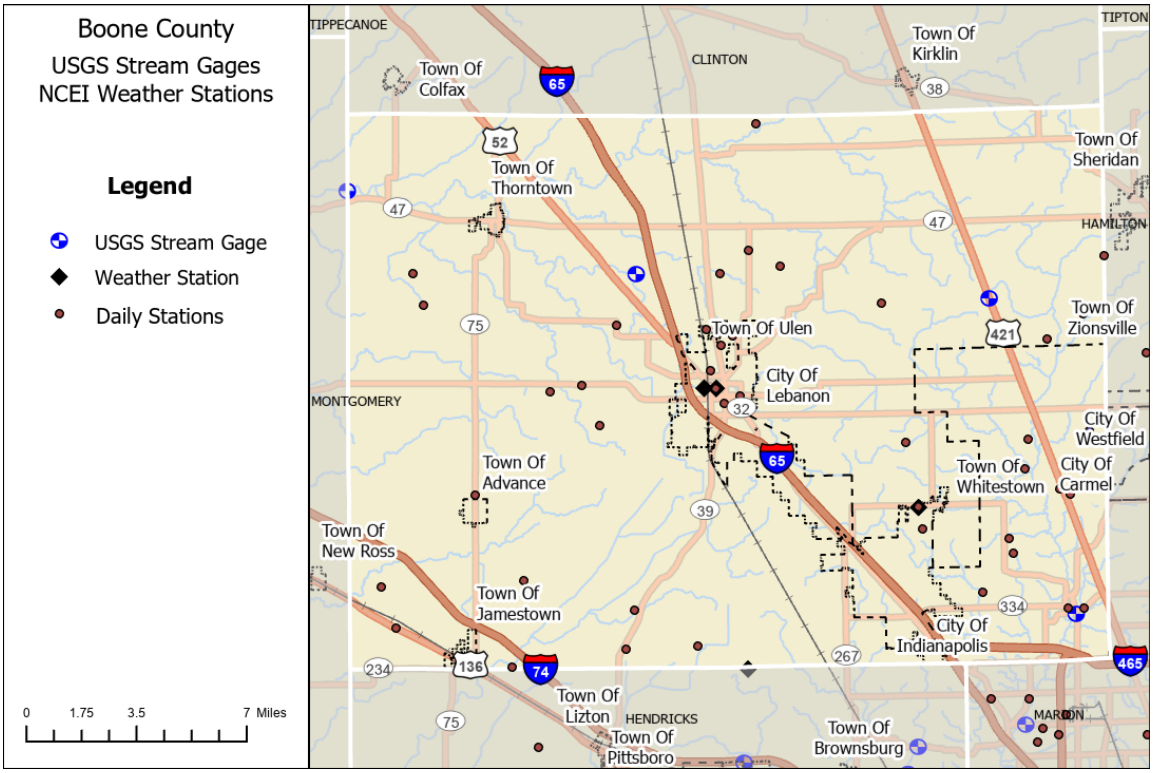


Figure 23. USGS Stream Gages and NCEI Weather Stations

4.3.1.3 Flood History in Boone County

Boone County has experienced a total of 52 flooding events. Since 2018 there have been 2 reported incidents of flash flooding and 3 reports of flooding. No individuals were injured or

died from the flood events. In June of 2019, a flash flooding event caused $50,000 of crop damage from thunderstorm rain fall near Thorntown. Additional details for NCEI events are included in Appendix C.

The Boone County Planning team answered a mitigation strategy worksheet to help identify problem areas in the county for each hazard type. Figure 24 below shows a rain event from April 18, 2013. The photo of Prairie creek is in Lebanon, from Jamison Street bridge viewing northeast toward Busby Street bridge. USGS reported the crest of the flooding level reached 15.71 feet. Survey answers can be found in Appendix F.

Figure 24. Photo of flooding in Lebanon, April 2013

4.3.1.4 Geographic Location for Flooding

Most river flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Severe thunderstorms may cause flooding during the summer or fall but tend to be localized.

4.3.1.5 Hazard Extent for Flooding

The SFHA are defined as the areas that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance flood is also referred to as the base flood or 100-year flood. The SFHAs in Boone County are identified in Figure 25.

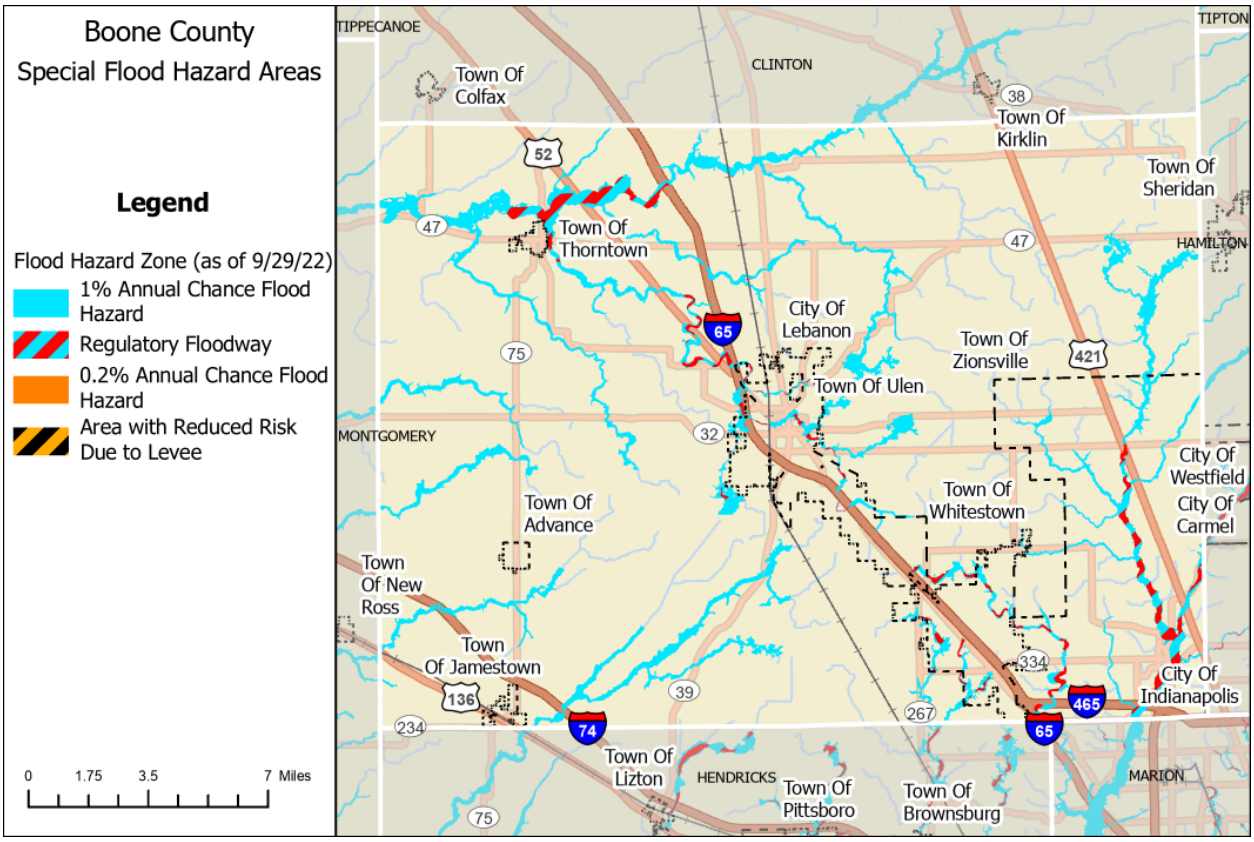


Figure 25. Special Flood Hazard Areas (SFHA) in Boone County

National Flood Insurance Program Analysis

If a structure is in a high-risk area, the 1% annual chance flood hazard, and the owner has a mortgage, they are required to purchase flood insurance through a federally regulated or insured lender. Flood insurance is not federally required in moderate- to low-risk areas, but it is still recommended. The National Flood Insurance Program (NFIP) provides flood insurance to protect against flood loss via federal government funding if is a community enforces a floodplain management ordinance.

Since the NFIP plays such a vital role in mitigating flood risk, understanding the status of hazard maps and reported losses occurring can provide insight on new strategies to mitigate the impacts and losses of future events. The communities in Boone County that participate in the NFIP, their NFIP number, current effective map date, and program entry date are provided in Table 17.

Table 17. NFIP Participation and Mapping Dates

NFIP Community	NFIP Number	Effective Map Date	Join Date
Boone County	180011#	1/18/2012	9/16/1982
City of Lebanon	180113#	1/18/2012	5/3/1982
Town of Whitestown	180015#	1/18/2012	4/5/1988
Town of Zionsville	180016#	1/18/2012	12/15/1981
Communities Not Participating in NFIP			
Town of Thorntown	180014#	1/18/2012	1/19/2012 (Suspended)
Town of Ulen	180514#	1/18/2012	11/29/1975
Communities without SFHA			
Town of Advance			
Town of Jamestown			

FEMA has a competitive grant program, the Flood Mitigation Assistance (FMA) grant, that provides funding to states, local communities, federally recognized tribes and territories for projects that reduce or eliminate the risk of repetitive flood damage to buildings insurance by the NFIP.

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP, which has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978. FEMA defines a severe repetitive loss structure as a single family property that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

The Indiana State NFIP Coordinator and FEMA Region V were contacted to determine the location of repetitive or severe repetitive loss structures. As of July 7, 2022, Boone County does not have any repetitive loss properties. To help understand flood risk, the total structures in the SFHA are compared to the total number of policies in the community. This is based on approximate building locations, and therefore should not be used as an absolute comparison. However, this information may be used to target further mitigation through further engagement with the NFIP. In addition, this may be a tool to help understand if there would be an interest in becoming involved in the discount program with the Community Rating System (CRS). Table 18 provides a comparison of the number of buildings in the 1% flood probability boundary to the number of policies as of 6/30/2022, and then provides a percent of insured structures represented by those policies. The last column in the table provides an estimate of the exposure that is insured.

Table 18. Comparison of Estimated Building Exposure to Insured Buildings

Community	Buildings in 100 Year Floodplain	Replacement Cost of Buildings in Floodplain	Number of Policies	Total Policy Coverage	Approximate Percent of Buildings Insured	Approximate Percent of Replacement Cost Insured
Boone County	346	$60,673,639	19	$4,909,000	6%	8%
Lebanon	2,263	$249,049,356	98	$14,050,900	4%	6%
Ulen	3	$31,430	0	--	0%	0%
Whitestown	78	$33,011,000	7	$1,829,000	9%	6%
Zionsville	285	$38,438,970	45	$13,375,000	16%	35%
Unknown			12	$2,007,000		

4.3.1.6 Risk Identification for Flood Hazard

The planning team determined that the probability of flash flooding and flooding is likely with limited consequences. Flash flooding has a warning time of 6 to 12 hours, while flooding has a warning of more than 24 hours. Duration for flash flooding was determined to be less than 1 week and more than 1 week for flooding. The calculated CPRI for flash flooding is 2.7, and 2.5 for flooding.

4.3.1.7 Vulnerability Analysis for Flash Flooding

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood.

4.3.1.8 Hazus-MH Analysis Using 100 Year (1% chance) Flood Boundary

A depth grid representing the 1% annual chance flood event in Boone County was created using the SFHA and a 2.5-foot resolution, LiDAR derived DEM. Hazus-MH was then used to estimate the potential economic impacts to structures located within the SFHA. The depth of water at the location of each building was related to depth damage curves to determine building and content losses.

Hazus-MH estimates that buildings located within the SFHA county-wide could sustain with $23 million in building losses and an additional $128 million in content losses. In the modeled scenario, the area with the most damage was Lebanon, with a potential $10 million in building losses and $44 million in content losses. The total estimated cost of damaged buildings by community are given in Table 19. Table 20 gives the total content losses. Figure 26 depicts the Boone County buildings that are damaged. Figure 27 and Figure 28 displays community maps of damaged buildings.

Table 19. Estimated Building Loss for Damaged Buildings by Community and Occupancy Class

Building Occupancy Class	Community				
	Boone County	Lebanon	Whitestown	Zionsville	Ulen
Agriculture	$444,134	--	--	$25,231	--
Commercial	$1,502	$85,670	$28,122	--	--
Education	--	--	--	--	--
Government	--	$639,107	--	$82,895	--
Industrial	$7,944,651	$483,437	--	--	--
Religious	--	--	--	$18,882	--
Residential	$1,840,517	$9,642,756	$66,595	$2,091,904	$157,148
Total Building Loss	**$10,230,804**	**$10,850,970**	**$94,717**	**$2,218,913**	**$157,148**

Table 20. Estimated Content Loss for Damaged Buildings by Community and Occupancy Class

Building Occupancy Class	Community				
	Boone County	Lebanon	Whitestown	Zionsville	Ulen
Agriculture	$6,483,319	--	--	$4,432,072	--
Commercial	$36,208	$25,873,776	$619,546	--	--
Education	--	--	--	--	--
Government	--	$2,419,127	--	$4,197,063	--
Industrial	$57,390,791	$1,786,802	--	--	--
Religious	$604,598	--	--	$2,841,478	--
Residential	$2,825,077	$14,683,907	$89,986	$3,863,388	$137,388
Total Building Loss	**$67,339,992**	**$44,763,613**	**$709,532**	**$15,334,001**	**$137,388**

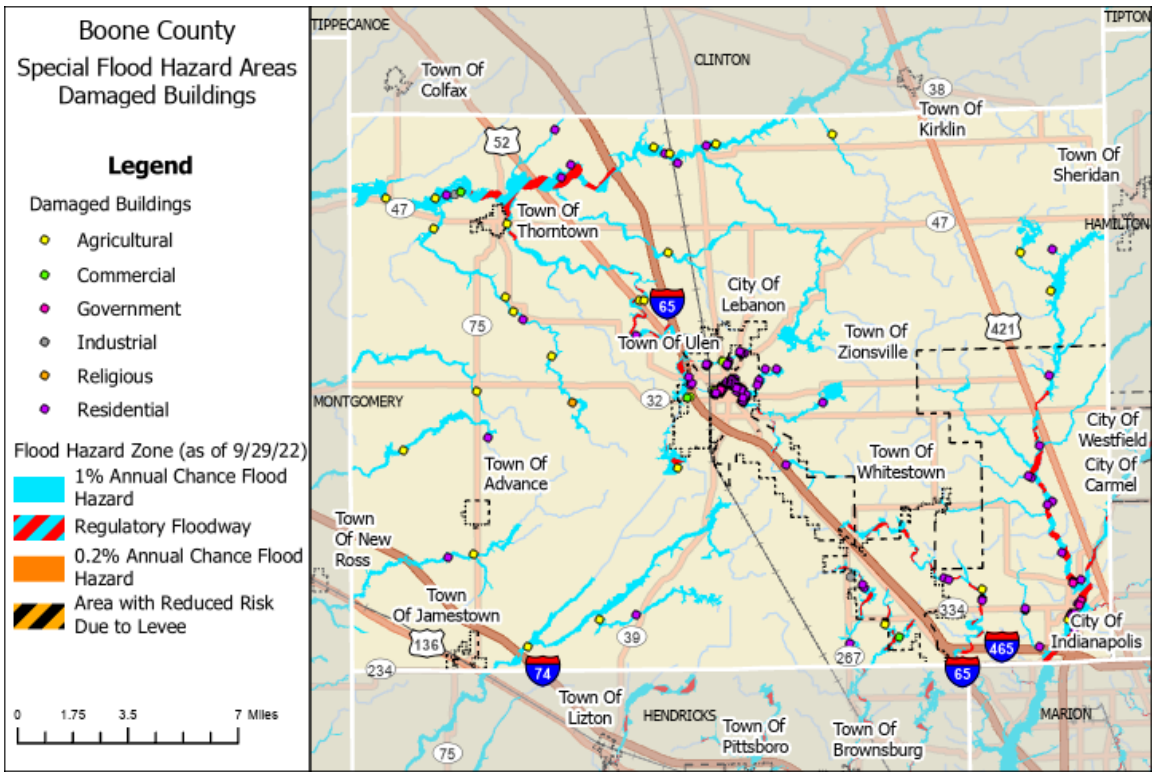


Figure 26. Estimated Buildings Damaged in SFHA

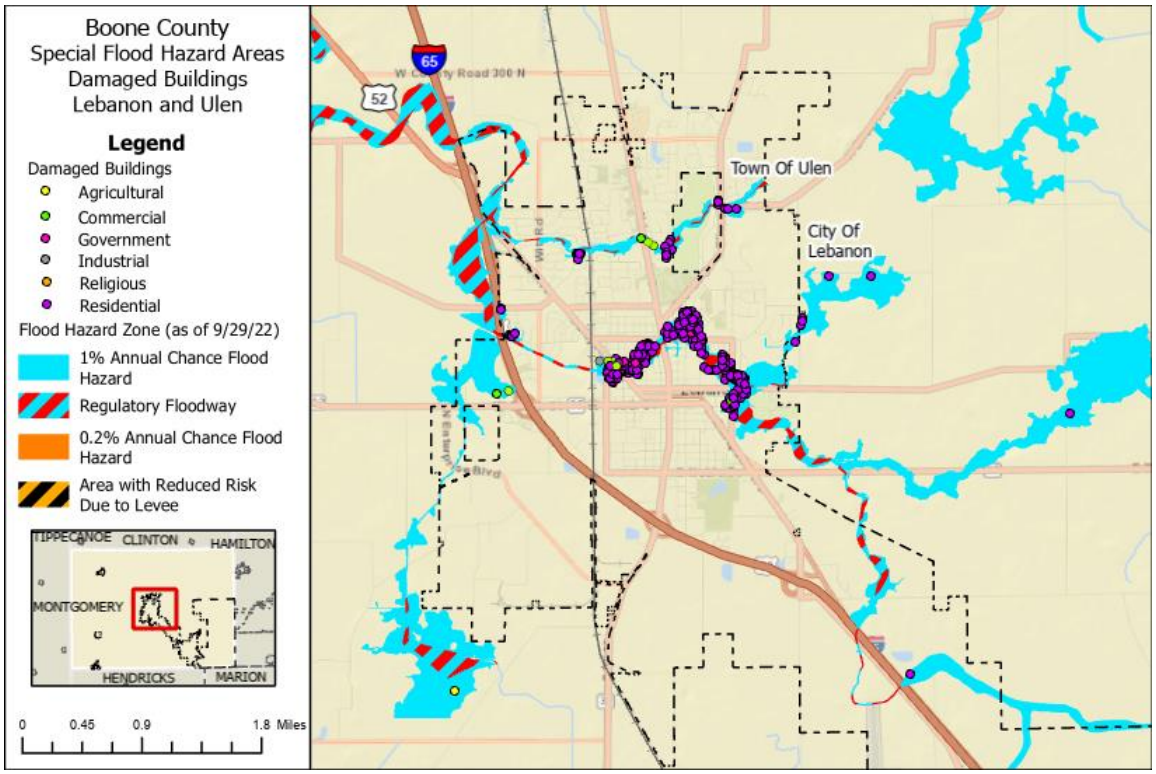


Figure 27. Estimated Buildings Damaged in SFHA (City of Lebanon and Town of Ulen)

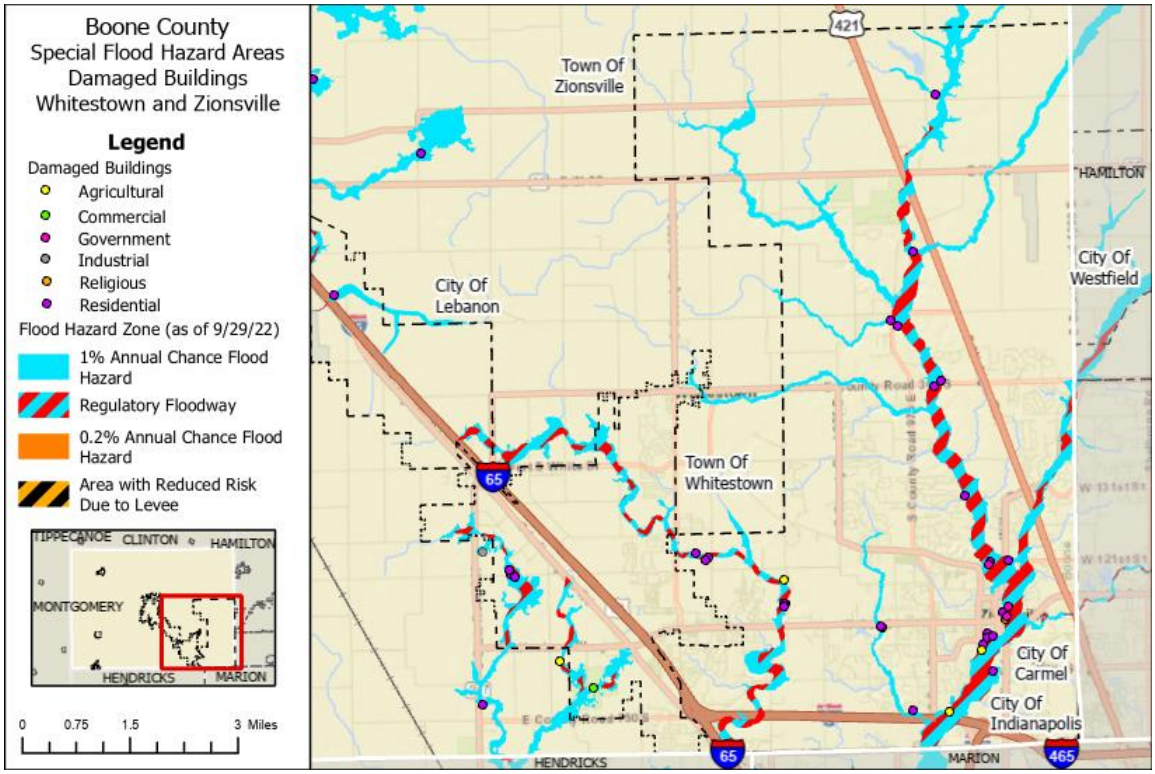


Figure 28. Estimated Buildings Damaged in SFHA (Towns of Whitestown and Zionsville)

Overlay Analysis of Essential Facilities

Essential and other critical facilities can become damaged during the 1% annual chance flood. Damages to these types of facilities can severely impact the ability of the community to respond and recover from disasters. Damaged facilities located within towns or cities have been mapped in the following figures. In the City of Lebanon, 1 school was modeled as having sustained damaged in the 1% annual chance flood, as displayed in Figure 29. Table 21 contains the name of each facility within the SFHA.

Table 21.Table of Essential Facilities within SFHA

Facility Type	Facility Name
School	Lmnop Child Care

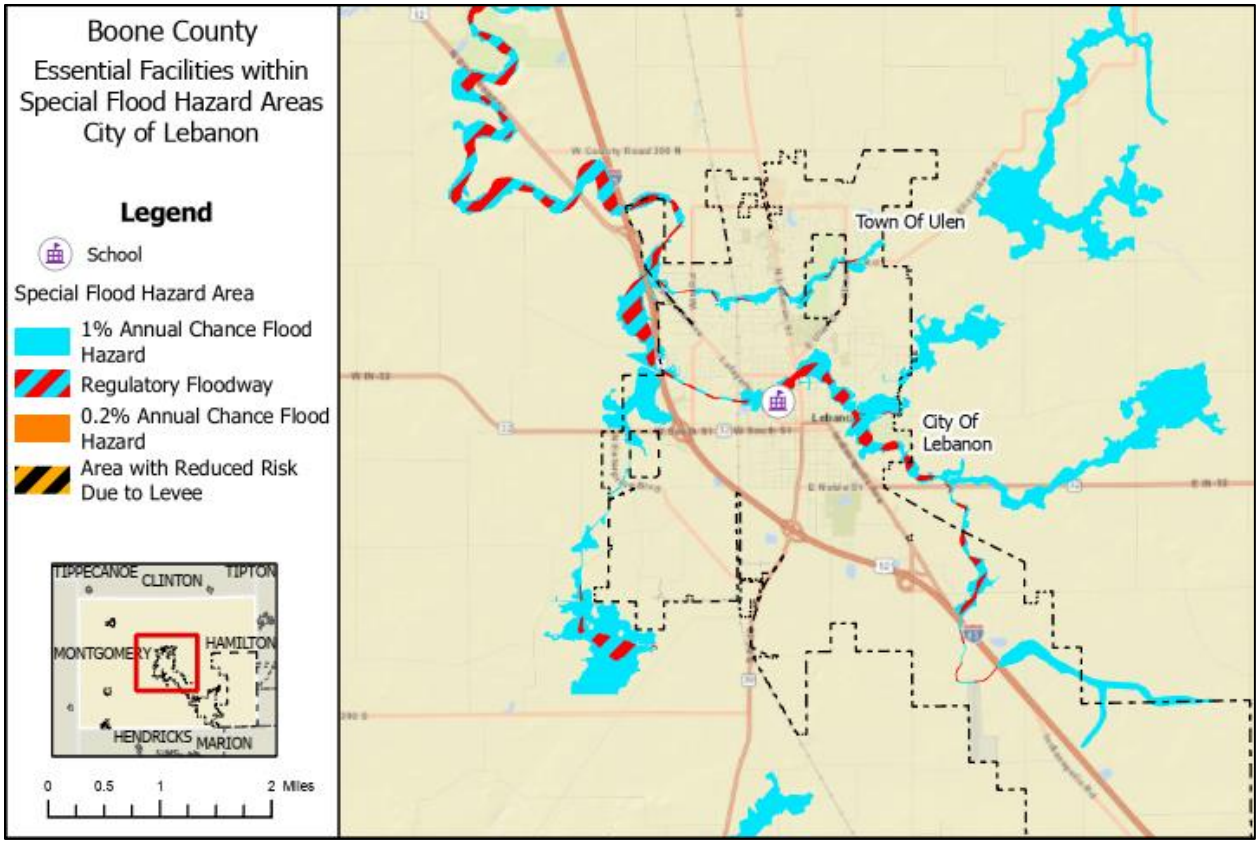


Figure 29. Essential Facilities within the SFHA (City of Lebanon)

4.3.1.9 IDNR Best Available Data Layer

The IDNR's Division of Water created a dataset for Indiana that incorporates the detailed-level floodplain data in the FEMA FIRMs and enhanced it with a lower level, but still quality, floodplain data for most streams in the state known as the "best available" floodplain layer. FEMA's dataset remains the official dataset of the NFIP; the "best available" layer assists in floodplain management applications and determining limits of jurisdiction for the Indiana Flood Control Act. The map in Figure 30 was created using the best available data layer from IDNR along with the county's building inventory. To show the possible buildings affected in the best available layer, only the buildings within the flood boundary have been mapped. A comparison of the damaged buildings for both the regulated SFHA and the DNR best available data are listed in Table 22.

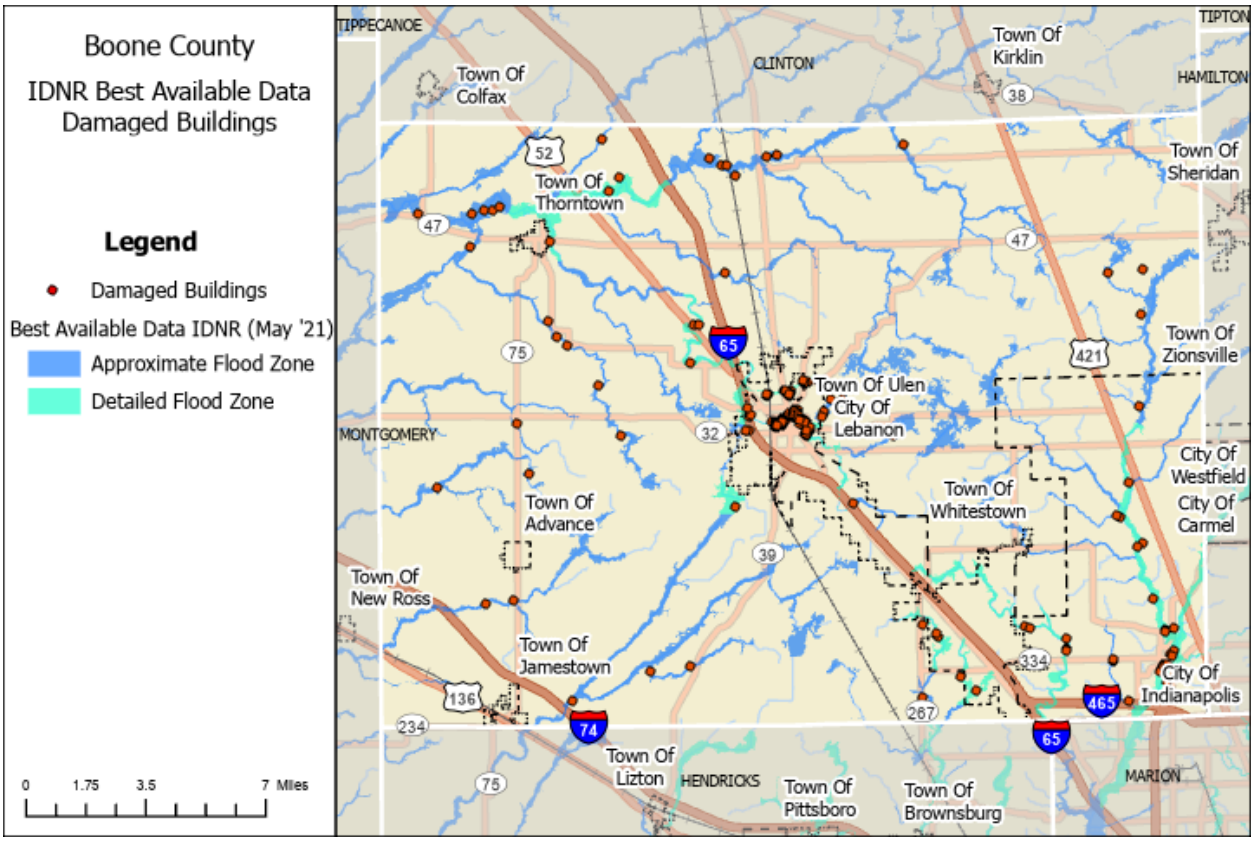


Figure 30. Estimated Buildings Damaged in IDNR Best Available Data

Table 22. Buildings in the SFHA and DNR Best Available Data Flood Zones

Occupancy Class	FEMA SFHA	DNR Best Available
Agricultural	162	214
Commercial	81	81
Educational	--	--
Government	30	30
Industrial	36	36
Religious	25	25
Residential	2,654	2,764
Total	**2,988**	**3,150**

4.3.1.10 Community Development Trends and Future Vulnerability

Controlling floodplain development is the key to reducing flood-related damages. Areas with recent development within the county may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible. Damage to these can cause the backup of water, sewage, and debris into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions.

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood.

The 3% of the population without access to a vehicle may be limited or incapable of evacuating in case of flooding, which can lead to injury and possibly death. Flood waters threaten manufactured homes more because of the materials used to create the home. Flooding damage to the 17 parcels with manufactured home means a greater probability those individuals will be without a habitable home after a flood event.

Flooding damages or destroys transportation infrastructure. Effects to transportation, especially large thoroughfares, removes the ability for about 73% of the community and 8,608 commuters driving in to/out of the county to get to work.

4.3.1.11 Climate Change and Flooding

As one of Indiana's most frequent hazards, flooding is anticipated to be significantly impacted by climate change. With rising global temperatures and changes in precipitation patterns outlined in Section 3, the state is likely to experience more intense and frequent rainfall events. These rainfall events will happen state- and county-wide. Extreme rainfalls can overwhelm existing drainage systems and natural watercourses, leading to a higher risk of flash floods and increased surface runoff.

4.3.1.12 Relationship to other Hazards

Severe storms and blizzards – Summer storms lead to logjams, and snowmelt can contribute to flooding and, under the right circumstances, flash flooding.

Dam Failure – Flood events can compromise the structural integrity of dams.

Public Health – Public health can be affected by wastewater spills due to flooding or power failures.

Water Main Breaks – Surges in water pressure by water pumps starting after power outages can lead to water main breaks.

4.3.2 Earthquake

4.3.2.1 Hazard Definition for Earthquake

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 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. Ninety-five percent of earthquakes occur at the plate boundaries; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern US.

Ground shaking and tremors from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and communication (e.g., phone, cable, Internet) services; and sometimes trigger landslides, flash floods, and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil and trailers or homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Magnitude is determined from measurements on seismographs and measures the energy released at the source of the earthquake. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined from effects on people, human structures, and the natural environment. Table 23 and Table 24 list earthquake magnitudes and their corresponding intensities.

Table 23. Abbreviated Modified Mercalli Intensity Scale

Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Table 24. Earthquake Magnitude vs. Modified Mercalli Intensity Scale

Earthquake Magnitude	Typical maximum Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II – III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.9	VII – IX
7.0 and higher	VIII or higher

4.3.2.2 Earthquake History in Boone County

The most seismically active area in the Central US is referred to as the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the central US capable of producing damaging earthquakes. The Wabash Valley Fault System in Indiana shows evidence of large earthquakes in its geologic history, and there may be other currently unidentified faults that could produce strong earthquakes.

At least 47 earthquakes, M3.0 or greater, have occurred in Indiana since 1817. The last such event in Indiana was a M3.8 centered northeast of Montezuma on June 17, 2021. While there are no recorded earthquakes in Boone County, there are records of earthquakes in surrounding counties. Montgomery county experienced a 3.2 magnitude earthquake in December of 1990. The earthquake was minor with weak shaking near the epicenter. The two most recent earthquakes in Boone County occurred 1990 (3.58 magnitude) and 2000 (3.28 magnitude). There were no reports of deaths or significant damage for either earthquake.

Most of the seismic activity in Indiana occurs in the southwestern region of the state. Earthquakes originate just across the boundary in Illinois and can be felt in Indiana.

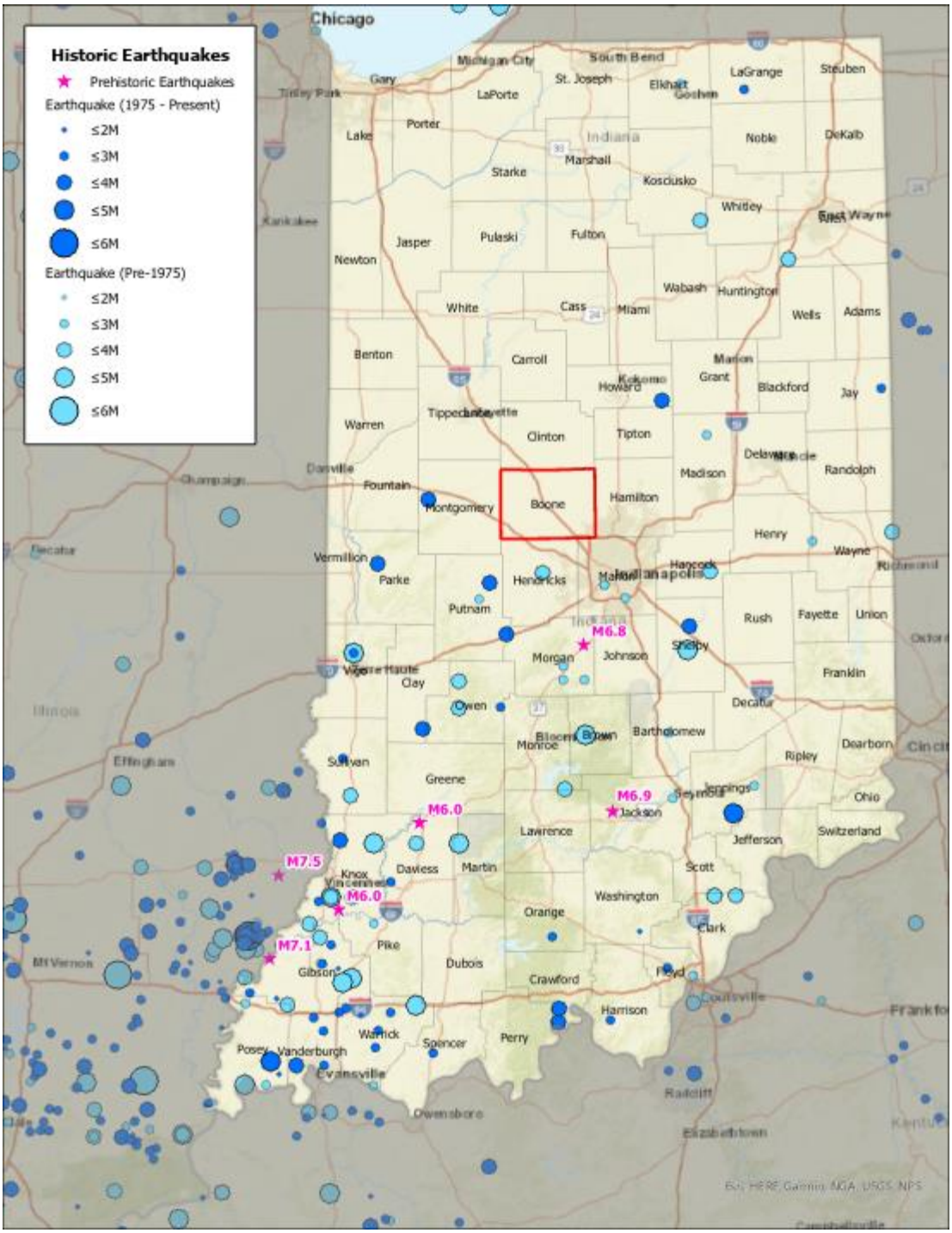


Figure 31. Indiana Earthquake Epicenters Map

4.3.2.3 Geographic Location for Earthquake

Boone County occupies a region susceptible to two earthquake threats: the threat of an earthquake along the Wabash Valley Fault System and the New Madrid Fault Line. Return

periods for large earthquakes within the New Madrid System are estimated to be 500 years. Moderate quakes between magnitude 5.5 and 6.0 can recur within approximately 150 years or less. The Wabash Valley Fault System is a sleeper that threatens the southwest quadrant of the state and may generate an earthquake large enough to cause damage as far north and east as Central Michigan.

4.3.2.4 Hazard Extent for Earthquake

The extent of the earthquake is countywide. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. A National Earthquake Hazards Reduction Program (NEHRP) compliant soils map was used for the analysis which was provided by IGS. The map identifies the soils most susceptible to failure and ranks their liquefaction potential. Boone County is primarily made up of soils ranking as moderate potential for liquefaction.

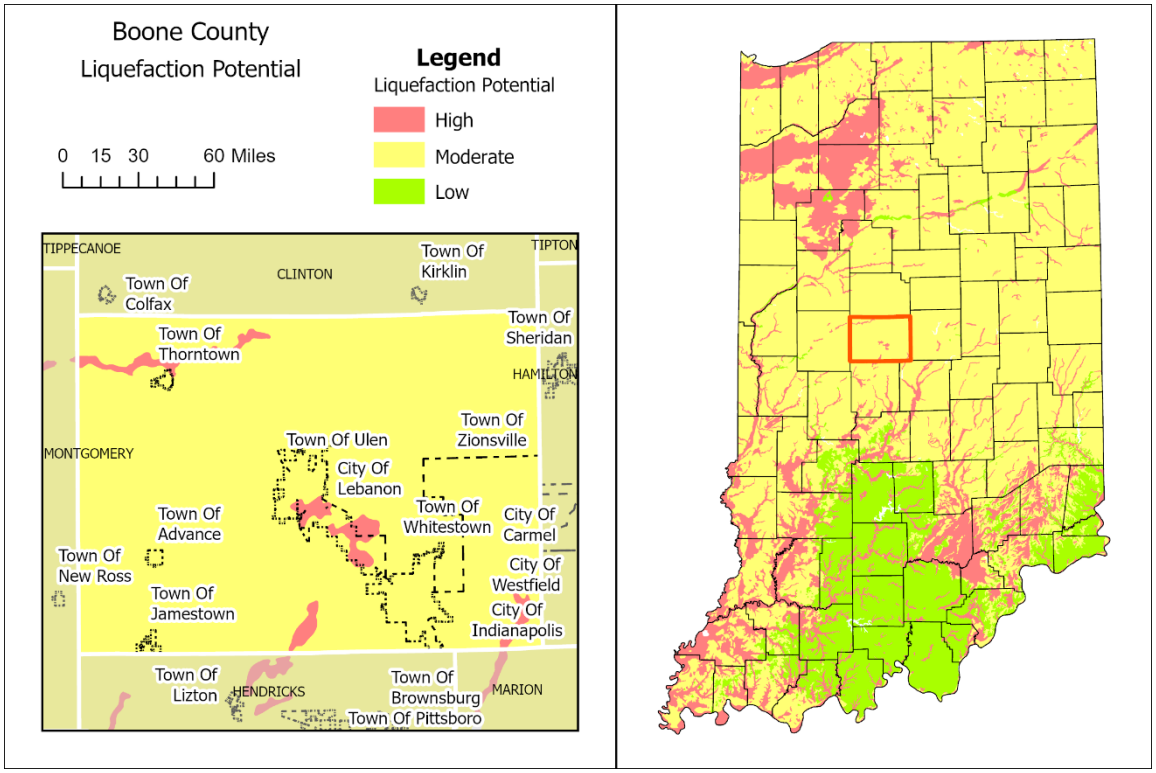


Figure 32. NEHRP State of Indiana Liquefaction Potential

4.3.2.5 Risk Identification for Earthquake

The planning team determined that the probability of an earthquake as possible with limited consequences. Earthquakes were determined to have a warning time of less than six hours with a duration less than 24 hours. The calculated CPRI for earthquakes in Boone County is 2.3.

4.3.2.6 Vulnerability Analysis for Earthquake

During an earthquake, the types of infrastructure that could be impacted include roadways, runways, utility lines and pipes, railroads, and bridges. Because an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that any number of these structures could become damaged in the event of an earthquake. The impacts to these structures include broken, failed, or impassable roadways and runways; broken or failed utility lines, such as loss of power or gas to a community; and railway failure from broken or impassable tracks. Bridges also could fail or become impassable, causing traffic risks, and ports could be damaged, which would limit the shipment of goods. Typical scenarios are described to gauge the anticipated impacts of earthquakes in the county in terms of numbers and types of buildings and infrastructure.

The Hazus-MH Earthquake Analysis model estimates damages and losses to buildings, lifelines, and essential facilities from deterministic and probabilistic scenarios.

The building damage loss amount is developed by the building inventory attributes inputs. Depending on the material of construction, type of foundation, and year of construction, the expense in rebuilding the structure will be affected.

Three events were modeled. The first scenario is the New Madrid Scenario. This event represents a large-magnitude, high-impact regional event situated in the Mississippi Valley region approximately 100 miles from the southwestern corner of the state. The magnitude of this event (M7.6) approximates the size of the largest of the three earthquakes in the 1811-1812 New Madrid sequence. The second scenario is the Wabash Valley Scenario. This event represents a “worst case” scenario of a large-magnitude (M7.3) event occurring along the Wabash Valley fault system, just outside the state of Indiana in southeastern Illinois. The model uses a liquefaction data map to account for the local soil conditions to estimate ground motion and liquefaction. The third scenario is a 500-year probabilistic scenario, which seeks to represent the cumulative hazard facing each area of the state based on a probabilistic likelihood of ground shaking associated with all the sources that could potentially affect a given area. In principle, this analysis evaluates the average impacts of a multitude of possible earthquake sources with a magnitude that would be typical of that expected for a 500-year return.

Table 25 displays damages for all three scenarios run by Hazus-MH. In addition to the dollar amount of building losses, the table displays the number of buildings damaged and to what extent. Figure 33 through Figure 35 display the total building losses for each scenario broken down by census tract.

Table 25. Building Damage Summary by Earthquake Event

Scenario	Building Loss in Dollars	Slight	Moderate	Extensive	Complete
New Madrid (M7.6)	$2,898,500	449	22	1	0
Wabash Valley (M7.3)	$28,775,000	3,318	213	9	0
Probabilistic (500-Year)	$11,355,300	1,283	62	2	0

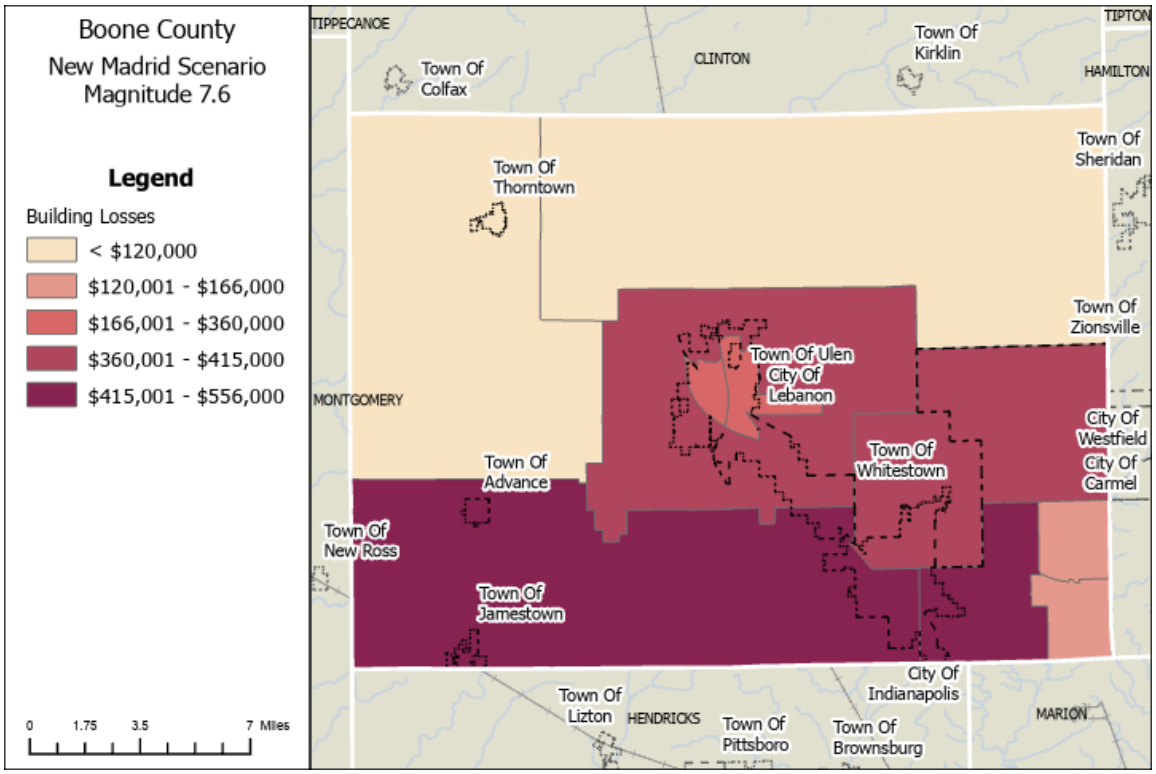


Figure 33. New Madrid Earthquake Scenario – Total Building Losses

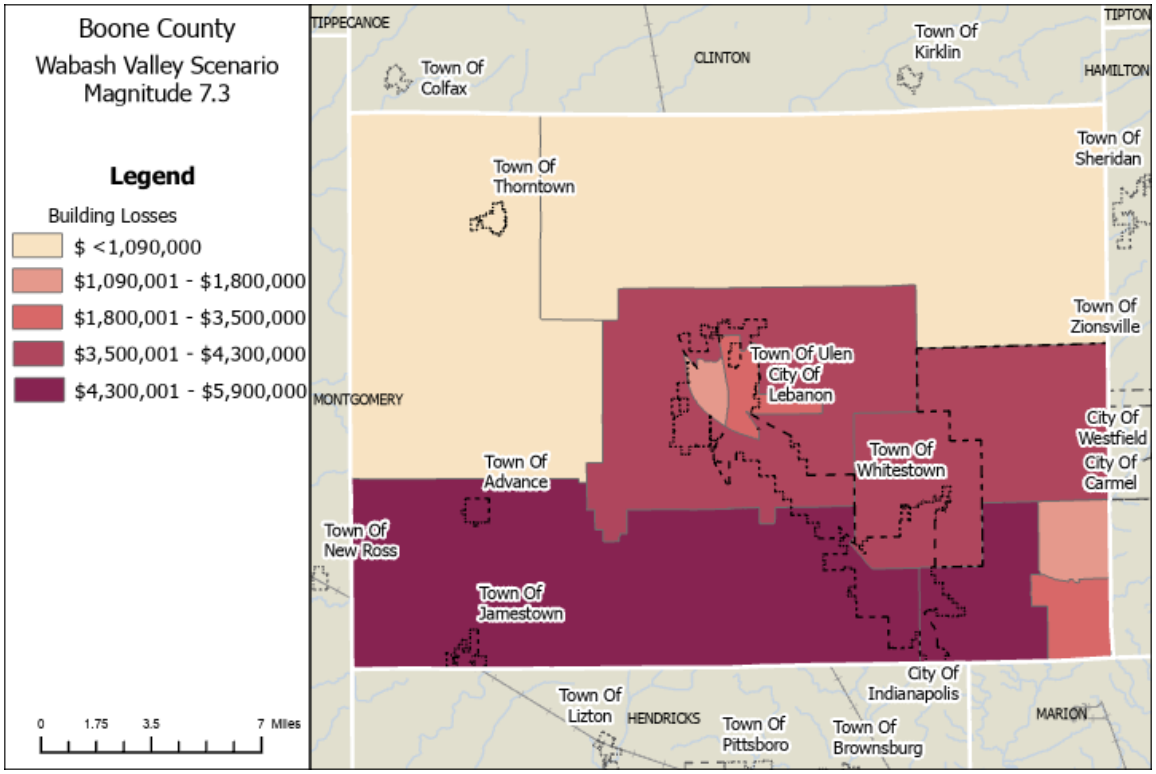


Figure 34. Wabash Valley Earthquake Scenario – Total Building Losses

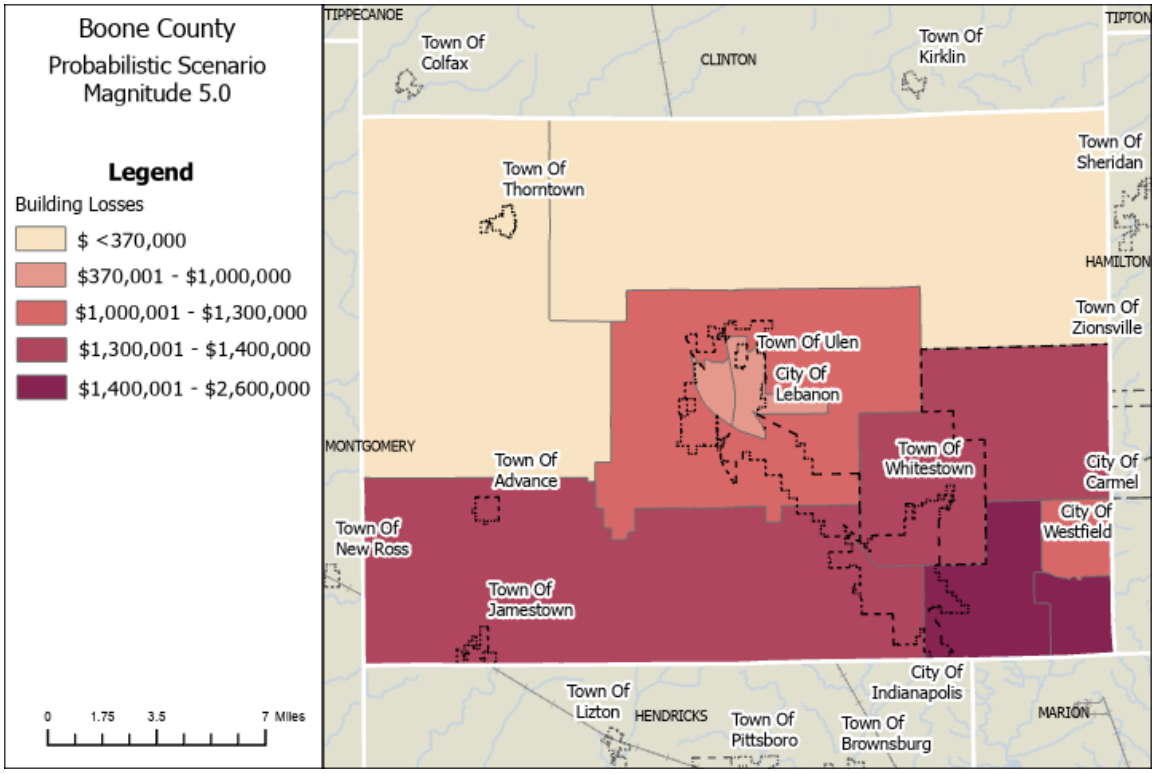


Figure 35. 500-Year Probabilistic Earthquake Scenario – Total Building Losses

Building losses account for only a portion of the total economic impact that could be realized from the modeled scenarios. Additional building related impacts could include lost wages, rental income, and other elements of business interruption; damages to building contents, social impacts.

4.3.2.7 Community Development Trends and Future Vulnerability

Community development will occur outside of the low-lying areas in floodplains with a water table within five feet of grade that is susceptible to liquefaction. New construction, especially critical facilities, will accommodate earthquake mitigation design standards.

The possibility of the occurrence of a catastrophic earthquake in the central and eastern United States is real as evidenced by history and described through this section. The impacts of significant earthquakes affect large areas, terminating public services and systems needed to aid the suffering and displaced. These impaired systems are interrelated in the hardest struck zones. Power lines, water and sanitary lines, and public communications may be lost; highways, railways, rivers, and ports may not allow transportation to the affected region. Furthermore, essential facilities such as fire and police departments and hospitals may be disrupted if not previously improved to resist earthquakes.

As with hurricanes, mass relocation may be necessary, but the residents without transportation may not be able to evacuate, receive aid if access is cut off for emergency personnel to respond, or even communication in the aftermath of a significant event.

Boone County does not account for earthquake Building Code requirements, which puts residents at greater risk of injury or death from unsuitable building conditions during an earthquake.

Currently, broadband infrastructure cannot withstand strong earthquake shaking. Downed broadband inhibits emergency personnel from responding at full capacity, may affect residents' ability to get in contact with first responders in case of injury or building collapse, and impacts the ability for residents to be in contact with family and friends after an event.

4.3.2.8 Climate Change and Earthquakes

There is no hard evidence specifically linking the effects of climate change on earthquakes, especially in Indiana. Some scientists are beginning to consider that associated changes in ground water levels due to changing precipitation patterns as result of climate change could theoretically influence stress on faults and could potentially cause minor seismic activity. This is not scientifically acknowledged or agreed upon to-date.

4.3.2.9 Relationship to other Hazards

Ground Failure – According to the National Academies of Sciences Engineering Medicine, the major cause of earthquake damage is ground failure. Some ground failures induced by earthquake are the result of liquefaction of saturated sands and silts, the weakening of

sensitive clays, or by the crumbling and breaking away of soil and rock on steep slopes. Ground failure has been known to cause buildings to collapse and to severely hinder communication and transportation systems.

Utility Failure – Earthquakes frequently damage utilities, particularly underground facilities, and older storage tanks, but nearly every utility can be vulnerable to the shaking earthquakes induce. Seismic damage to buried utilities are often influenced by ground conditions and subsurface strain distribution. Since utilities are typically part of a larger network system, damages to key locations in a network can potentially set off a chain reaction that affects significant portions of the utility system. Earthquake damage to utilities can also potentially create secondary hazards such as fires or hazmat situations since some utilities may handle volatile or flammable substances.

4.3.3 Ground Failure

4.3.3.1 Hazard Definition for Ground Failure

Indiana has three types of ground failure. Ground failure is a general reference to landslides, fluvial erosion, and subsidence to include karst sinkholes and underground coal mine collapse.

Landslides

Landslides are a serious geologic hazard common to almost every state in the US. Nationally, it is estimated that they cause up to $2 billion in damages and result in 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The term landslide is a general designation for a variety of downslope movements of earth materials. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. The main causes of landslides include:

- Significant ground vibration
- Slope failure due to excessive downward movement, gravity
- Groundwater table changes (often due to heavy rains)

Preventive and remedial measures include modifying the landscape of a slope, controlling the groundwater, constructing tie backs, and spreading rock nets. The expansion of urban and recreational development into hillside areas has resulted in an increasing number of properties subject to damage as a result of landslides. Landslides commonly occur in connection with other major natural disasters such as earthquakes, wildfires, and floods.

Karst

Southern Indiana has a network of underground caves formed by the natural physical interaction of groundwater with its bedrock, forming what is known as karst landscape. According to the Indiana Geological & Water Survey, karst topography is a distinctive type of landscape largely shaped by the dissolving action of groundwater (naturally acidic) on carbonate bedrock, which in this area is mostly limestone. This geological process, which takes thousands of years, is characterized by unique features such as sinkholes, fissures, caves, disappearing streams, springs, rolling topography, and underground drainage systems. Structures built above a karst formation could potentially be subject to land subsidence and collapse into a resulting sinkhole.

Underground Coal Mines

According to the Indiana Geological Survey's GIS Atlas, there are areas of underground coal mines which could lead to ground failure. Roof failure has always been a major concern in underground coal mining. Most underground mines in southwest Indiana are older mines since abandoned and thus susceptible to collapse.

Fluvial Erosion

Streams naturally migrate (change course and move laterally) over time. This movement is called a Fluvial Erosion Hazard or FEH. The rate and intensity of movement is dependent upon many factors including drainage area, geology, and human actions. FEH represents a significant concern in areas where human development and infrastructure are established near natural waterways. In mild cases, this may be seen as the gradual loss of a farm field or the undermining of a fence row when gradual channel migration consumes private land. In more severe cases, the FEH risk may threaten properties and/or structures to the degree that they become uninhabitable or even lost to natural channel processes.

4.3.3.2 Ground Failure History in Boone County

The planning team did not identify any major ground failure events including landslide and land subsidence events.

4.3.3.3 Geographic Location for Ground Failure

The geographic location for ground failure varies depending on the type of ground failure. Karst areas for Boone County are mapped in Figure 36. There are no known karst areas in the county.

A 2015 study by the Indiana Geological & Water Survey determined the probability of sinkhole formation throughout southern Indiana. Their analysis is based on the density of known sinkholes, as well as several geologic, topographic, and hydrologic variables that indicate the future vulnerability to sinkhole formation. Figure 37 shows the results of this study, showing that areas with the highest probability of sinkhole development generally occur throughout

central southern Indiana, with less chance of sinkhole occurrence toward the eastern and western parts of southern Indiana.

Underground coal mines in Boone County are illustrated in Figure 38. There are no underground coal mines in Boone County.

Figure 39 highlights streams found to be “actively migrating” which can indicate an increased FEH risk. Many streams in the western two-thirds of the county are actively migrating.

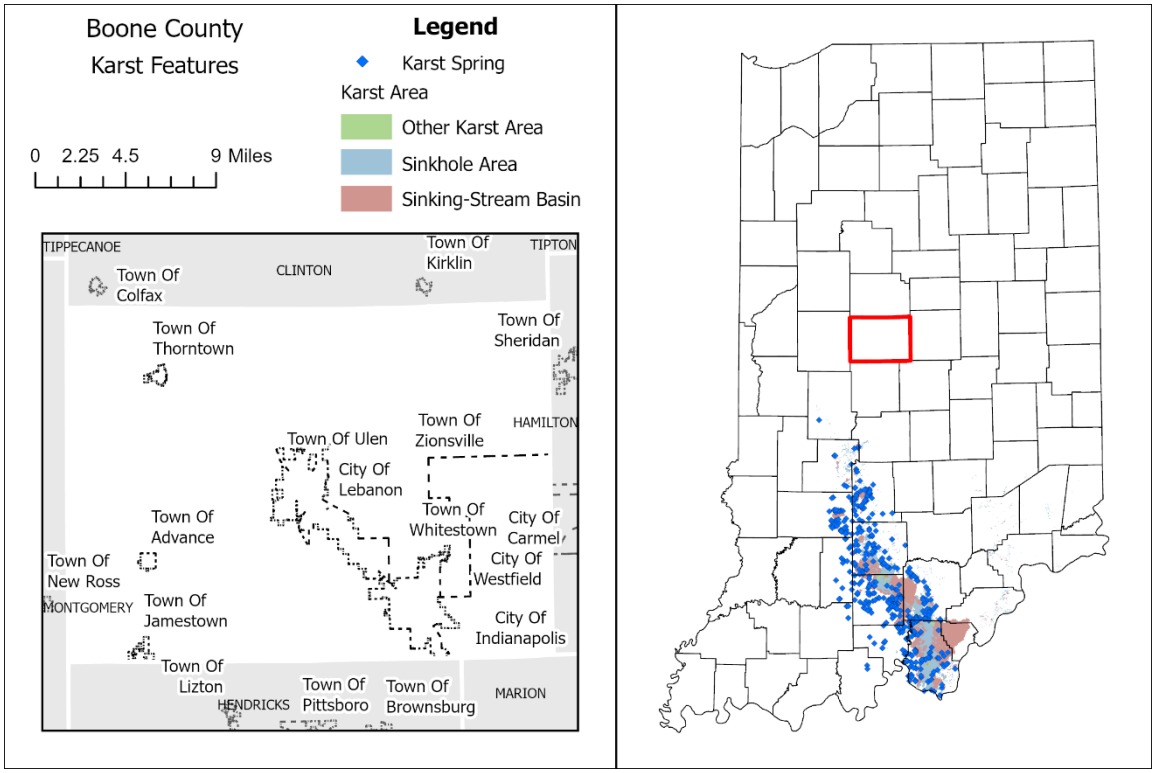


Figure 36. Boone County Karst Features

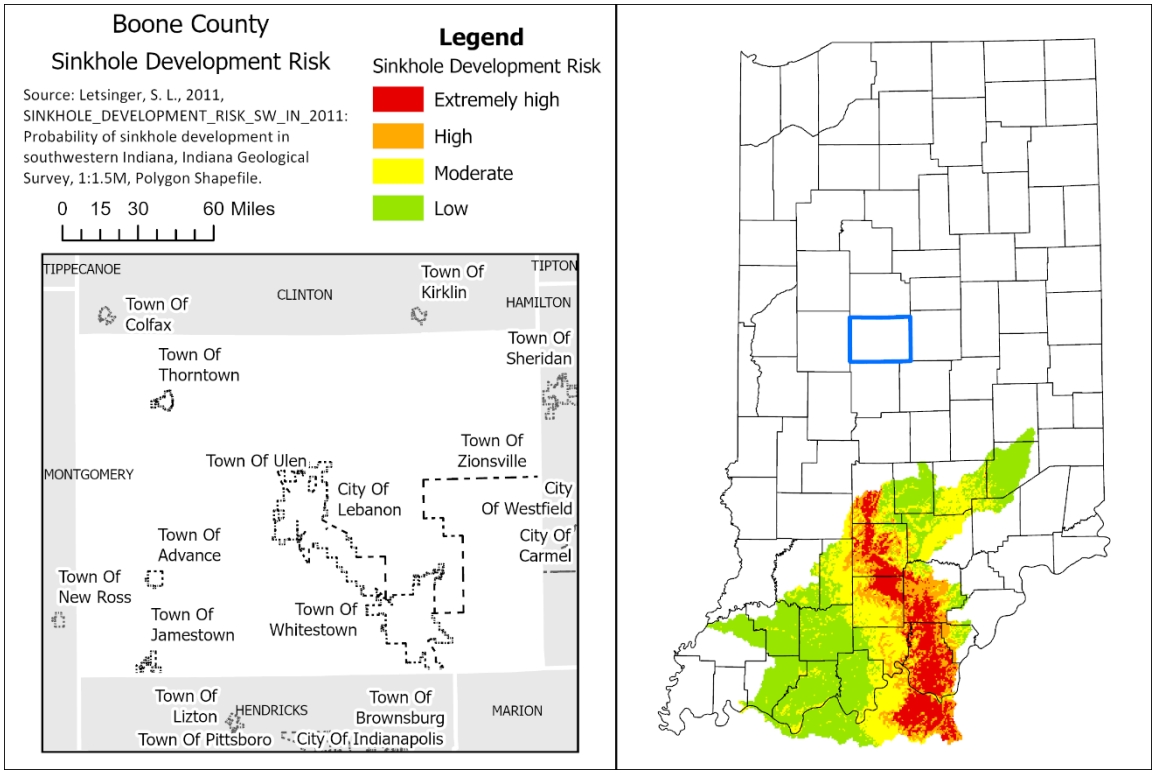


Figure 37. Risk of Sinkhole Development

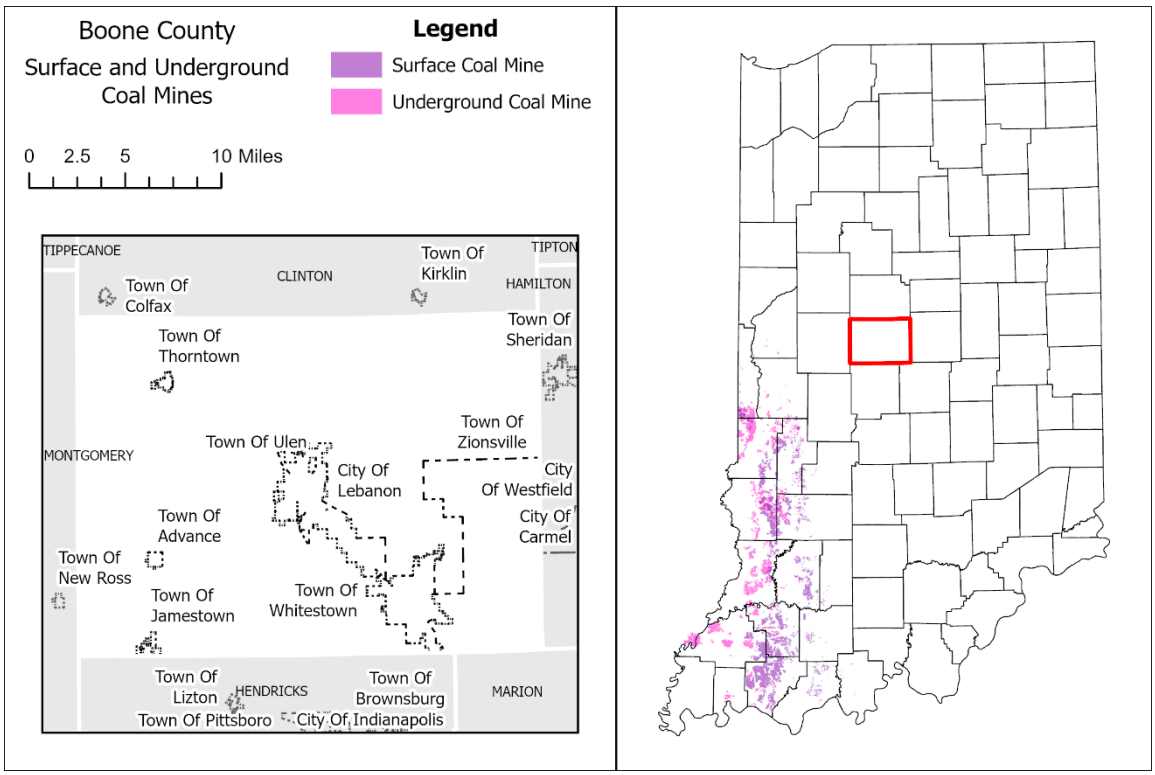


Figure 38. Surface and Underground Coal Mines

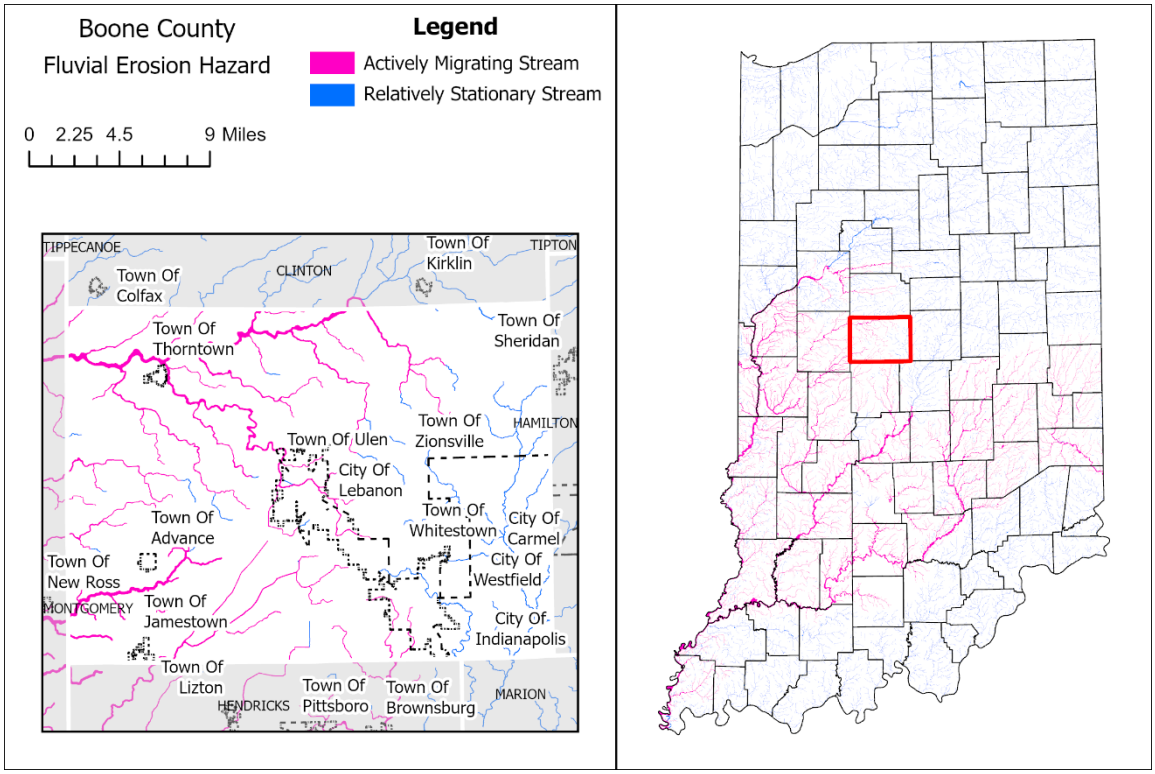


Figure 39. Boone County FEH Risk

4.3.3.4 Hazard Extent for Ground Failure

The extent of the ground failure hazard is closely related to development near the regions that are at risk. The extent will vary within these areas depending on the potential of elevation change, as well as the size of the underground structure. The hazard extent of ground failure is related to various concentrated areas as shown on the maps.

4.3.3.5 Risk Identification for Ground Failure

The planning team determined that the probability of ground failure is unlikely with limited consequences. The warning time for ground failure is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for ground failure is 1.85.

4.3.3.6 Vulnerability Analysis for Ground Failure

The US Geological Survey's Landslide Overview Map of the Conterminous United States shows two large zones in south-central Indiana as having moderate susceptibility for landslides, but with low incidence of landslides. In contrast, the majority of northern Indiana has a very low (less than 1.5% of the area involved) incidence of landslides and only the northwest is shown as having a moderate level of susceptibility.

As seen in Figure 40, Boone County predominantly lies in the low landslide incidence zone.

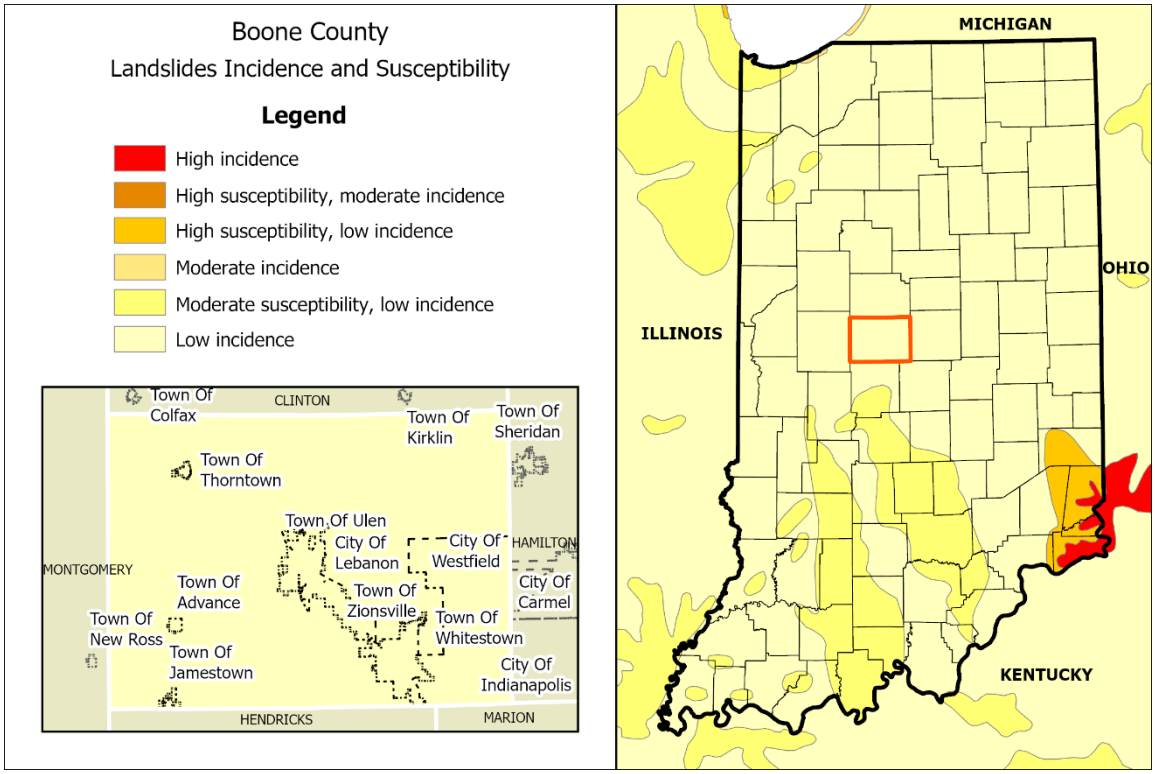


Figure 40. USGS Landslide Overview Map

4.3.3.7 Community Development and Future Vulnerability

All future communities, buildings, and infrastructure will remain vulnerable to ground failure in the areas of Boone County where underground mine features exist, where the structures are located near streams and rivers, and in areas of significant elevation change. In areas with higher levels of population, the vulnerability is greater than in open areas with no infrastructure demands. Abandoned underground mine subsidence may affect several locations within the county; therefore, buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas. Currently, Boone County reviews new developments for compliance with the local zoning ordinance. Newly planned construction should be reviewed with the historical mining maps to minimize potential subsidence structural damage.

4.3.3.8 Climate Change and Ground Failure

Increased frequency and intensity of extreme weather events like heavy rainfall, prolonged droughts, and rapid snowmelt contribute to ground failures. In regions prone to landslides, heavy rainfall can saturate the soil, reducing its stability and triggering landslides on steep slopes. Conversely, prolonged droughts lead to soil desiccation, making it more prone to subsidence and sinkholes.

Refer to Section 4.3.5 for additional information on Drought and the effects of climate change of drought. Refer to Section 4.3.6 for more information regarding snowmelt and the associated affects from climate change.

4.3.3.9 Relationship to other Hazards

Flooding – Flooding is typically the leading cause to ground failure, particularly along streams. Ground failure and flooding combine to impact property and infrastructure such as roads and bridges.

4.3.4 Summer Storms and Tornadoes

4.3.4.1 Hazard Definition for Summer Storm

Thunderstorms

Severe thunderstorms are defined as thunderstorms with one or more of the following characteristics: strong winds, large damaging hail, or frequent lightning. Severe thunderstorms most frequently occur in Indiana during the spring and summer but can occur any month of the year at any time of day. A severe thunderstorm's impacts can be localized or widespread in nature. NOAA's National Weather Service classifies a thunderstorm as severe when it meets one or more of the following criteria:

- Hail with a one-inch diameter or greater
- Wind speeds greater than or equal to 58 miles an hour
- Thunderstorms that produce a tornado

The National Weather Service does not consider lightning frequency a criterion for issuing a severe thunderstorm warning; however, frequent, and dangerous lightning is considered a severe weather hazard. The NOAA consistently ranks lightning as one the top weather killers in the United States.

Lightning

Lightning is caused by the discharge of electricity between clouds or between clouds and the surface of the earth. In a thunderstorm there is a rapid gathering of particles of moisture into clouds and forming of large drops of rain. This gathers electric potential until the surface of the cloud (or the enlarged water particles) is insufficient to carry the charge, and a discharge takes place, producing a brilliant flash of light. The power of the electrical charge and intense heat associated with lightning can electrocute on contact, split trees, ignite fires, and cause electrical failures. Most lightning casualties occur in the summer months, during the afternoon and early evening.

Hail

Hail is a product of a severe thunderstorm. Hail consists of layered ice particles which are developed when strong updrafts within the storm carry water droplets above the freezing level. They remain suspended and continue to grow larger, until their weight can no longer be supported by the winds. The NWS uses the following descriptions when estimating hail sizes: pea size is ¼ inch, marble size is ½ inch, dime size is ¾ inch, quarter size is 1 inch, golf ball size is 1 ¾ inches, and baseball size is 2 ¾ inches. Individuals who serve as volunteer "storm spotters" for the NWS are located throughout the state and are instructed to report hail dime size (¾ inch) or greater. Hailstorms can occur throughout the year. The months of maximum hailstorm frequency are typically between May and August. Although hailstorms rarely cause injury or loss of life, they can cause significant damage to property, particularly roofs and vehicles.

Windstorms

Windstorms can and do occur in all months of the year; however, the most severe windstorms usually occur during severe thunderstorms in the warm months. Associated with strong thunderstorms, downbursts are severe localized downdrafts from a thunderstorm or rain shower. This outflow of cool or colder air can create damaging winds at or near the surface. Downburst winds can potentially cause as much damage as a small tornado and are often confused with tornadoes due to the extensive damage that they inflict. As these downburst winds spread out, they are frequently referred to as straight-line winds. Straight-line winds can cause major structural and tree damage over a relatively large area.

Summer storms, including thunderstorms, hailstorms, and windstorms affect Pike County on an annual basis. Thunderstorms are the most common summer hazardous event in the county, occurring primarily during the months of May through August with the severest storms most likely to occur from mid-May through mid-July. Typically, thunderstorms are locally produced by cumulonimbus clouds, are always attended by lightning, and are often accompanied by strong wind gusts, heavy rain, and sometimes hail and tornadoes.

4.3.4.2 Hazard Definition for Tornado

The Glossary of Meteorology defines a tornado as a violently rotating column of air with wind speeds between 40-300 mph, in contact with the ground, either pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud. They develop under three scenarios: (1) along a squall line; (2) in connection with thunderstorm squall lines during hot, humid weather; and (3) in the outer portion of a tropical cyclone. Funnel clouds are rotating columns of air not in contact with the ground. The column of air can reach the ground very quickly and become a tornado.

Since 2007, tornado strength in the United States is ranked based on the Enhanced Fujita scale (EF Scale), replacing the Fujita scale introduced in 1971. The EF scale uses similar principles to

the Fujita scale, with six categories from 0-5, based on wind estimates and damage caused by the tornado. The EF Scale is used extensively by the NWS in investigating tornadoes, and by engineers in correlating damage to buildings and techniques with different wind speeds caused by tornadoes.

Tornado damage curves for the EF Scale are shown in the following table. The approximate width of the damage and minimum percent damage provide a better understanding of the capabilities of the tornado funnels as the sizes increase.

Table 26. EF Scale as Defined by Tornado Path Widths and Damage

Enhanced Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	3,000	100%
EF4	2,400	100%
EF3	1,800	80%
EF2	1,200	50%
EF1	600	10%
EF0	300	0%

4.3.4.3 Summer Storm and Tornado History in Boone County

Thunderstorms

Severe thunderstorms are defined as thunderstorms with one or more of the following characteristics: strong winds, large damaging hail, or frequent lightning. Severe thunderstorms most frequently occur in Indiana during the spring and summer but can occur any month of the year at any time of day. A severe thunderstorm's impacts can be localized or widespread in nature. NOAA's National Weather Service classifies a thunderstorm as severe when it meets one or more of the following criteria:

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Table 27. EF Scale as Defined by Tornado Path Widths and Damage

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	3000	100%
EF4	2400	100%
EF3	1800	80%
EF2	1200	50%
EF1	600	10%
EF0	300	0%

4.3.4.5 Summer Storm and Tornado History in Boone County

Summer Storm History

The history of summer storms in Boone County was determined by analyzing the hail, high wind, lightning, strong wind, and thunderstorm wind events for the county in the NCEI database. There were 202 summer storm-related reports from 1966 through 2011. There have been 91 summer storm-related reports from 2012 through 2021. A thunderstorm wind event in July 2015 led to a driver being injured by a falling tree. Several events resulted in property damage costs. A thunderstorm wind event in April 2020 in Lebanon resulted in an estimated $100,000 in property damage. Another thunderstorm wind event in July 2016 in Whitestown resulted in an estimated $30,000 in property damage. This event led to snapped trees, downed tree limbs and fences, blown off roof shingles, and damaged air conditioning units.

Additional NCEI events and details about their associated impacts can be found in Appendix C. Figure 41 displays the locations for historic hail and wind events in the county.

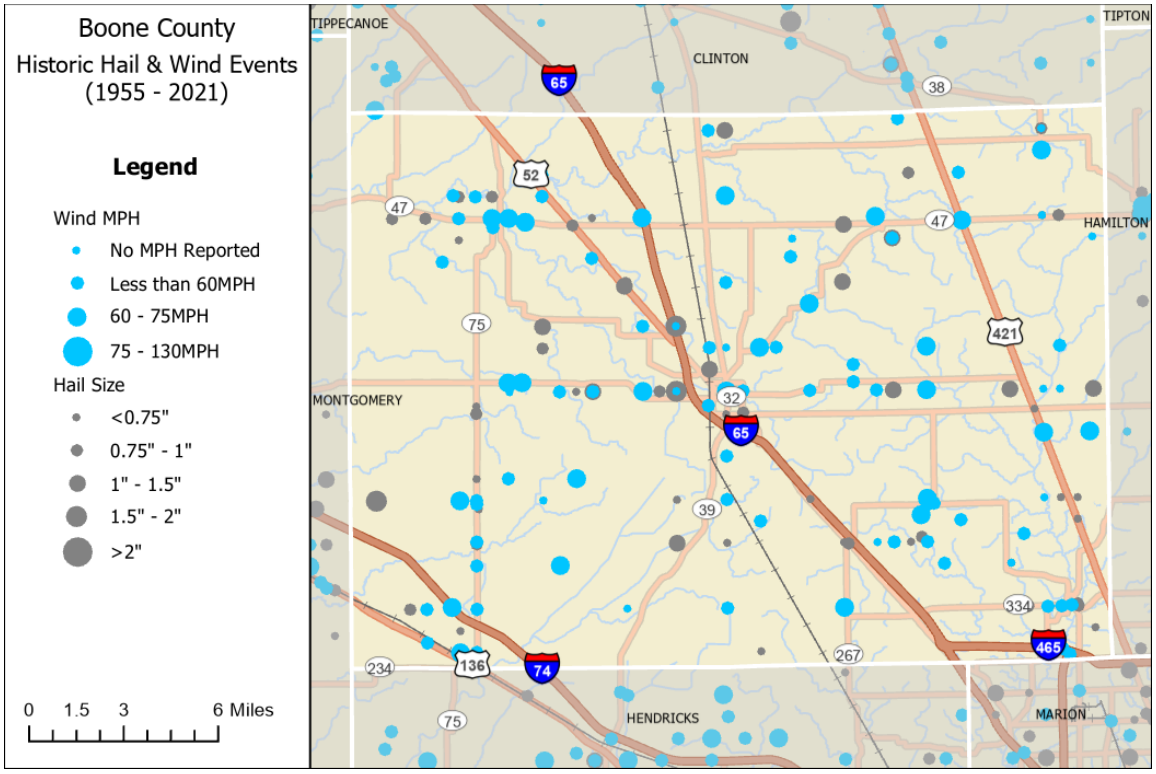

Figure 41. Boone County Historic Hail and Wind Events

Tornado History

According to the NCEI there have been 32 occurrences of tornadoes within Boone County since 1956. Five of those happened since 2012. Two tornadoes touched down in Boone County November of 2013—one was EF1 and the other EF2. The tornadoes resulted in 2 injuries and totaled $210,000 of property damage. Figure 42 is a photo of the tornado damage. Another EF2 tornado touched down in Boone County in August of 2016. Its peak winds were estimated at 115 mph, destroying a pole barn, grain bin, and farm equipment. The tornado snapped tree trunks, downed trees, and damaged corn in its path. There were no injuries or deaths reported. Near Thorntown in May of 2017, an EF1 tornado touched down causing $20,000 of property damage. Boone County NCEI recorded tornadoes are identified in Table 28. Additional details for NCEI events are included in Appendix C. Figure 43 displays historical tornadoes for Boone County.

Figure 42. Image of tornado damage to Skjodt-Barret building in Lebanon, November 2013

*Table 28. Boone County Tornadoes since 2002**

Location or County	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Lebanon	Apr 20, 2004	F0	0	0	$75K	$0
Jamestown	Apr 20, 2004	F1	0	8	$1.65M	$0
Thorntown	Apr 19, 2011	EF1	0	0	$10K	$0
Gadsden	Nov 17, 2013	EF1	0	0	$10K	$0
Max	Nov 17, 2013	EF2	0	2	$200K	$0
Whitestown	Apr 28, 2016	EF1	0	0	$35K	$0
Royalton	Aug 15, 2016	EF2	0	0	$25K	$3K
Thorntown	May 20, 2017	EF1	0	0	$20K	$0

* NCEI records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

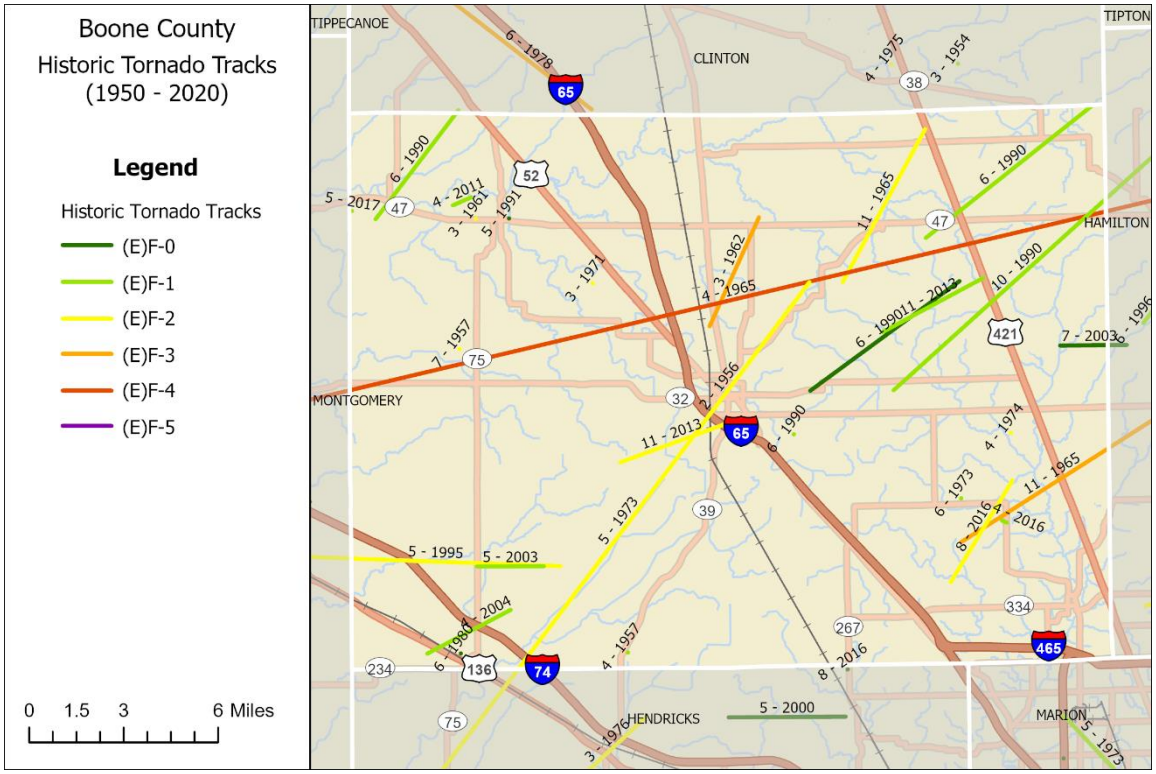

Figure 43. Historical Tornado Tracks and Touchdowns for Boone County

4.3.4.6 Geographic Location for Summer Storm and Tornado

The entire county has the same risk for occurrence of summer storms and tornadoes. They can occur at any location within the county.

4.3.4.7 Hazard Extent for Summer Storm and Tornado

The extent of the summer storm and tornado hazards vary both in terms of the extent of the path of the event and the wind speed.

4.3.4.8 Risk Identification for Summer Storm and Tornado

The planning team determined that the probability of a summer storm is highly likely with limited consequences. The warning time for a summer storm is less than 6 hours with a duration of less than 6 hours. The calculated CPRI for summer storm is 3.1. The planning team ranked the tornado hazard as likely with critical consequences. The warning time for a tornado is less than 6 hours with a duration of less than 6 hours. The calculated CPRI for a tornado is 2.95.

4.3.4.9 Vulnerability Analysis for Summer Storm and Tornado

Tornado and severe thunderstorms could impact, damage, or destroy infrastructure including roadways, utility lines/pipes, railroads, and bridges. The impacts to these items include broken,

failed, or impassable roadways, broken or failed utility lines (e.g., loss of power or gas to community), and railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic.

All facilities are vulnerable to severe thunderstorms. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality, such as a damaged police station would no longer be able to serve the community.

Boone County has tornado sirens located around the county to warning individuals outside in case of a tornado. In addition, the County has a voluntary sign-up alert program called Rave Alert System, that sends warnings to individual cell phones.

GIS Tornado Analysis

The following analysis completed for the plan update utilizes an example scenario to gauge the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure.

GIS overlay modeling was used to determine the potential impacts of an EF4 tornado. The analysis used a hypothetical tornado path mimics a historic tornado that runs for 28 miles starting in Montgomery County and runs east into Boone County near Advance. This scenario includes impacts to the major employers of the county. The selected widths were modeled after a recreation of the EF Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the path. This natural process was modeled in GIS by adding damage zones around the tornado path. Figure 44 depicts tornado damage curves as well as path widths.

Table 29. Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	3000	100%
EF4	2400	100%
EF3	1800	80%
EF2	1200	50%
EF1	600	10%
EF0	300	0%

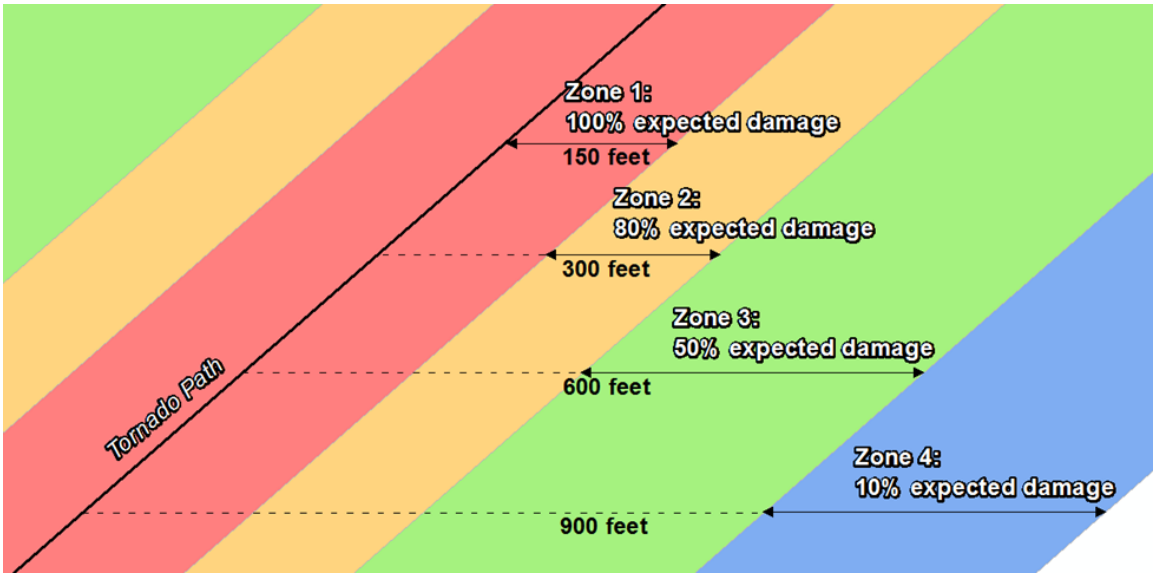

Figure 44. EF4 Tornado Analysis, Using GIS Buffers

The hypothetical path is shown in Figure 45. The results of the analysis are depicted in Figure 46, Table 30, and Table 31. The GIS analysis estimates that 147 buildings will be damaged. The estimated building losses are $5.9 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against the Building Inventory using the Assessor data in combination with parcel records (see Section 4.2.1.2).

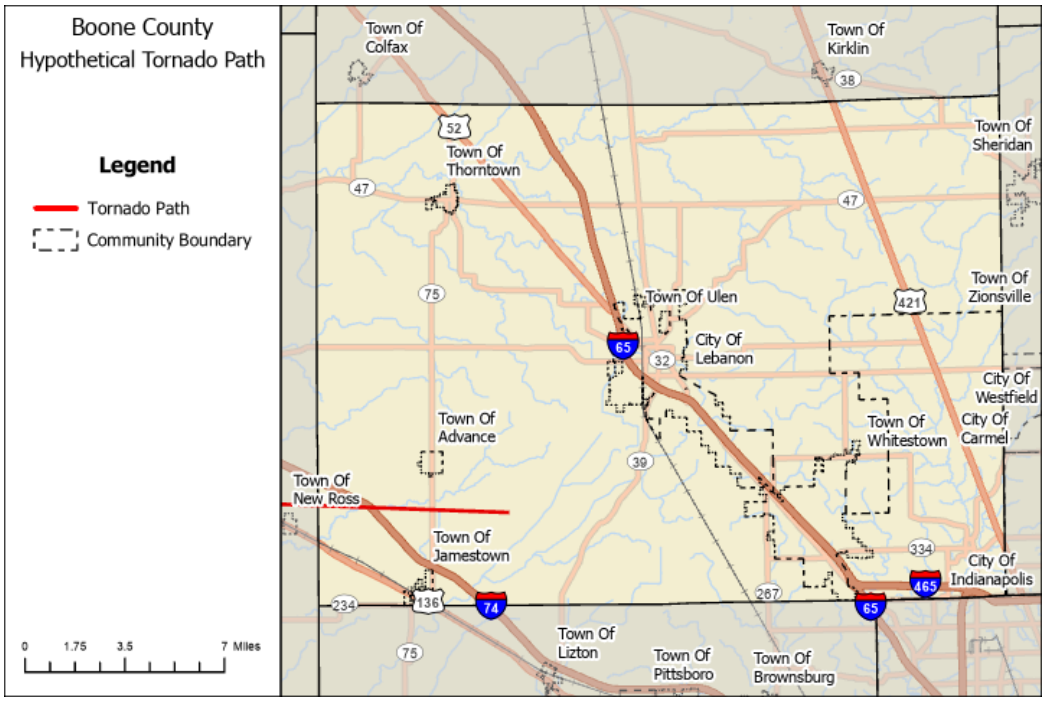

Figure 45. Modeled F4 Tornado Damage Hypothetical Path

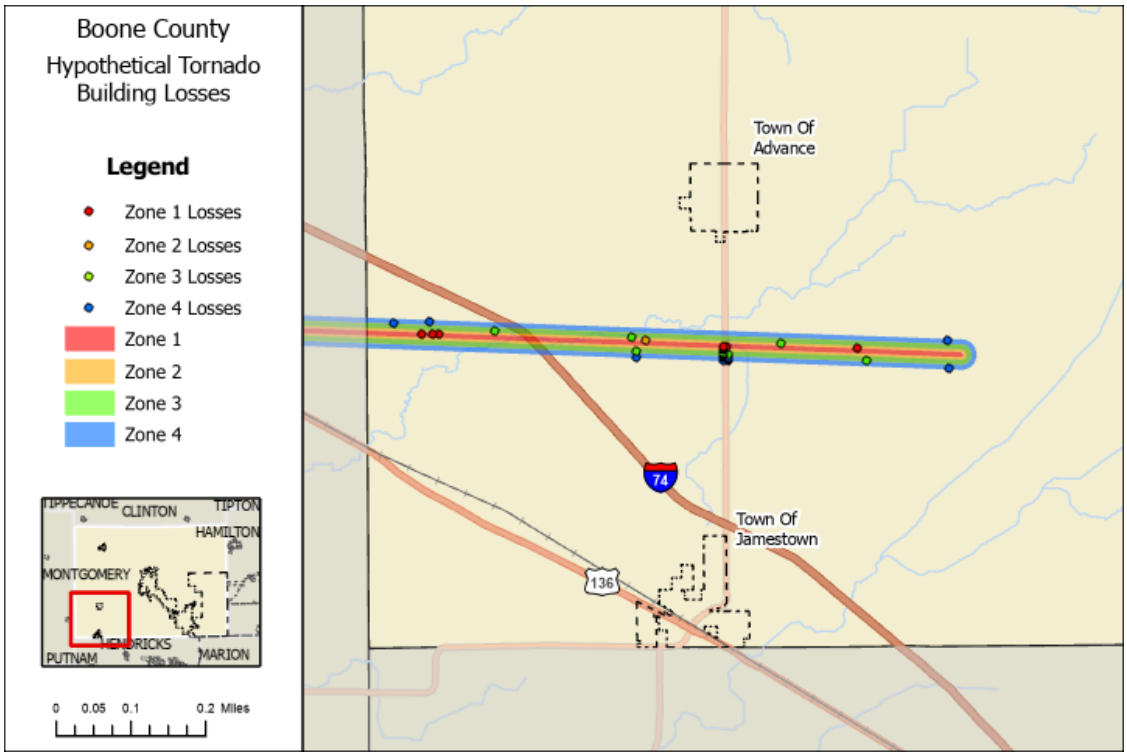

Figure 46. Tornado Path with Damaged Buildings

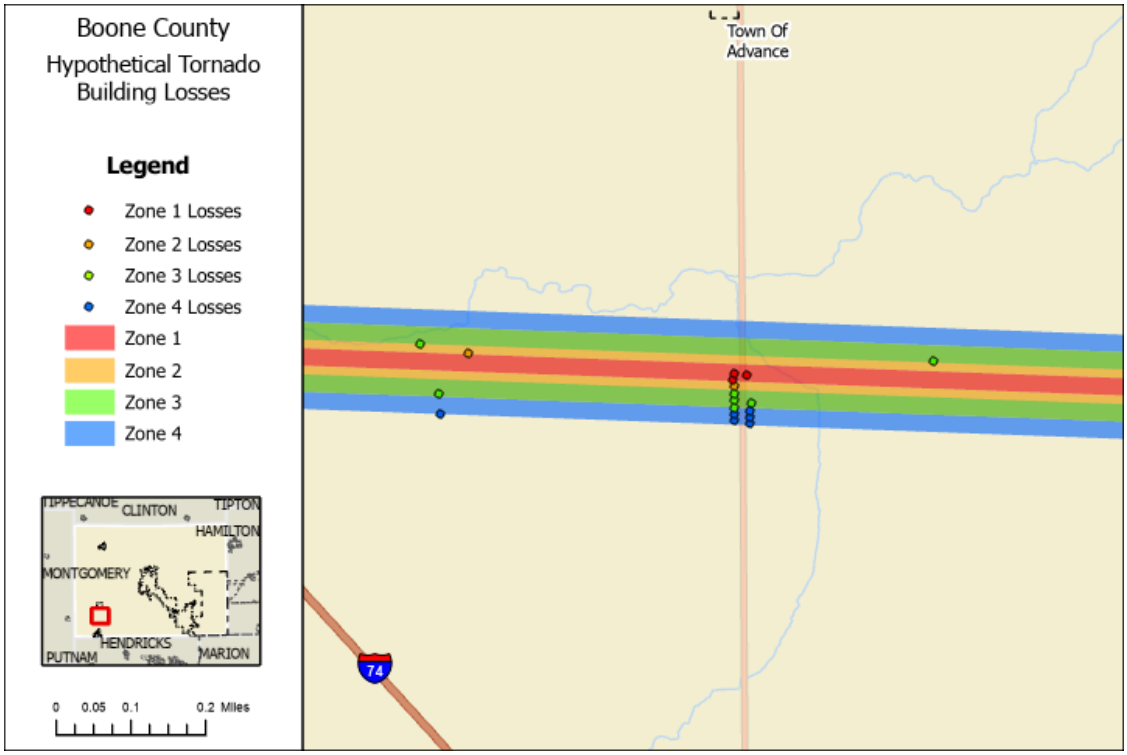

Figure 47. Tornado Path: near Town of Advance

Table 30. Estimated Amount of Building Losses by Zone by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	15	10	40	47
Commercial	--	--	--	--
Industrial	--	--	--	--
Agriculture	20	--	5	10
Religious	--	--	--	--
Government	--	--	--	--
Education	--	--	--	--
Total	**35**	**10**	**45**	**57**

Table 31. Estimated Number of Buildings Damaged by Zone by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$945,700	$1,572,600	$1,488,125	$402,189
Commercial	--	--	--	--
Industrial	--	--	--	--
Agriculture	$1,141,550	--	$330,800	$19,090
Religious	--	--	--	--
Government	--	--	--	--
Education	--	--	--	--
Total	**$2,087,250**	**$1,572,600**	**$1,818,925**	**$421,279**

Facility and Infrastructure Damage

There were no essential or critical facilities damaged in the hypothetical tornado path.

4.3.4.10 Community Development Trends and Future Vulnerability

The entire population and buildings have been identified as being at risk as summer storms and tornadoes can occur anywhere within the state of Indiana at any time of the day. Furthermore, any future development in terms of new construction within the county will be at risk. The building exposure for Boone County is included in Table 15. All critical facilities in the county and communities within the county are at risk. Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures need to be built with more sturdy construction, and those structures already in place need to be hardened to lessen the potential impacts of severe weather. Community warning sirens to provide warnings of approaching storms are also vital to preventing the loss of property and ensuring the safety of Boone County residents.

Tornadoes are a threat to the community, especially vulnerable populations. The 13.2% of the population over the age of 65 and 9.4% with a disability are more likely to lack physical ability or have limited mobility which makes getting to safety in a basement or storm cellar strenuous. 56% of Boone County residents do not have basements, which means they need to know where

to go for safety. The residents on the 17 parcels of manufactured homes may not have access to a safe shelter, which can lead to loss of life or death.

Team Identified Vulnerability & Potential Strategy

The planning team answered a series of surveys and worksheets to help better identify hazards and potential solutions to those problems. The team did not identify significant drought incidents.

4.3.4.11 Climate Change and Tornadoes

As the planet is getting warmer, research has shown conditions are becoming more conducive for tornado activity; however, in Indiana Purdue University climate change researchers are hesitant to state there is enough evidence to directly correlate change in climate and tornado intensity or frequency. One example of data trends beginning to link tornado frequency/intensity with climate change is recorded tornado activity in the US's tornado alley. Historically, tornado alley included areas were the borders of South Dakota, Nebraska, Kansas, Oklahoma, Colorado, New Mexico, and Texas touched. Figure 48 displays one research result of where the US is predicted to see a decrease and increase in favorable conditions for tornado activity. Based on tornado data, tornado alley is shifting east to include Indiana (Finch, 2022). Although different research states varying portions of Indiana that fall within the new tornado alley, Indiana is undoubtably predicted to see an increase in favorable conditions for tornado activity (Moore, 2018). Further, while the number of annual tornado days is decreasing, the number of tornadoes that occur on days where there are tornadoes is increasing (Moore, 2018).

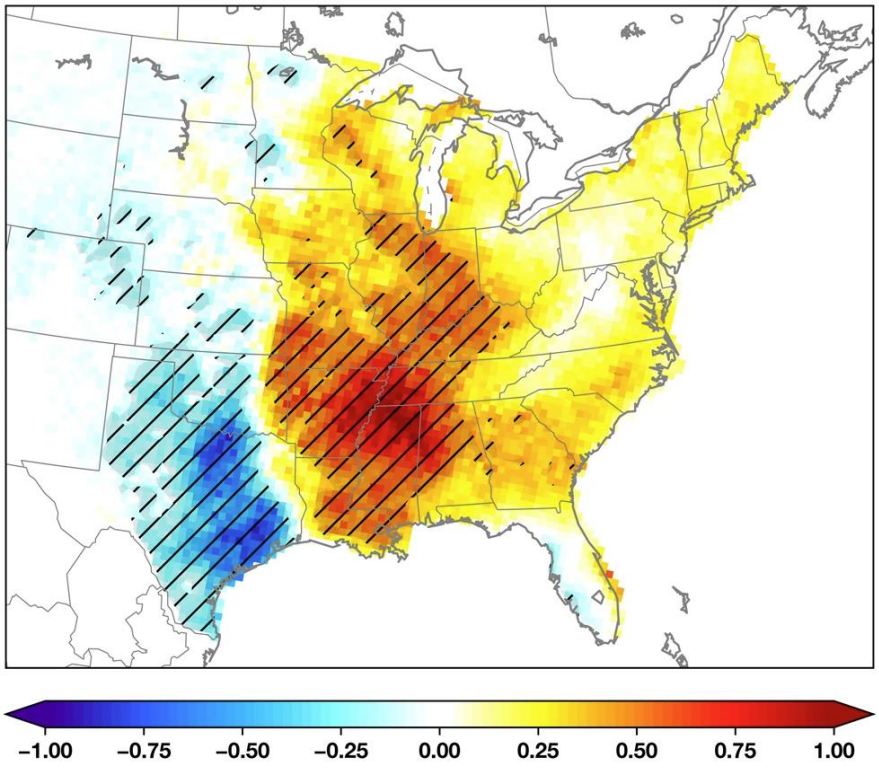

Figure 48. Trends in Favorable Tornado Environments (Gensini & Brooks, 2018)

4.3.4.12 Relationship to other Hazards

Flooding – Thunderstorms with heavy amounts of rainfall can cause localized flooding, which can impact property and infrastructure such as roads.

Public Health – Public health can be impacted by wastewater spills due to flooding.

Wildland Fire – Lighting strikes may ignite a wildland fire. Windstorms that result in downed timber increase the fuel load in a forest that may increase the risk of wildfire.

Structural Fire – Lighting strikes may ignite a structural fire**.**

4.3.5 Drought

4.3.5.1 Hazard Definition for Drought

The meteorological condition that creates a drought is below normal rainfall. However, excessive heat can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

The Palmer Drought Severity Index (PDSI), developed by W.C. Palmer in 1965, is a soil moisture algorithm utilized by most federal and state government agencies to trigger drought relief

programs and responses. The objective of the PDSI is to provide standardized measurements of moisture, so that comparisons can be made between locations and periods of time—usually months. The PDSI is designed so that a -4.0 in Indiana has the same meaning in terms of the moisture departure from a climatological normal as a -4.0 does in South Carolina.

The U.S. Drought Monitor (USDM) provides a national assessment on drought conditions in the United States. The following table is a reference from the classification scheme provided by the USDM, and the correlation between PDSI and the category, descriptions, and possible impacts associated with those level events. This classification is often used to refer to the severity of droughts for statistical purposes. The USDM provides weekly data for each county, noting the percent of land cover in the condition of the drought category identified below.

Table 32. USDM Index

Category	Description	Possible Impacts	Palmer Drought Severity Index
D0	Abnormally Dry	Going into drought: -short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits	-1.0 to -1.9
D1	Moderate Drought	-Some damage to crops, pastures -Streams, reservoirs, or wells low, some water shortages developing or imminent -Voluntary water-use restrictions requested	-2.0 to -2.9
D2	Severe Drought	-Crop or pasture losses likely -Water shortages common -Water restrictions imposed	-3.0 to -3.9
D3	Extreme Drought	-Major crop/pasture losses -Widespread water shortages or restrictions	-4.0 to -4.9
D4	Exceptional Drought	-Exceptional and widespread crop/pasture losses -Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less

In the past decade, the US has continued to consistently experience drought events with economic impacts greater than $1 billion; FEMA estimates that the nation's average annual drought loss is $6 billion to $8 billion. For Indiana alone, the National Drought Mitigation Center reported hundreds of drought impacts in the past decade ranging from water shortage warnings to reduced crop yields and wildfires.

4.3.5.2 Drought History in Boone County

Since the last MHMP, the National Drought Mitigation Center and the Indiana Drought Monitor have recorded several incidences of drought in Boone County. No recorded incident exceeded a D1 condition. In 2020, Boone County experienced drought conditions from June through

October. 100% of the county was in D0 drought for the summer, leading to a period of D1 drought in September and October.

Like the rest of Indiana, Boone County was affected by the 2012 Central US drought. At the peak of the drought, 100% of the county was at category D3. In response to the disaster, the United States Department of Agriculture streamlined the disaster designation process. More than half of Indiana counties, including Boone County, were declared eligible for SBA loans, and Boone County enacted an open burn ban.

Since the 2012 drought, the National Drought Mitigation Center reported drought impacts in 2015 and 2016. In October 2015, soybeans, winter wheat, and pastures were affected by dryness. During the summer of 2016, Dry weather causing Indiana pastures to brown, crops were stressed from lack of rain, and late planted corn withered.

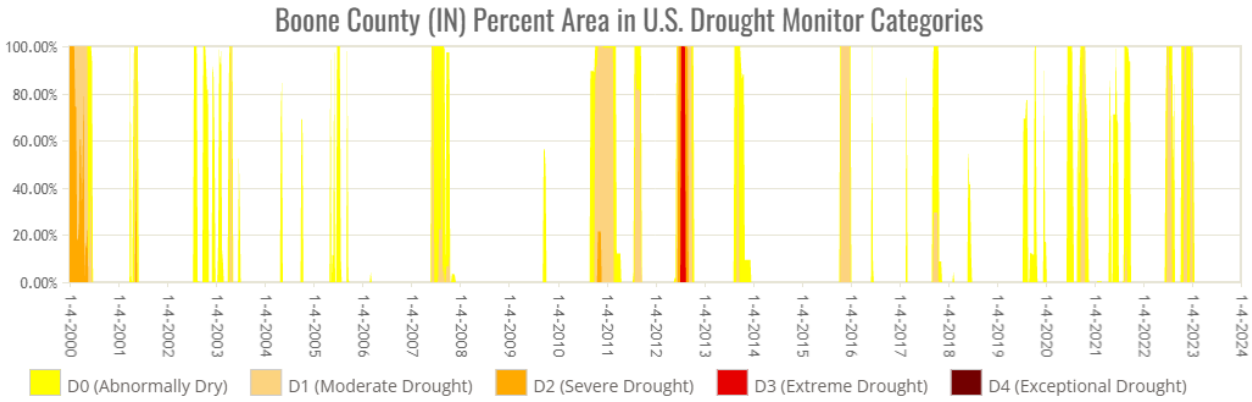

Figure 49. Boone County Percent Area in Drought

4.3.5.3 Geographic Location for Drought

Droughts are regional in nature. All areas of the county are vulnerable to the risk of drought.

4.3.5.4 Hazard Extent for Drought

Droughts can be widespread or localized events. The extent of the droughts varies both in terms of the extent of the heat and the range of precipitation.

4.3.5.5 Risk Identification for Drought

The planning team determined that the probability of a drought is likely with limited consequences. The warning time for a drought is at least 24 hours with a duration of more than 1 week. The calculated CPRI for drought is 2.5.

4.3.5.6 Vulnerability Analysis for Drought

Drought impacts, as described in the drought history previously, are a distributed threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect the same impacts within the affected area.

4.3.5.7 Community Development Trends and Future Vulnerability

Drought impacts, as described in the drought history section, are a threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect varying impacts within the affected area. Future development will remain vulnerable to drought events. Typically, some urban and rural areas are more susceptible than others. Excessive demands for water in populated urban areas place a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of drought.

4.3.5.8 Climate Change and Drought

A notable study (Mirshra, 2010) built a land surface model based on long-term historical time series (1916-2007) soil moisture data and projected future climate change (2009-2099) in Illinois and Indiana. The authors predicted an upward trend for precipitation, minimum air temperature, total column soil moisture and a downward trend for maximum air temperature, frozen soil moisture, and snow water that could affect the severity and scale of droughts across Indiana. These results are likely given trends outlined in Section 3.

4.3.5.9 Relationship to other Hazards

Wildfires – A drought situation can significantly increase the risk of wildfire.

Extreme Temperatures – A drought situation can significantly increase with long periods of high temperatures.

4.3.6 Winter Storms: Blizzards, Ice Storms, Snowstorms

4.3.6.1 Hazard Definition for Winter Storm

Severe winter weather consists of various forms of precipitation and strong weather conditions. This may include one or more of the following: freezing rain, sleet, heavy snow, blizzards, icy roadways, extreme low temperatures, and strong winds. These conditions can cause human-health risks such as frostbite, hypothermia, and death.

Ice Storms

Ice or sleet, even in the smallest quantities, can result in hazardous driving conditions and can be a significant cause of property damage. Sleet can be easily identified as frozen raindrops. Sleet does not stick to trees and wires. The most damaging winter storms in Indiana have been ice storms. Ice storms are the result of cold rain that freezes on contact with objects having a temperature below freezing. Ice storms occur when moisture-laden gulf air converges with the

northern jet stream, causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain, coating power lines, communication lines, and trees with heavy ice. The winds then will cause the overburdened limbs and cables to snap, leaving large sectors of the population without power, heat, or communication. Falling trees and limbs also can cause building damage during an ice storm. In the past few decades, numerous ice-storm events have occurred in Indiana.

Snowstorms

Significant snowstorms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snowstorm with winds of 35 miles an hour or greater and/or visibility of less than one-quarter mile for three or more hours. The strong winds during a blizzard blow about falling and already existing snow, creating poor visibility and impassable roadways. Blizzards have the potential to result in property damage.

Indiana has been struck repeatedly by blizzards. Blizzard conditions not only cause power outages and loss of communication, potentially for days, but can also make transportation difficult. The blowing of snow can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous, if not deadly.

Damages from blizzards can range from significant snow removal costs to human and livestock deaths. Because of the blinding potential of heavy snowstorms, drivers are also at risk of collisions with snowplows or other road traffic. Stranded drivers can make uninformed decisions, such as leaving the car to walk in conditions that put them at risk. Drivers and homeowners without emergency plans and kits are vulnerable to the life-threatening effects of heavy snowstorms such as power outages, cold weather, and inability to travel, communicate, obtain goods, or reach their destinations. Heavy snow loads can cause structural damage, particularly in areas where there are no building codes or for residents living in manufactured home parks.

4.3.6.2 Winter Storm History in Boone County

The NCEI database identified 11 winter storm, heavy snow, ice storm, winter weather, or blizzard events for Boone County since 2012. In February 2016, heavy snowfall caused slick roads and hazardous driving conditions on I-65. The slick road conditions caused a 40-car vehicle accident. There were 30 injuries and $280,000 of property damage reported from the incident. In November of 2018, an ice storm caused $60,000 of property damage from a 5 car accidents as a result of ice accumulations on roads. Additional details for NCEI events are included in Appendix C.

4.3.6.3 Geographic Location for Winter Storm

Severe winter storms are regional in nature. Most of the NCEI data is calculated regionally or in some cases statewide.

4.3.6.4 Hazard Extent for Winter Storm

A severe winter storm can occur anywhere in the jurisdiction. The Sperry-Piltz Ice Accumulation Index, also known as the SPIA Index, is a forward-looking predictive tool designed to forecast ice accumulation and its potential damage. Much like how the Enhanced Fujita Scale categorizes tornadoes, the SPIA Index classifies ice storms. Utilizing a sophisticated algorithm incorporating meticulously researched parameters and National Weather Service forecast data, the SPIA Index accurately anticipates the expected ice accumulation, projected affected area, and potential resulting damage caused by imminent ice storms. Figure 50 shows how SPIA categorizes an area's risk of ice damage and impact for any given 24-hour period of time.

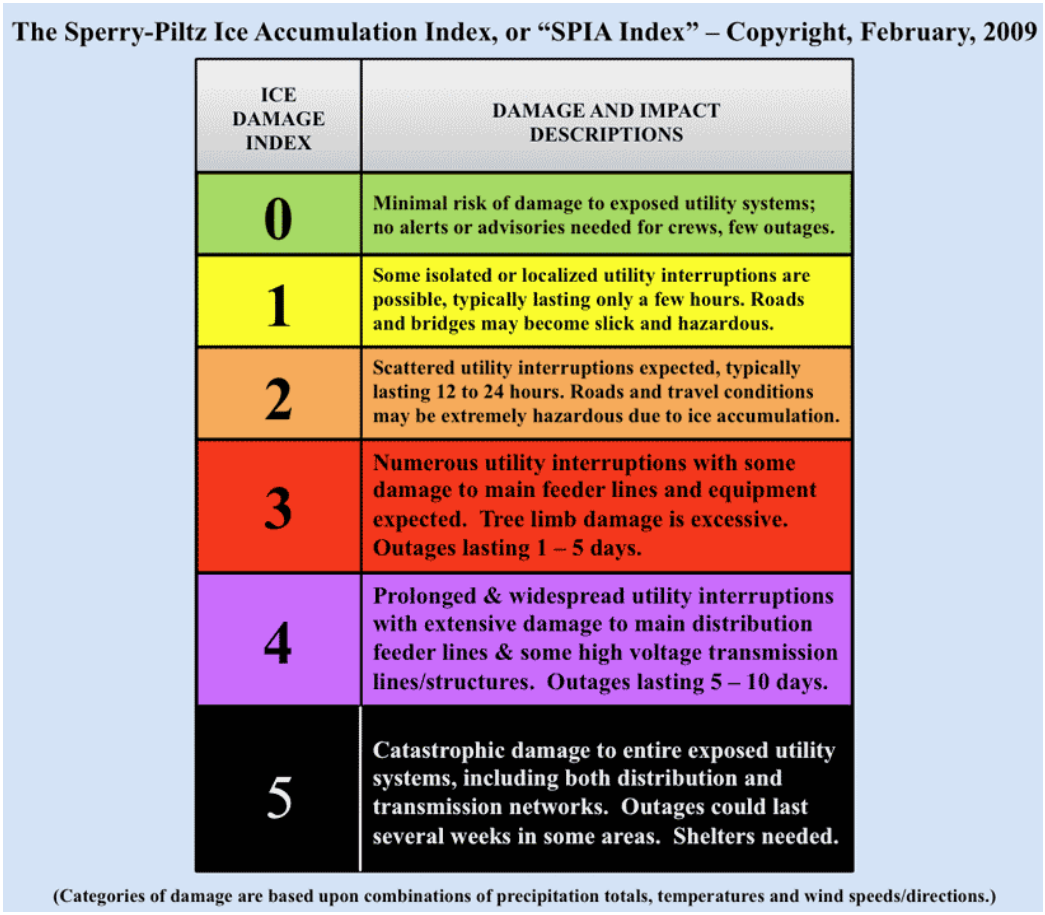

Figure 50. SPIA Index Categories
(Source: https://www.spia-index.com/index.php)

The SPIA serves as a real-time reference based on prevailing weather conditions and patterns within a 24-hour period of time. Given this plan serves a five-year span, please visit the SPIA website (https://www.spia-index.com/index.php) on a given day to determine Boone County's current SPIA category and risk.

4.3.6.5 Risk Identification for Winter Storm

The planning team determined that the potential for a winter storm is likely with limited consequences. The warning time for a winter storm is 6 to 12 hours with a duration of less than 1 week. The calculated CPRI for a winter storm is 2.7.

4.3.6.6 Vulnerability Analysis for Winter Storm

Winter storm impacts are equally distributed across the entire jurisdiction; therefore, the entire county is vulnerable to a winter storm and can expect the same impacts within the affected area. A table of the building exposure in terms of types and numbers of buildings for the entire county is listed in Table 15. The impacts to the general buildings within the county are similar to the damages expected to the critical facilities. These include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow.

During a winter storm, the types of infrastructure that could be impacted include essential and critical facilities, roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable it is important to emphasize that any number of these items could become damaged during a winter storm.

4.3.6.7 Community Development Trends and Future Vulnerability

Any new development within the county will remain vulnerable to these events. Because the winter storm events are regional in nature, future development will be equally impacted across the county.

4.3.6.8 Climate Change and Winter Storms

While the overall number of winter storms may decrease in some regions due to shifting weather patterns, intensity and impact of individual storms are expected to increase. Warmer temperatures lead to more winter precipitation falling as rain rather than snow, particularly at the beginning and end of the winter season. This causes a higher likelihood of rain-on-snow events, leading to rapid snowmelt and increased risk of flooding.

Conversely, increased moisture in the atmosphere due to climate change can result in heavier snowfalls during intense winter storms.

4.3.6.9 Relationship to other Hazards

Flooding – Melting from heavy snows can cause localized flooding which can impact property and infrastructure, such as roads.

Wildland or Structural Fire – Heavy storms that result in large amounts of downed timber can result in an increase of dead or dying trees left standing, thus providing an increased fuel load for a wildfire. There is an additional risk of increased frequency of structural fires during heavy snow events, primarily due to utility disruptions and the use of alternative heating methods by residents.

Public Safety – Drivers stranded in snowstorms may make uninformed decisions that can put them at risk; residents who are unprepared or vulnerable may not be able to obtain goods or reach their destinations. EMS providers may be slowed by road conditions to respond to emergencies. Ice storms may result in power outages due to downed power lines, putting people at risk for cold temperature exposure and reducing the ability to spread emergency messages to the public via television, radio, or computer.

4.3.7 Extreme Temperatures

4.3.7.1 Hazard Definition for Extreme Temperatures

Extreme Cold

What constitutes an extreme cold event, and its effects varies by region across the US. In areas unaccustomed to winter weather, near freezing temperatures are considered “extreme cold.” Extreme cold temperatures are typically characterized by the ambient air temperature dropping to approximately zero degrees Fahrenheit or below.

Exposure to cold temperatures—indoors or outdoors—can lead to serious or life-threatening health problems, including hypothermia, cold stress, frostbite or freezing of the exposed extremities, such as fingers, toes, nose, and earlobes. Certain populations—such as seniors aged 65 or older, infants and young children under five years of age, individuals who are homeless or stranded, or those who live in a home that is poorly insulated (such as mobile homes)—without heat are at greater risk to the effects of extreme cold.

The magnitude of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. WCT are the temperatures felt outside and is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin’s temperature to drop.

In 2001, the NWS implemented a new WCT Index, designed to more accurately calculate how cold air feels on human skin. The index, shown in Figure 51, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.

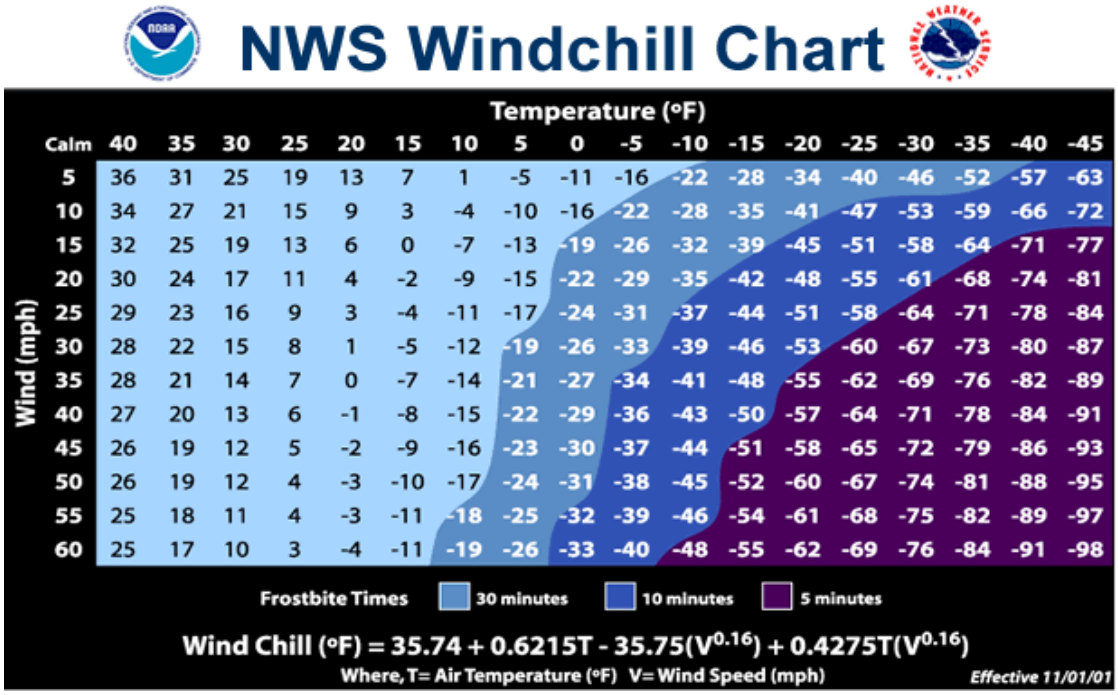

Figure 51. NWS Wind Chill Temperature Index

Extreme Heat

Human beings need to maintain a constant body temperature if they are to stay healthy. Working in high temperatures induces heat stress when more heat is absorbed into the body than can be dissipated out. Heat illness such as prickly heat, fainting from heat exhaustion, or heat cramps are visible signs that people are working in unbearable heat. In the most severe cases, the body temperature control system breaks down altogether and body temperature rises rapidly. This is a heat stroke, which can be fatal. The NWS issues a heat advisory when, during a 24-hour period, the temperature ranges from 105°F to 114°F during the day and remains at or above 80°F at night.

Heat is the leading weather-related killer in the United States, even though most heat-related deaths are preventable through outreach and intervention. According to NOAA, the summer of 2022 was the third hottest summer on record with the number of days of extreme heat predicted to increase with changes in climate.

Unusually hot summer temperatures have become more frequent across the contiguous 48 states in recent decades (see the High and Low Temperatures indicator), and extreme heat events (heat waves) are expected to become longer, more frequent, and more intense in the future. As a result, the risk of heat-related deaths and illness is also expected to increase. Temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event (EHE). An extended period of extreme heat of three or more consecutive days is typically referred to as a heat

wave. Most summers see EHEs in one or more parts east of the Rocky Mountains. They tend to combine both high temperatures and high humidity, although some of the worst heat waves have been catastrophically dry.

Heat alert procedures are based primarily on Heat Index Values. The Heat Index—given in degrees Fahrenheit—is often referred to as the apparent temperature and is a measure of how hot it really feels when the relative humidity is factored with the actual air temperature. The National Weather Service Heat Index Chart can be seen in Figure 52.

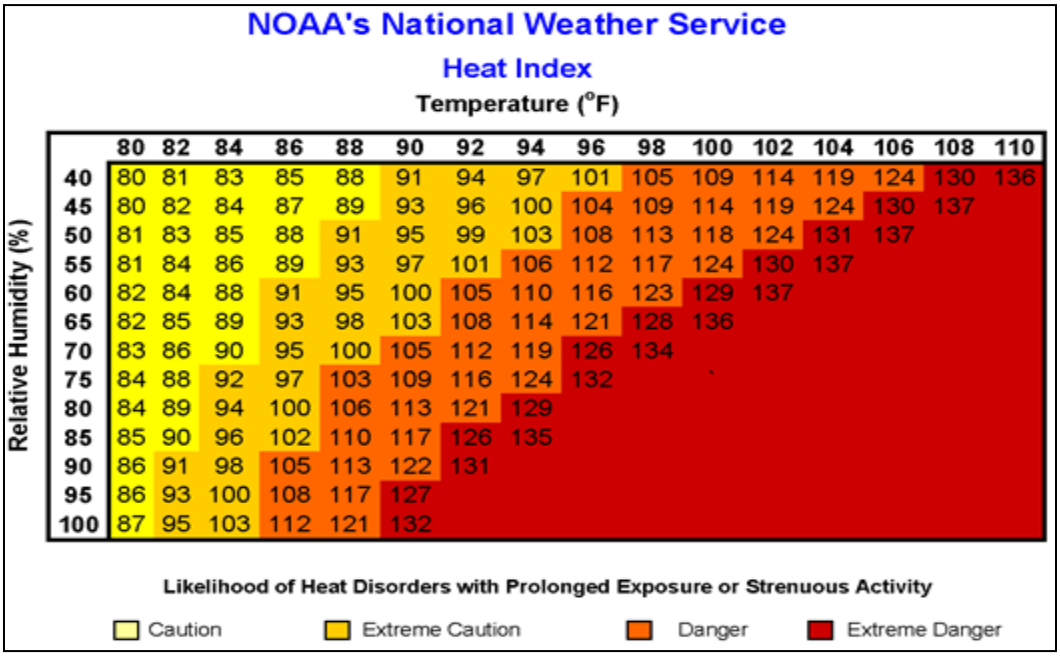

Figure 52. National Weather Service Heat Index
Source: Office of Atmospheric Programs. (2006). Excessive Heat Events Guidebook. Unites States Environmental Protection Agency. Washington, D.C.

4.3.7.2 Extreme Temperature History in Boone County

The NCEI reported four occurrences of extreme temperatures in Boone County since 1996. One extreme cold even happened in February 1996. The three extreme heat events were recorded for the same time period in July 1997. Additional details for NCEI events are included in Appendix C.

4.3.7.3 Geographic Location for Extreme Temperature

Extreme temperatures are regional in nature. All areas of the Boone County are vulnerable to the risk of extreme cold or extreme heat.

4.3.7.4 Hazard Extent for Extreme Temperature

Extreme temperatures are normally widespread events.

4.3.7.5 Risk Identification for Extreme Temperature

The planning team determined that the probability of an extreme temperature hazard is possible with limited consequences. Extreme temperatures were determined to have a warning time of at least 24 hours with a duration more than one week. The calculated CPRI for extreme temperatures in Boone County is 2.05.

4.3.7.6 Vulnerability Analysis for Extreme Temperature

Extreme temperature impacts are an equally distributed threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect the same impacts within the affected area. According to FEMA, approximately 175 Americans die each year from extreme heat.

Prolonged exposure to extreme heat may lead to serious health problems, including heat stroke, heat exhaustion, or sunburn. Certain populations — such as seniors aged 65 and over, infants and young children under five years of age, pregnant women, the homeless or poor, the obese, and people with mental illnesses, disabilities, and chronic diseases — are at greater risk to the effects of extreme heat and extreme cold. Vulnerable populations are exponentially vulnerable to extreme temperatures as climate change continues. Depending on severity, duration, and location these populations may not have ready access to cooling or warming centers.

4.3.7.7 Community Development Trends and Future Vulnerability

Because extreme temperatures are regional in nature, future development will be impacted across the county. Although urban and rural areas are equally vulnerable to this hazard, those living in urban areas may have a greater risk from the effects of a prolonged heat wave. The atmospheric conditions that create extreme heat tend to trap pollutants in urban areas, adding contaminated air to the excessively hot temperatures and creating increased health problems. Furthermore, asphalt and concrete store heat longer, gradually releasing it at night and producing high nighttime temperatures. This phenomenon is known as the “urban heat island effect.” Local officials should address extreme temperature hazards by educating the public on steps to take before and during the event and locations of cooling and warming centers.

Having a cooling and heating system in homes help to mitigate threats to a community from extreme temperatures. Within the 4% of dwellings that do not have a cooling system and 1% that do not have heating, individuals living in those dwellings are more susceptible to illness or death from extreme temperatures.

4.3.7.8 Climate Change and Extreme Temperatures

Climate change effects on extreme temperatures is strongly correlated to projected temperature changes outlined in Section 3. Indiana is expected to witness an increase in the

frequency, intensity, and duration of heatwaves. Summers are likely to become hotter, with a higher number of days exceeding historical temperature records. Conversely, winters may experience fluctuations, with warmer days and a reduction in the number of extremely cold days. These alterations disrupt traditional seasonal patterns, impacting agriculture, energy consumption, public health, and overall infrastructure resilience.

4.3.7.9 Relationship to other Hazards

Drought and Wildfire – Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire.

Public Safety – Anyone exposed to extreme heat can develop heat exhaustion and heat stroke. The elderly, children and those who engage in outdoor work or recreation may be most susceptible to the danger of extreme heat.

4.3.8 Hazardous Material Release

4.3.8.1 Hazard Description for Hazardous Material Release

The State of Indiana has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances between our borders every day. The transportation of chemicals and substances along interstate routes is commonplace in Indiana. The rural areas of Indiana have considerable agricultural commerce, creating a demand for fertilizers, herbicides, and pesticides to be transported along rural roads. Finally, Indiana is bordered by two major rivers and Lake Michigan. Barges transport chemicals and substances along these waterways daily. These factors increase the chance of hazardous material releases and spills throughout the State of Indiana.

The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials and chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response. Emergency response may require fire, safety and law enforcement, search and rescue, and hazardous materials units.

4.3.8.2 Hazardous Incident History in Boone County

In May 2021, the YMCA in Lebanon experienced a Chlorine release. A partial evacuation of the hospital and full evacuation of Lebanon High School, approximately 2 miles south of the YMCA, was conducted. Clean up was completed in less than 8 hours. The planning team identified the release as minor. The planning team stated there have been many minor releases that have put local firefighters, hazardous materials teams, emergency management, and local law enforcement into action to try to stabilize these incidents and prevent or lessen harm to Boone

County residents. Jamestown identified a hazardous material release as the largest threat to the community.

4.3.8.3 Geographic Location for Hazardous Material Release

The hazardous material hazards are countywide and are primarily associated with the transport of materials via highway, railroad, and/or river barge.

4.3.8.4 Hazard Extent for Hazardous Material Release

The extent of the hazardous material (referred to as hazmat) hazard varies in terms of the quantity of material being transported as well as the specific content of the container. Hazmat impacts are an equally distributed threat across the entire jurisdiction; therefore, the entire county is vulnerable to a hazmat release and can expect the same impacts within the affected area. The main concern during a release or spill is the population affected. This plan will therefore consider all buildings located within the county as vulnerable.

4.3.8.5 Risk Identification for Hazardous Material Release

The planning team determined that the probability of a hazmat release was likely with limited consequences. Hazmat releases were determined to have a warning time of less than 6 hours with a duration less than 24 hours. The calculated CPRI for hazardous material release in Boone County is 2.75.

4.3.8.6 Vulnerability Analysis for Hazardous Materials Release

The hazardous material release hazards are countywide and primarily are associated with the transport of materials by highway and/or railroad. During a hazardous material release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response.

4.3.8.7 GIS Hazmat Analysis

The U.S. EPA's Areal Locations of Hazardous Atmospheres (ALOHA) model was utilized to assess the area of impact for a chlorine release from the YMCA in northern Lebanon, mimicking the released that occurred in 2021.

ALOHA generates a threat zone area where a hazard (such as toxicity or thermal radiation) has exceeded a user-specified Level of Concern (LOC). ALOHA will display up to three threat zones overlaid on a single picture. Through the development of Acute Exposure Guideline Levels (AEGLs) are exposure guidelines designed to help responders deal with emergencies involving

chemical spills or other catastrophic events where members of the general public are exposed to a hazardous airborne chemical.

AEGLs are intended to describe the health effects on humans due to once-in-a-lifetime or rare exposure to airborne chemicals. The National Advisory Committee for AEGLs is developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills or other catastrophic exposures.

- **Zone 1 (AEGL 1):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure
- **Zone 2 (AEGL 2):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape
- **Zone 3 (AEGL 3):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). Figure 53 is an illustration of the toxic threat plume footprint as determined by ALOHA.

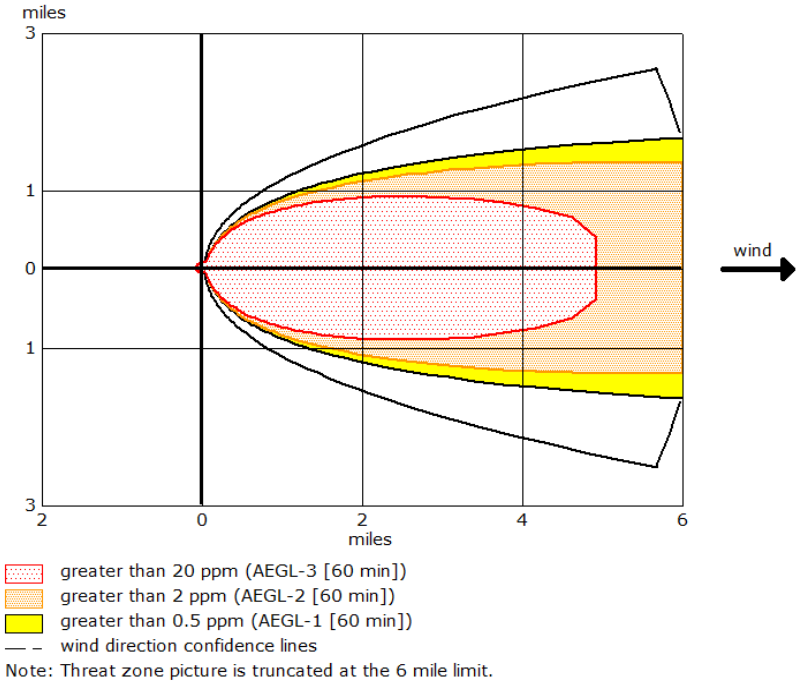

Figure 53. Toxic Threat Plume Footprint Generated by ALOHA

For this scenario, real-world atmospheric and climatic conditions with a breeze from the north was assumed, and the ALOHA atmospheric modeling parameters were based on the actual conditions at the location when the model was run including wind speed of 9 mph. The temperature was 80°F with misting rain and overcast skies.

This modeled release was based on a chlorine leak from 2.5 feet-diameter hole in the tank. According to the ALOHA parameters, approximately 2,400 pounds of material would be released per minute. Figure 54 shows the location of the release.

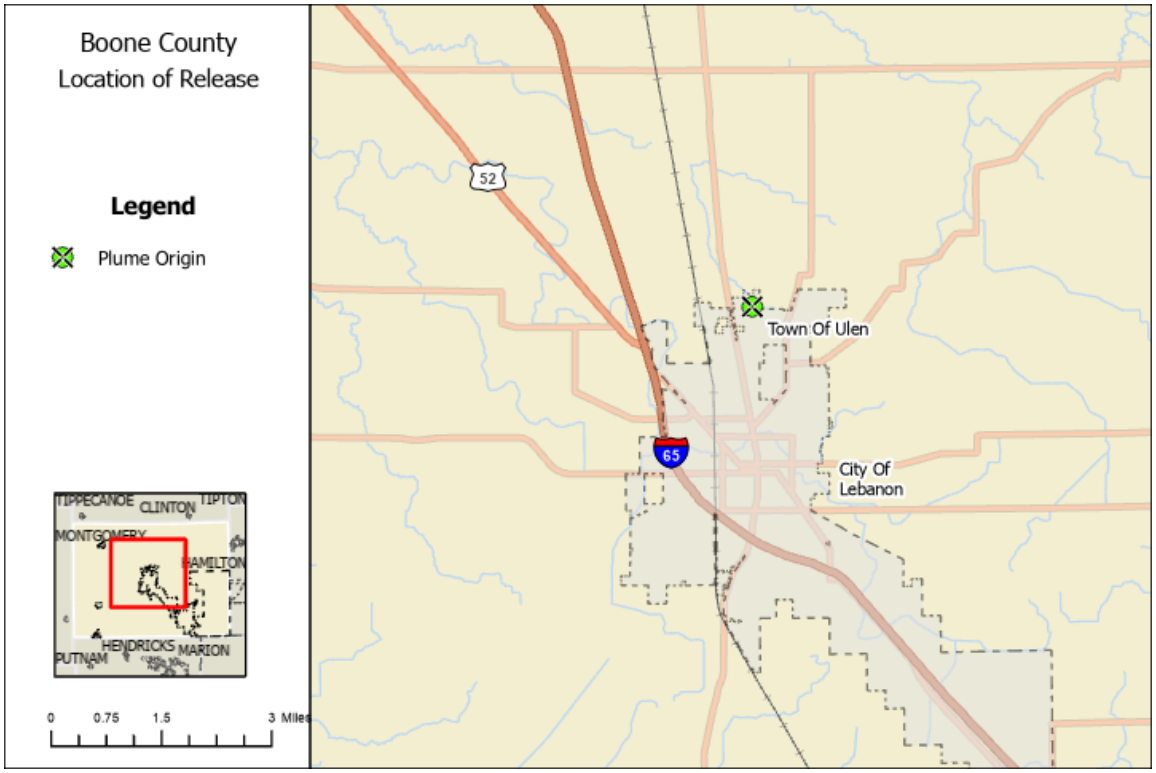

Figure 54. Location of Release

The Boone County Building Inventory was added to ArcGIS Pro and overlaid with the threat zone footprint. The Building Inventory was then intersected with each of the three footprint areas to classify each point based upon the plume footprint in which it is located. Figure 55 depicts the Boone County Building Inventory after the intersect process.

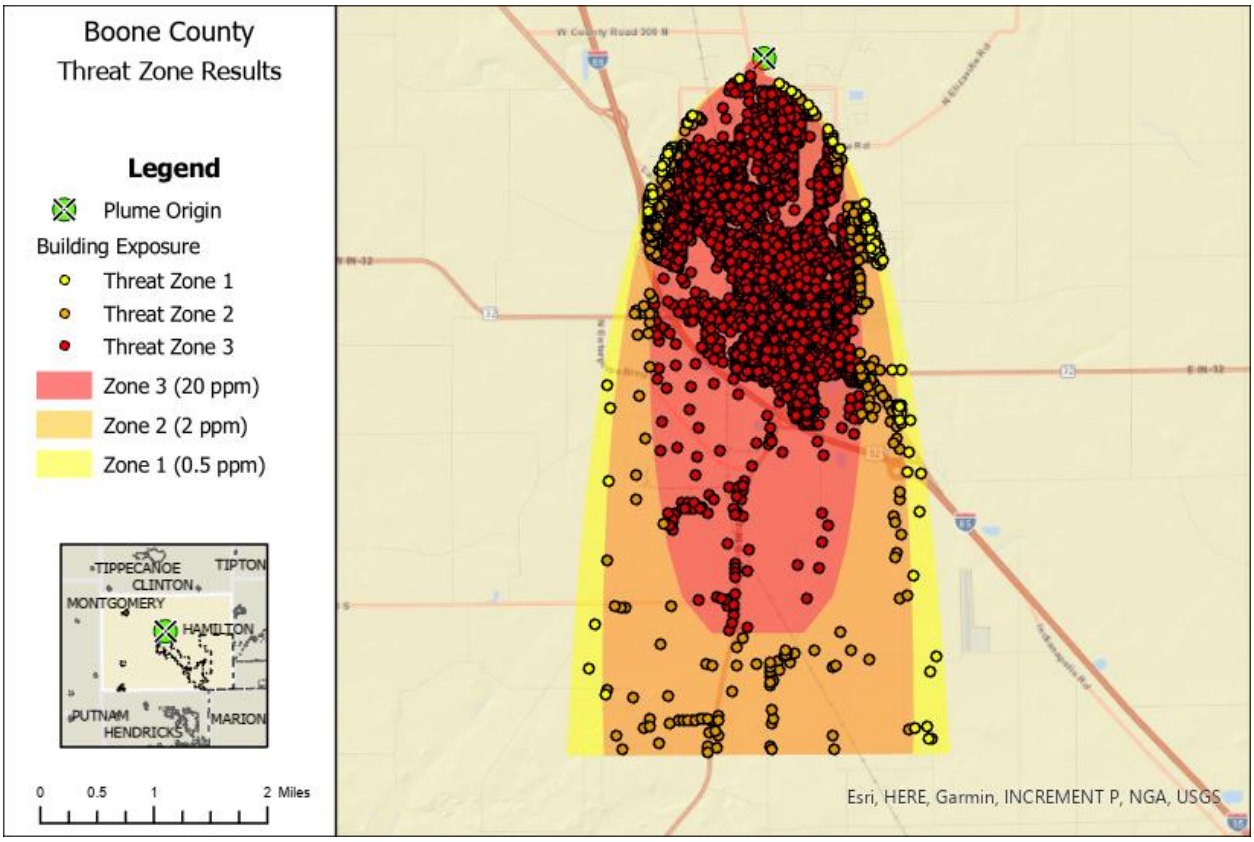

Figure 55. Location of Release and Building Inventory by Threat Zone

The number of buildings within each threat zone are reported in Table 33.

Table 33. Estimated Exposure for all Threat Zones

	Number of Buildings within the Hazmat Plume		
Occupancy	**AEGL 3 (most severe)**	**AEGL 2**	**AEGL 1 (least severe)**
Agriculture	22	94	16
Commercial	1,814	219	31
Education	30	5	--
Government	138	15	5
Industrial	326	71	15
Religious	425	35	5
Residential	20,015	3,022	801
Total	**22,779**	**3,461**	**873**

Table 34 summarizes the replacement costs of buildings within each threat zone. Values represent only those portions of each zone that are not occupied by other zones.

Table 34. Estimated Replacement Cost for all Threat Zones

Occupancy	Replacement Cost of Buildings within the Hazmat Plume		
	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	$446,180	$5,836,855	$197,050
Commercial	$493,206,721	$64,932,330	$12,164,340
Education	$3,831,200	$37,438,000	$192,500
Government	$66,972,585	$6,372,100	--
Industrial	$783,537,720	$748,881,550	$197,695,950
Religious	$135,153,730	$4,626,300	$72,500
Residential	$1,929,115,344	$393,731,736	$118,730,750
Total	**$3,412,263,480**	**$1,261,818,871**	**$329,053,090**

Essential Facilities

All facilities affected by the plume have been mapped and labeled in Figure 56. Table 34 lists all affected essential facilities. Appendix E contains a map and list of critical facilities that fall in the plume.

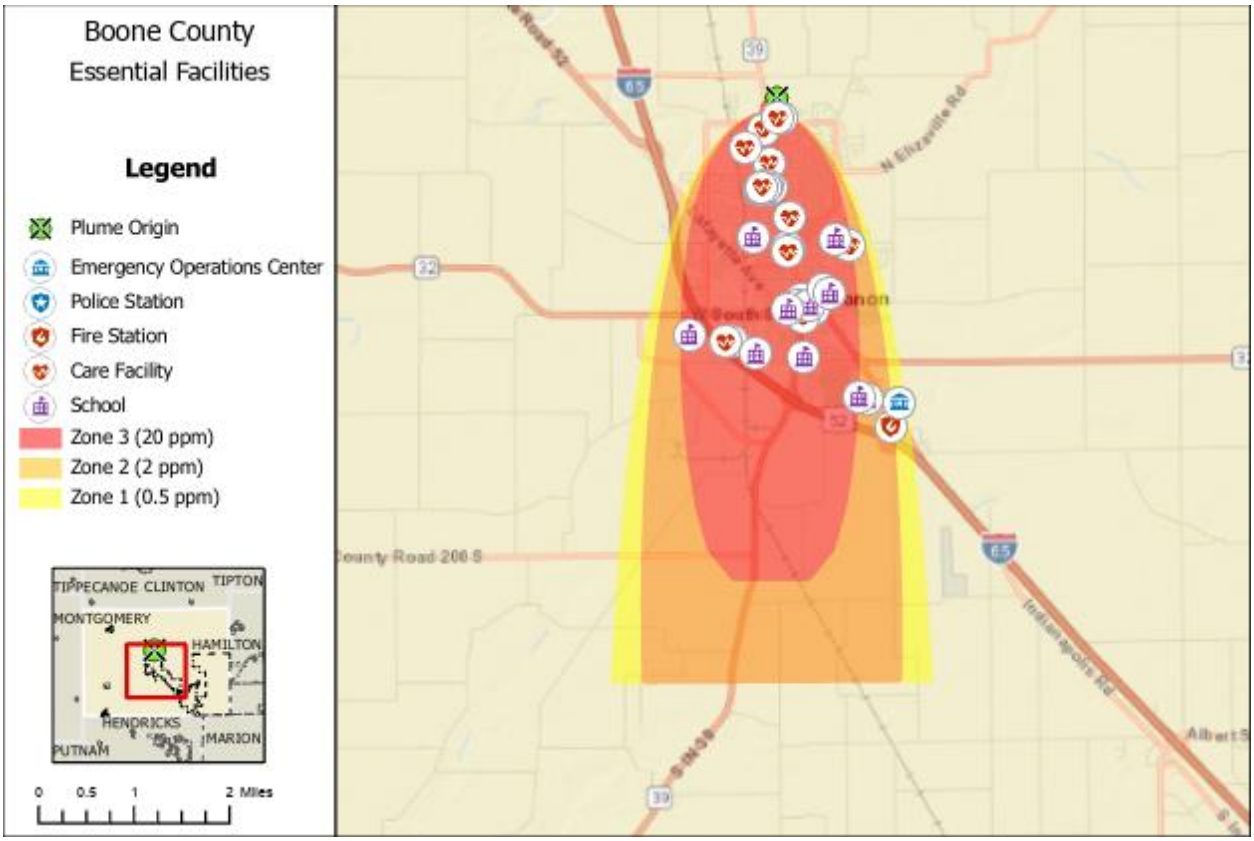

Figure 56. Essential Facilities Located in Threat Zone

Table 35. Essential Facilities within plume threat zone

Facility Type	Facility Name
Care Facility	WITHAM HOSPITAL
Care Facility	BASE MENTAL HEALTH
Care Facility	WALGREENS LEBANON
Care Facility	BEHAVIOR CORP MENTAL HEALTH
Care Facility	BOONE COUNTY HEALTH DEPARTMENT
Care Facility	HOMEWOOD HEALTHCARE
Care Facility	ESSEX NURSING HOME
Care Facility	KROGER PHARMACIES
Care Facility	WITHAM HOSPITAL
Care Facility	LEBANON MANOR VILLAGE
Care Facility	PARKSIDE DRUGS
Care Facility	CVS LEBANON
Care Facility	COWAN DRUGS
Care Facility	PARKWOOD HEALTH CARE
Care Facility	WALMART PHARMACY
Emergency Center	Boone County EMA
Fire Station	Lebanon Fire Dept
Fire Station	Center Twp Fire Dept
Police Station	Lebanon Police Dept
Police Station	Boone County Sheriff
School	Boys & Girls Club
School	Central Elementary School
School	Harney Elementary School
School	Just Be Kids Learning Center
School	Kiddie Corner Day Care
School	Lebanon Ballet School
School	Lebanon High School
School	Little Angels Daycare
School	Little Blessings
School	Pixie Playhouse
School	Presbyterian Church
School	Stokes Elementary School
Courthouse	Boone County Courthouse

4.3.8.8 Community Development Trends and Future Vulnerability

Because the hazardous material hazard events may occur anywhere within the county, future development will be impacted, especially development along major roadways. The major transportation routes and the industries located in Boone County pose a threat of dangerous chemicals and hazardous materials release.

4.3.8.9 Climate Change and Hazardous Material Release

Climate change has an indirect impact on hazardous material releases in Indiana. Increased frequency and intensity of extreme weather events, rising temperatures, and altered precipitation patterns, elevate the risk of hazardous material incidents. For example, extreme weather events like floods and severe storms damage industrial facilities, storage tanks, and transportation routes, leading to hazardous material releases.

Moreover, shifts in temperature and weather patterns affect the behavior and stability of certain hazardous substances, potentially making them more volatile or prone to chemical reactions that could result in accidental releases. Rising temperatures increase the pressure on aging infrastructure, making pipelines and storage tanks more susceptible to failures and leaks.

4.3.8.10 Relationship to other Hazards

Flood – Hazmat incidents are likely when flood incidents occur. Hazardous material storage containers can become compromised due to flooding.

4.3.9 Dam and Levee Failure

4.3.9.1 Hazard Definition for Dam and Levee Failure

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below creates large amounts of potential energy, creating the potential for failure. The same potential exists for levees when they serve their purpose, which is to confine flood waters within the channel area of a river and exclude that water from land or communities land-ward of the levee. Dams and levees can fail due to either 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam or levee fails, issues of primary concern include injury or loss of human life, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, security leads to new construction, added infrastructure, and increased population over time. Levees are built to hold back flood waters only up to some maximum level, often the 100-year (1% annual probability) flood event. When that maximum is exceeded by more than the design safety margin, the levee will be overtopped or otherwise fail, inundating communities in the land previously protected by that levee. It has been suggested that climate change, land-use shifts, and some forms of river engineering may be increasing the magnitude of large floods and the frequency of levee failure situations.

In addition to failure that results from extreme floods above the design capacity, levees and dams can fail due to structural deficiencies. Both dams and levees require constant monitoring and regular maintenance to assure their integrity. Many structures across the U.S. have been under-funded or otherwise neglected, leading to an eventual day of reckoning in the form either of realization that the structure is unsafe or, sometimes, an actual failure. The threat of dam or levee failure may require substantial commitment of time, personnel, and resources. Since dams and levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

Low-Head Dams

Another type of dam low-head, or in-channel, dams can present a safety hazard to the public because of their ability to trap victims in a submerged hydraulic jump formed just downstream from the dam. Recent deaths and injuries around these structures in the state, have brought the attention of this issue to the surface for local, state, and federal officials. Current initiatives led by the Indiana Silver Jackets—a multi-agency coalition that leverages efforts to address natural hazards—have focused on the identification of these dams statewide, as well as various efforts to notify the public on their dangers.

Non-Levee Embankments

Along with accredited levees regulated by federal agencies, there are also what are referred to as Non-Levee Embankments (NLE), which typically parallel to the direction of natural flow. An embankment is an artificial mound of soil or broken rock that supports railroads, highways, airfields, and large industrial sites in low areas, or impounds water. NLEs are often highways or railroads built on fill in low lying areas and thus tend to impose lateral constraints on flood flows, and typically contain the following characteristics:

- NLEs are elevated linear features adjacent to waterways and within the floodplain.
- They are typically man-made and include agricultural embankments built by landowners and road and railroad embankments banks.
- They are levee-like structures but are not certified or engineered to provide flood protection.

The National Committee on Levee Safety estimates that the location and reliability status of 85% of the nation's NLEs are unknown. In Indiana, majority of NLEs are unidentified and are typically not maintained. NLEs impose lateral constraints on flood flows, reducing the floodplain storage capacity and increasing the flood velocity. As a result, downstream flooding and the potential for stream erosion can increase. As such, NLE's can give a false sense of security and protection to the people residing near NLEs. For these reasons, it is extremely important to map where these features are located.

Living with levees is a shared responsibility. While levees are in operation, maintaining levee systems are the levee sponsor responsibility. Local officials are adopting protocols and procedures for ensuring public safety and participation in the NFIP.

4.3.9.2 Dam and Levee Failure History in Boone County

According to the Boone County Hazard Analysis, there are no records or local knowledge of any dam or certified levee failure in the county.

The team did not identify dam or levee failure as a threat to the county or jurisdictions. These survey answers can be found in Appendix F.

4.3.9.3 Geographic Location for Dam and Levee Failure

A review of the IDNR dam database revealed 5 state regulated dams located in Boone County and no federally regulated dams. Table 36 summarizes the dam information and Figure 57 maps the dams on a county level. High hazard and in channel dams are individually mapped in the vulnerability section. A review of the U.S. Army Corp of Engineers (USACE) and IDNR's data identified no certified levees in the county. There are, however, 266 non-levee embankments in the county that could be of concern to the planning team. They are mapped in Figure 58.

Table 36. Indiana Department of Natural Resources Dam Inventory

Dam Name	Hazard Rank	EAP?
Windy Hill Farm Lake	Significant	No
Morton Farms Lake Dam	Low	No
Elrod Lake Dam	Low	No
Mallard Pond Dam	Low	No
Holliday Lake Dam	Low	No

*According to IDNR, this is not a state regulated dam, but it is federally regulated.

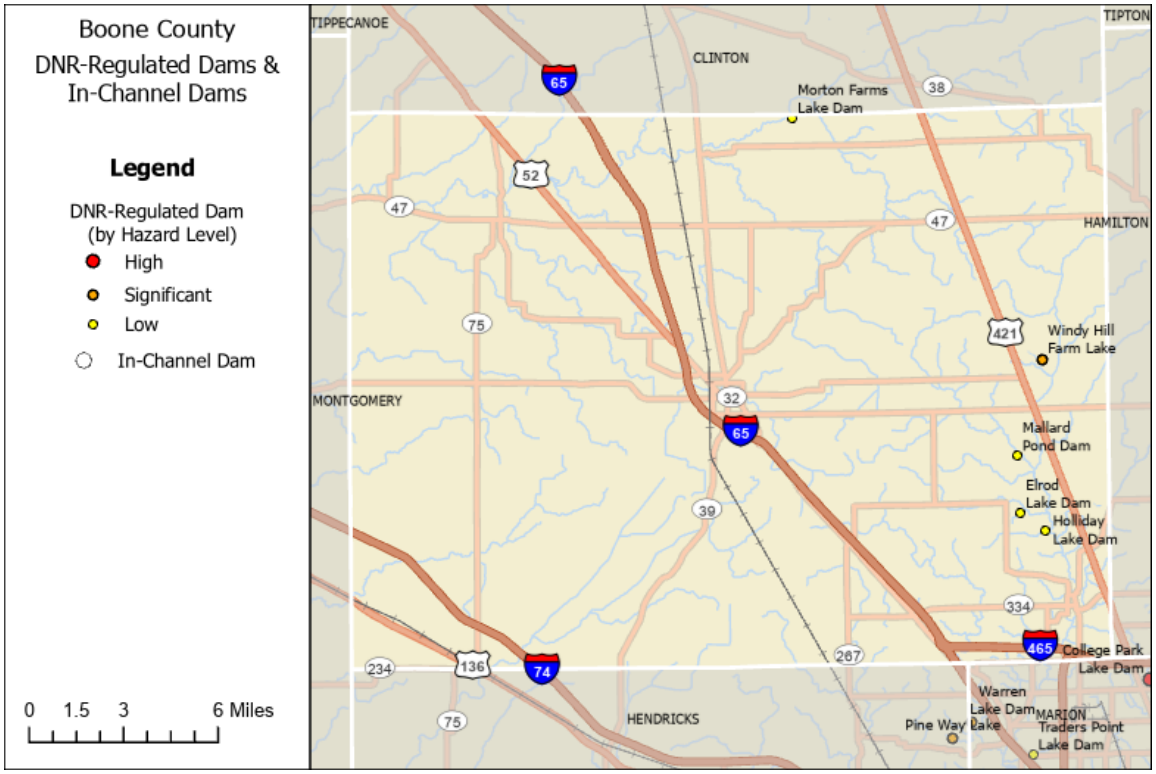

Figure 57. Boone County DNR Regulated Dams with Hazard Classification

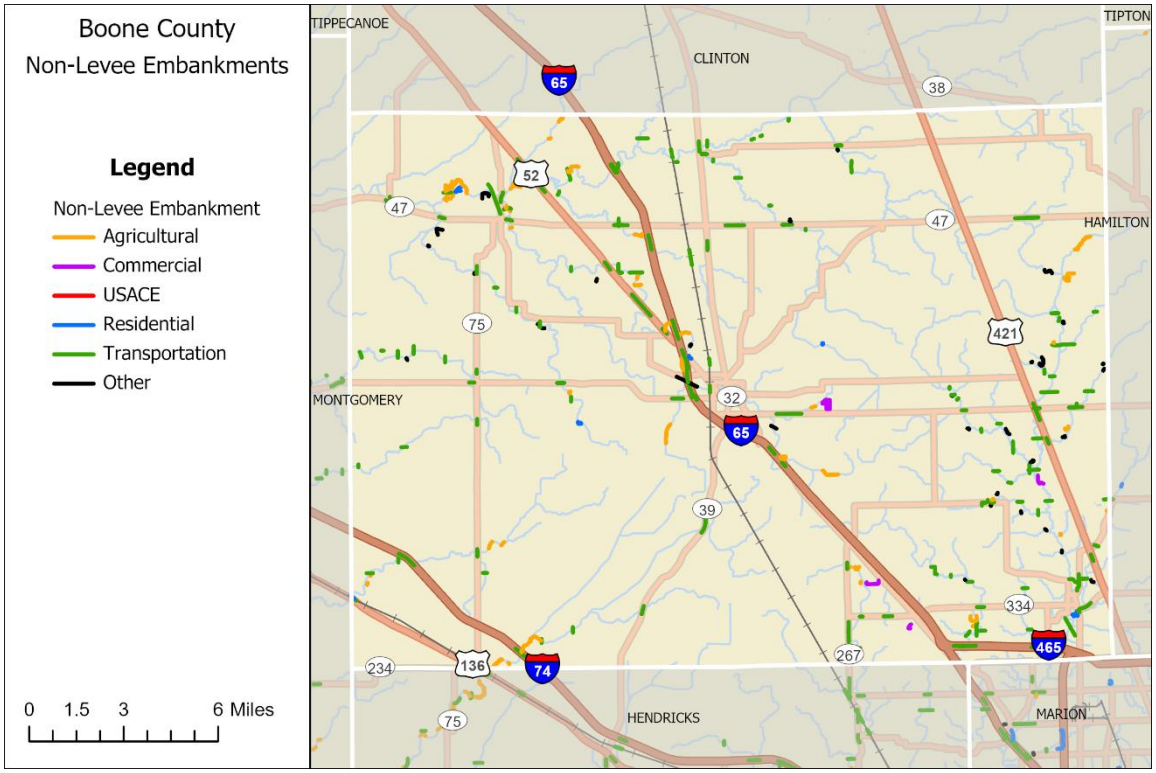

Figure 58. Boone County Non-Levee Embankments

4.3.9.4 Hazard Extent for Dam and Levee Failure

When dams are assigned the low (L) hazard potential classification, it means that failure or incorrect operation of the dam will result in no human life losses and no economic or environmental losses. Losses are principally limited to the owner's property. Dams assigned the significant (S) hazard classification are those dams in which failure or incorrect operation results in no probable loss of human life; however, it can cause economic loss, environment damage, and disruption of lifeline facilities. Dams classified as significant hazard potential dams are often located in predominantly rural or agricultural areas but could be in populated areas with a significant amount of infrastructure. Dams assigned the high (H) hazard potential classification are those dams in which failure or incorrect operation has the highest risk to cause loss of human life and significant damage to buildings and infrastructure.

According to IDNR and the National Inventory of Dams, Boone County has no dam classified as high hazard or dams with an Emergency Action Plan (EAP). An EAP is not required by the State of Indiana but is strongly recommended in the 2007 Indiana Dam Safety & Inspection Manual.

Accurate mapping of the risks of flooding behind levees depends on knowing the condition and level of protection the levees provide. FEMA and the U.S. Army Corps of Engineers are working together to make sure that flood hazard maps clearly reflect the flood protection capabilities of levees, and that the maps accurately represent the flood risks posed to areas situated behind them. Levee owners—usually states, communities, or in some cases private individuals or organizations—are responsible for ensuring that the levees they own are maintained according to their design. In order for a dam or levee to be considered a creditable flood protection structure on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the 1% annual chance flood.

4.3.9.5 Risk Identification for Dam and Levee Failure

The planning team determined that the probability of dam or levee failure is unlikely with limited consequences. The warning time for dam or levee failure is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for dam or levee failure is 1.85.

4.3.9.6 Vulnerability Analysis for Dam and Levee Failure

Boone County has no High Hazard dams, dams with an EAP, or in-channel dams that could cause potential damage.

The extent of potential levee failure varies across the county. To be considered accredited flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the 1% annual chance flood. If this accreditation is maintained, portions that would be mapped as Special Flood Hazard Area appear on a FIRM map as Zone X, protected by levee. A review of the

USACE and FEMA data identified no certified levee segments in Boone County. As mentioned previously, Boone County has several Non-Levee Embankments that were mapped as part of a statewide project. While these NLEs cannot be regulated, they none the less can affect the flow of flood waters. Boone County showed no significant NLEs near major areas of population or essential facilities.

4.3.9.7 Community Development Trends and Future Vulnerability

The county recognizes the importance of maintaining its future assets, infrastructure, and residents. Inundation maps can highlight the areas of greatest vulnerability in each community. The Boone County Planning Commission reviews new development for compliance with the local zoning ordinance.

Impoverished and unemployed individuals within an inundation zone are unequally affected by the possibly of a dam or levee failure. Any of the 6.6% of the population living impoverished and 3.4% unemployed that have property and home destroyed by a dam or levee failure are unable to build back at the same rate or to the same extent of the total population.

4.3.9.8 Climate Change and Dam and Levee Failure

Increased variability and intensity in precipitation patterns leads to more frequent and intense rainfall events. Elevated rainfall can overload dams and levees, putting them at greater risk of failure.

4.3.9.9 Relationship to Other Hazards

Flooding – Flooding is typically the leading cause of dam or levee failure incidents.

Drought – Property owners living around dams may have problems accessing boating equipment during times of drought.

4.3.10 Wildfire

4.3.10.1 Hazard Definition for Wildfire

The hazard extent of wildfires is greatest in the heavily forested areas of southern Indiana. The IDNR Division of Forestry assumes responsibility for approximately 7.3 million acres of forest and associated wild lands, including state and privately-owned lands. A map of the number of wildfires per county is shown in Figure 59, totaling 300 wildfires recorded in Indiana.

Indiana's wildfire seasons occur primarily in the spring and fall. In the spring, the leaf litter on the ground dries out and before young herbaceous plants start to grow and cover the ground (green up). In the fall, leaves come down and cause a fire hazard before they are wetted down by the first heavy snow. During these times, especially when weather conditions are warm, windy, and with low humidity, cured vegetation is particularly susceptible to burning. Fuel, weather, and topography when combined present an unpredictable danger to unwary civilians

and firefighters in the path of a wildfire. Human action can not only intervene to stop the spread of wildfires but can also mitigate their onset and effects. Forest and grassland areas can be cleared of dry fuel to prevent fires from starting and can be burned proactively to prevent uncontrolled burning.

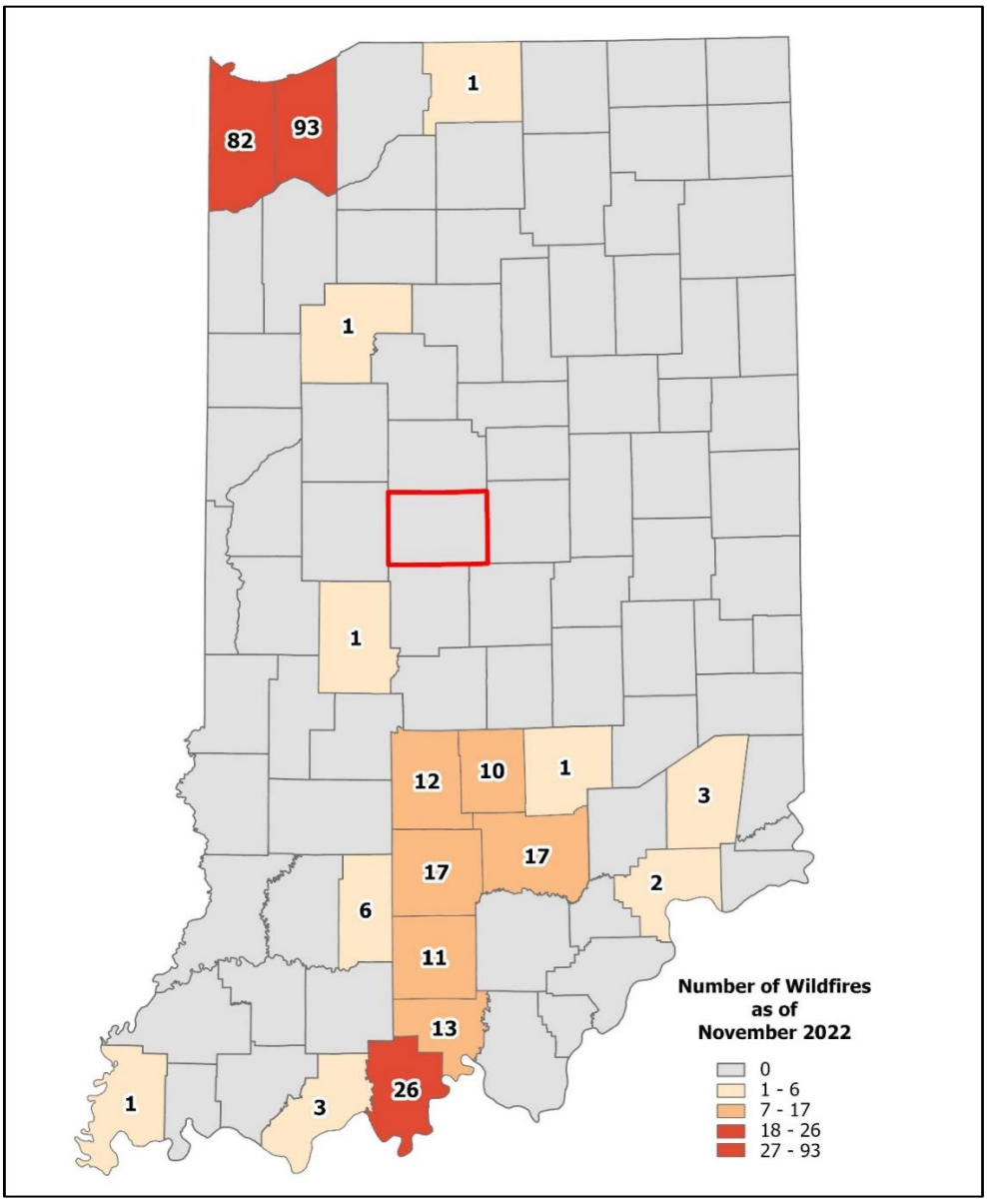

Figure 59. Number of Recorded Wildfires per County as of November 2022 (Source: The Wildland Fire Interagency Geospatial Services Group)

4.3.10.2 Wildfire History in Boone County

The planning team identified one grass fire in 2021 that burned approximately 50 acres in the northern portion of the County, near CR 750N and SR 39. There have been no recently recorded wildfires or damages from wildfires reported in Boone County.

4.3.10.3 Geographic Location for Wildfire

Wildfires can affect any area of the county that may be experiencing a drought.

4.3.10.4 Hazard Extent for Wildfire

Wildfires can be widespread or localized events.

4.3.10.5 Risk Identification for Wildfire

The planning team determined that the probability of a wildfire is possible with limited consequences. The warning time for a wildfire is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for wildfire is 2.3.

4.3.10.6 Vulnerability Analysis for Wildfire

Residential, commercial, and recreational areas are all vulnerable to wildfires. Areas of concentrated vegetation such as national parks or forests can be exceptionally vulnerable to wildfire.

4.3.10.7 Community Development Trends and Future Vulnerability

Because wildfire hazard events may occur anywhere within the county, future development will be impacted. Major future development areas will be supplied with water distribution, including hydrants for fire protection.

4.3.10.8 Climate Change and Wildfire

Rising temperatures and frequent heatwaves promote hot and dry conditions for fire weather—a favorable environment with warmer temperatures, low rainfall, low humidity, and high winds (Williams, 2019; Smith, 2020; Parks, 2016). This increases the risk of wildfires. Studies have indicated that fire weather has become more frequent globally, increasing on average by eight days between 1979 and 2019 (Jolly, 2015). The western portion of the US will be more greatly impacted than Indiana.

4.3.10.9 Relationship to other Hazards

Flooding and Erosion – Wildfires can completely eliminate vegetation and pose an increased risk to flooding and erosion effects.

Drought and Extreme Heat – Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire.

Hazardous Material Release – Storage tanks carrying chemicals including chlorine, anhydrous ammonia, and fuel tanks located at farms pose an increased risk to wildfire ignition.

4.3.11 Environmentally Harmful Organisms

4.3.11.1 Hazard Definition for Environmentally Harmful Organisms

The spread of harmful organisms is occasionally overlooked, potential natural hazards that can be exacerbated following other natural disasters. Invasive alien species and climate change, with land use change and changes in the nitrogen and carbon cycles, are identified as the top four drivers of global biodiversity loss. This hazard can include invasive species, such as the Emerald ash borer, or vector-borne diseases, such as West Nile fever.

Emerald Ash Borer

EAB has been detected in Boone County, Indiana. As of 2017, the entire state of Indiana lies within the Federal quarantine boundaries. However, The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has proposed removing the federal domestic EAB quarantine regulations as they have proved ineffective. Indiana lifted its EAB quarantine in October 2016.

The EAB's larvae stage feed on the inner bark of the ash trees, disrupting a tree's ability to transport nutrients and water. The EAB is responsible for killing millions of ash trees in North America. It has cost municipalities, property owners, nursery owners, and forest industries millions of dollars.

Vector-Borne Illness

Vector-borne diseases are caused by infectious microorganisms that are transmitted to people via living organisms including blood-sucking arthropods such as mosquitos, ticks, fleas, and spiders. Natural disasters, particularly meteorological events such as cyclones, hurricanes, and flooding, can influence transmission of vector-borne disease. The crowding of infected and vulnerable hosts, a debilitated public health infrastructure, and disruptions of ongoing control processes are risk factors for transmission of vector-borne disease. The Indiana State Department of Health (IDOH) identifies sleeping sickness (Eastern equine encephalitis virus), La Crosse encephalitis (La Crosse virus), St. Louis encephalitis (St. Louis encephalitis virus), West Nile fever (West Nile virus), and dengue fever (dengue virus), as mosquito-borne diseases that Hoosiers should take steps to protect themselves against.

The health department reported 155 instances of tick-borne illness in Indiana in 2018 alone. The IDOH highlighted Lyme disease, Rocky Mountain spotted fever (RMSF), and Erlichiosis as tick-borne diseases particularly prevalent in Indiana. Over the past few years, Indiana has experienced a rise in tick-borne infections. There were 36 cases of RMSF in 2014 but 80 in 2018. There were approximately 26 cases of Lyme disease in 2006, 112 cases in 2014, and 155 cases

in 2018. Increased summer tick populations frequently follow mild winters, and back-to-back mild winters can cause a notable surge in tick numbers, along with the diseases they carry. In June of 2017, a young Indiana girl died after contracting Rocky Mountain spotted fever from a tick bite. Recently, a new tick-transmitted virus has made headlines through the state, the Heartland virus. The Centers for Disease Control confirmed two cases in Indiana. Both infected patients survived.

4.3.11.2 Environmentally Harmful Organisms History in Boone County

Emerald Ash Borer

EAB has been detected in 8 locations in Boone County, as shown in Figure 60.

Vector-Borne Illness

Since 2018, Boone County had 8 reports of Lyme disease and 2 reports of RMSF. Mosquitoes carrying West Nile virus were detected in Boone County in 2015, 2016, 2017, 2018, 2019, and 2022. Most people who get infected with West Nile virus will have either no symptoms or mild symptoms, but a few individuals may contract a more severe form of the disease.

4.3.11.3 Geographic Location for Environmentally Harmful Organisms

Emerald Ash Borers are commonly found in forested areas but can also negatively impact neighborhoods and other areas with trees.

Mosquitos are drawn to areas of standing water and are commonly most active at dusk and dawn; however, all areas are affected by mosquito populations.

Viruses are found throughout a county and can affect all individuals.

4.3.11.4 Hazard Extent for Environmentally Harmful Organisms

An exposure analysis identifies the existing and future assets located in identified hazard areas. The areas with reported identification of the EAB in Boone County are identified in Figure 60. The points shown are collected from DNR annual surveys and from the DNR Division of Entomology and Plant Pathology field staff. According to the DNR, a live larva must be collected from an ash tree and identified by a trained specialist to confirm the presence of EAB at the marked location. There may be more locations with EAB that have not been identified.

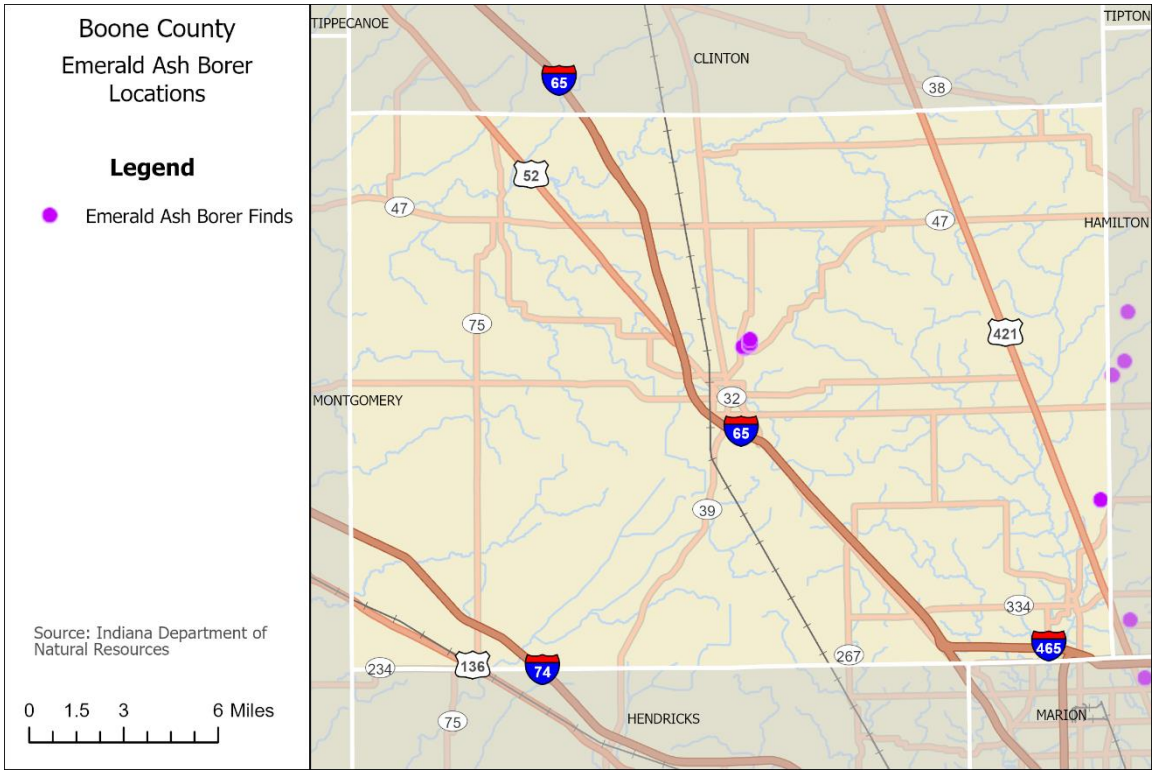

Figure 60. Emerald Ash Borer in Boone County

4.3.11.5 Risk Identification for Environmentally Harmful Organisms

The planning team determined that the probability of a harmful organism hazard as likely with limited consequences. The warning time for a harmful organism hazard is less than 6 hours with a duration longer than 24 hours. The calculated CPRI for harmful organisms is 2.75.

4.3.11.6 Vulnerability Analysis for Environmentally Harmful Organisms Hazard

Wooded, areas of concentrated vegetation, and agricultural areas attract organisms that may be potentially harmful. Areas with standing water or that are excessively damp attract insects that spread disease, such as mosquitoes. All communities are susceptible to effects from environmentally harmful organism.

4.3.11.7 Community Development Trends and Future Vulnerability

Future development will remain vulnerable to these events. EABs have killed millions of ash trees in Indiana, Michigan, Illinois, Ohio, and Ontario and will continue to do so until the insects are effectively contained or eliminated, or a strain of more resistant trees is developed.

According to the National Institute of Allergy and Infectious Diseases, tick-borne illnesses will continue to remain a problem as people build homes in wilderness areas where ticks and their animal hosts live; however, urban environments can also host ticks and the pathogens they can transmit.

Eliminating areas of standing water may help diminish the disease-carrying mosquito population by removing or treating stagnant bodies of water areas that serve as mosquitos' breeding grounds.

4.3.11.8 Climate Change and Environmentally Harmful Organisms

Climate change is anticipated to affect invasive species by enabling them to expand their range into new areas due to warmer temperatures and altered precipitation patterns. This expansion could disrupt ecosystem dynamics and relationships with native species, potentially giving invasive species a competitive advantage in resource competition.

Higher temperatures and altered weather patterns extend the geographic range of disease-carrying vectors, such as mosquitoes and ticks, allowing them to thrive in regions that were once inhospitable. Expansion leads to the spread of diseases like Lyme disease to new areas.

4.3.11.9 Relationship to other Hazards

The risk for infectious disease transmission is primarily associated with displacement and the characteristics of the displaced population, the proximity of sterile water and functional restrooms, the nutritional status of the displaced, the level of immunity to vaccine-preventable infections, and the availability of access to healthcare services.

Flooding – Increased risk of vector-borne diseases. EAB-damaged trees may pose a risk for increased logjam events. In the aftermath of flooding, a plethora of standing water combined with a possibly weakened health infrastructure and an interruption of ongoing control programs increases the risk factors for vector-borne disease transmission. While initial flooding may wash away existing mosquito-breeding sites, standing water caused by heavy rainfall or overflow of rivers can create new breeding sites.

Earthquake – In the aftermath of earthquakes, some populations have experienced infection outbreaks associated with increased exposure to airborne dust from landslides.

Tornadoes – Natural disasters like tornadoes, which impact communities on a large-scale and cause displacement, have been associated with an increased risk in disease.

Utility Failure – Power outages and the disruption of water treatment and supply plants can affect the proper functioning of health facilities and has also been linked with an increase in diarrheal illness.

4.3.12 Infectious Diseases Dangerous to Public Health

With the Novel Coronavirus (COVID-19) declared as a natural disaster by FEMA, the need has become clear to correlate harmful diseases that could affect public health, ultimately affecting emergency services. The CDC characterizes a disease outbreak as a sharp increase in the number of incidences of a disease in the population. When the expected or routine amounts of

incidences of a disease rapidly grows into a public health threat, public health and emergency management officials and medical care professionals must act swiftly to limit morbidity and mortality. Disease outbreaks pose a particular risk to urban and suburban communities due to the close environments in which people interact.

The COVID-19 pandemic had a significant impact on individuals, communities, and society. COVID-19 exposed the need to understand how infectious diseases can be hazardous and their biological impact. Other common viruses seen in Indiana are Influenza A and B, Pneumonia, Rhinovirus, Enterovirus, Adenovirus, and Norovirus. Viruses are transmitted directly or indirectly. Direct transmission includes droplet spread, such as sneezing and coughing. Indirect forms of spread include airborne, vehicle borne, or vector borne (mechanical or biological). COVID-19 is transmitted by both modes. Other examples of transmission may include airborne inhalation, food, liquids, bodily fluids, contaminated objects, or ingestion. Between 2012 and 2018, IDOH Epidemiology Resource Center published an annual report of infectious diseases documented in the state and their incidence. Recent reports can be found at https://www.in.gov/isdh/20667.htm.

FEMA declared COVID-19 as a national disaster March of 2022 and is still an active disaster declaration as of the time of this writing. With the global impact of COVID-19, statistics and data are readily available. According to the Indiana COVID-19 Dashboard by the IDOH, the State of Indiana has had a total of 2,010,174 cases and 24,413 deaths from COVID-19. As of January 3, 2023, the Indiana COVID-19 Home Dashboard reports a total of 17,228 cases for Boone County. Other common viruses, not necessarily reported to doctors, such as the Rhinovirus or Norovirus, are difficult to track by county. According to the IDOH, between 2015 and 2020 there were a total 50 deaths reported due to Influenza and Pneumonia. Although statistics lack on number of infections, illness as a hazard has grave or deadly impacts on individuals.

The planning team identified Infectious Diseases as a likely probability with limited consequences. The warning time was determined to be more than 24 hours with a duration greater than 1 week. The CPRI score for infectious disease is 2.5.

Older and younger populations are more susceptible to virus infection. The 13.2% of the population in Boone County over the age of 65 are at greater risk of infection. In addition, impoverished and unemployed individuals are unequally affected by infections for reasons such as lack of ability to get to a health provider and pay for services and supplies. These individuals are more affected by not being able to work should the virus keep them from attending, as well.

4.3.13 Cyberattacks

Cyberattacks are malicious attempts to access or damage a computer that can occur 24 hours a day, 7 days a week, 365 days a year. Unlike physical attacks which can be immediately

responded to, cyberattacks are often difficult to identify and address. Cyberattacks can be in the form of viruses or the introduction of malware which alter or erase programs and systems, accessing and/or altering restricted files or systems, and accessing the computer or device of another person to attack others or steal confidential information. Cyberattacks can have wide-ranging effects on the individual, organizational, community, and national level.

These risks include:

- Organized cybercrime, state-sponsored hackers, and cyber espionage can pose national security risks.
- Transportation, healthcare, power, and other services may be disrupted by large-scale cyber incidents.
- Vulnerability to data breach and loss increases if an organization's network is compromised. Information about a company, its employees, and its customers can be at risk.
- Unauthorized access to individually owned devices such as computers, tablets, mobile phones, and gaming systems that connect to the Internet. Personal information may be at risk without proper security.

Scale is important to consider when accessing cyberattack exposure. The probability a single user is attacked is highly likely, but an attack to one computer most likely will not affect a county-wide IT system. Boone County has many systems in place to block threats or create redundancies should a threat break into a system.

In February 2018, the Director of National Intelligence identified cyber threats at the top of the list of worldwide threats. A recent survey conducted by Gallup in February 2021 has found that cyberterrorism tops the list of potential threats to the United States. In 2014, the Federal Bureau of Investigation (FBI) expanded its "Most Wanted" list with a "Cyber Most Wanted" list. As of January 2023, it included 41 individuals or groups.

While there were 12 billion records stolen in 2018, it is expected for that number to grow to 33 billion by 2023. Identity theft has affected about 60 million Americans in 2018, compared to 15 million in 2017. About 47% Americans experienced financial identity theft in 2020, and almost 119 million were affected by information breach in the first half of 2021. By 2025, global cybercrime is predicted to reach or exceed $10.5 trillion annually.

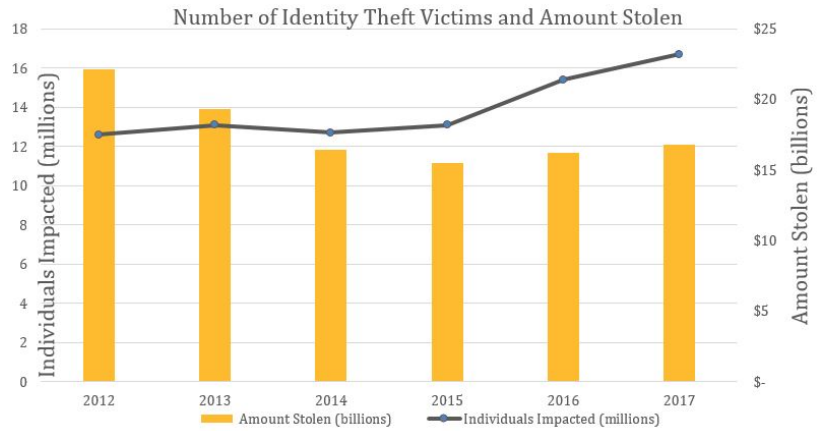

Figure 61. Number of Identity Theft Victims and Amount Stolen (Norton by Symantec, 2018)

While ransomware has been publicized in the news in recent years, a growing number of attacks were remote code execution attacks associated with cryptomining (Imperva, 2018).

The past few years have seen several high-visibility attacks in Indiana. These include attacks on Lutheran Hospital in Fort Wayne, Hancock Health in Greenfield, the Indiana Department of Education, the Indiana National Guard, and the attacks on Becker Hospital, Marion County; Vigo County Sheriff's Office and 911 Systems; Madison County Offices; Marion County Public Health Department; and City of Gary and Lake County Government Systems in 2021. The United States is the top target of cyberattacks in the world. By law, public entities are required to report a cyber incident (https://www.in.gov/cybersecurity/report-a-cyber-crime/). The Indiana Information Sharing and Analysis Center (IN-ISAC) offers high-level consulting at no cost to organizations. This consulting is intended to help those with limited or no cybersecurity knowledge or skills in-house, get their questions answered and their security programs started (https://www.in.gov/cybersecurity/in-isac/3649.htm).

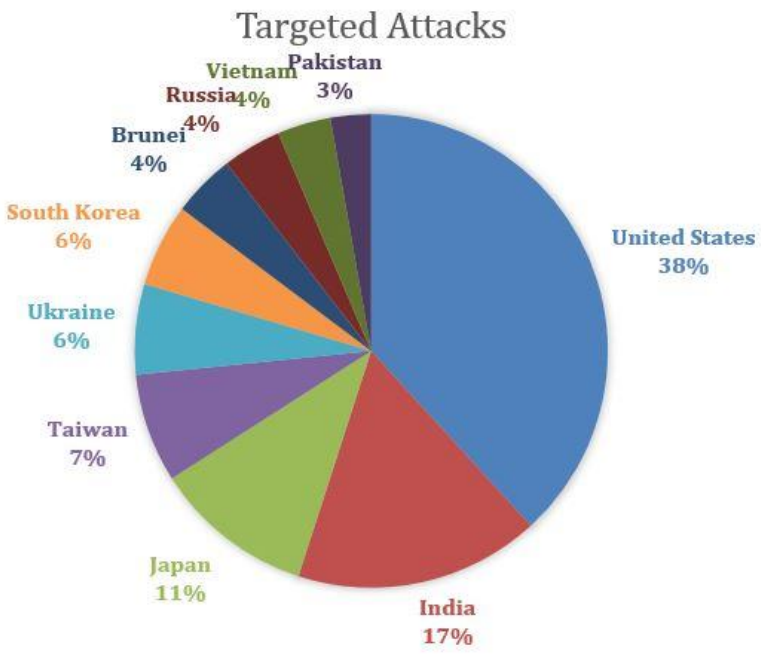

Figure 62. Attacks by Target Country (Norton)

Indiana State government systems are not immune. Approximately 41% of the email received is legitimate. Over a 9-month period in 2018, more than 30 million emails and 24,000 viruses were blocked from entering State computer infrastructure. Additionally, over 2 billion connection requests were blocked at the firewall. The most common source of blocked connections came from Ukraine, followed by Russia and China.

5 Mitigation Goals and Strategies

The goal of mitigation is to protect lives and build disaster-resistant communities through minimizing disruptions to local and regional economies, reducing the future impacts of hazards including property damage, and supporting best use practices for public and private funds spent on recovery assistance. This chapter discusses the general mitigation vision and mitigation goals to reduce or avoid long-term vulnerabilities to the hazards identified in the preceding chapter. Successful mitigation actions and projects are based on well-constructed risk assessments, which are provided in Chapter 4.

5.1 Community Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. It identifies the policies, regulations, procedures, programs, and projects that contribute to the lessening of disaster damages. The assessment also provides an evaluation of county capabilities to determine whether the activities may be improved to reduce the impact of future hazards more effectively. The following sections highlight the existing plans and mitigation capabilities within all of the communities.

5.1.1 Planning and Regulatory

Planning and regulatory capabilities include the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. In the following subsection, the team details the NFIP program and local plans, codes, and ordinances in place that serve to make the county more resilient to disasters.

5.1.1.1 NFIP Continued Compliance

According to FEMA, the NFIP is designed to alleviate the escalating costs of repairing flood damage to buildings and their contents. See Section 4.3.1 for NFIP risk assessment. To remain eligible for future mitigation funds, NFIP communities must adopt either their own MHMP or participate in the development of a multi-jurisdictional MHMP.

Boone County, City of Lebanon, Town of Whitestown, and Town of Zionsville participate in the NFIP. The total number of policies and coverage of insurance in-force are identified in Table 17.

To assure coverage is available for all policy holders, the county and its NFIP communities need to assure continued compliance of the state floodway and NFIP requirements.

The Indiana Flood Control Act grants the IDNR regulatory control over floodway areas in any state waterway (streams less than 1 square mile in drainage area). Within the Flood Control Act, the General Assembly created a permitting program. Two of the fundamental provisions of the Act's regulatory programs consist of the following:

1. An abode or place of residence may not be constructed or placed within a floodway.
2. Any structure, obstruction, deposit, or excavation within a floodway must receive written approval from the Director of the Department of Natural Resources for the work before beginning construction.

The state waterways in Boone County include Sugar Creek, Eagle Creek, and the Prairie Creek tributary that joins with Sugar Creek in Thorntown. The Floodplain Administrators are tasked with ensuring that NFIP communities adhere to the established standards. While there have not been any significant flood events in recent years requiring a substantial improvement or damage assessment, the process through which the FPA would assess these provisions is detailed in the Floodplain Ordinance. You can find information about which participants have a floodplain ordinance and which rely on the County's in Table 37.

The IDNR is the Cooperating Technical Partner for the FEMA Floodplain Mapping program and provides floodway site determinations upon request. The IDNR performs both the Community Assistance Call (CAC) and Community Assistance Visit (CAV) for the NFIP program. The CAV and CAC serve as each NFIP communities' assurance that the community is adequately enforcing its floodplain management regulations and prices opportunities for technical assistance by the DNR on behalf of FEMA.

The NFIP's CRS recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards. Depending upon the level of participation, flood insurance premium rates for policyholders can be reduced. Besides the benefit of reduced insurance rates, CRS floodplain management activities enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Technical assistance on designing and implementing some activities is available at no charge. Participating in the CRS provides an incentive to maintaining and improving a community's floodplain management program over the years. The City of Lebanon participates in the CRS program.

5.1.1.2 Plans and Ordinances

Boone County and its incorporated communities have several plans and ordinances in place to ensure the safety of residents and the effective operation of communities. These include the Soil Survey of Boone County, the Boone County Comprehensive Plan, and the Boone County Land Use & Development Code-Zoning Ordinance. Information was collected through surveys with plan team representatives of the county, cities, and towns. The results of these surveys can be found in Appendix F. The review of this information was used to inform the development of mitigation strategies for this plan update.

Table 37. Jurisdictions Planning Mechanisms

Capabilities	Boone County	Whitestown	Jamestown	Lebanon	Advance	Thorntown	Ulen
Planning							
Comprehensive Plan	Yes (2019)	Yes (2020)	Yes (2017)	Yes (2020)	Yes (2022)	Yes (2010)	In progress
Emergency Operations Plan	Yes (2012)	Yes (2020)	County	Yes (2017)	Yes (2020)	Yes	County
Watershed Plan	Yes	Yes (2020)	No	In Progress	Yes (2022)	Yes	No
Ordinances							
Zoning Ordinance	Yes	Yes	Yes	Yes	County	Yes	In progress
Building Codes/ Ordinance	Yes	Yes	Yes	Yes	State	Yes	In progress
Floodplain Ordinance*	Yes	County	No	Yes	No	No	In progress
Storm Water Ordinance	Yes	County	Yes	Yes	No	Yes	In progress
Erosion Ordinance	Yes	State	State	State	Yes	State	In progress
Burning Ordinance	State	Yes	Yes	State	Yes	Yes	Yes

Capabilities	Zionsville	Lebanon Community School Corp	Trader's Points Christian Academy	Western Boone School Corp	Zionsville Community Schools	Boone County SWCD
Planning						
Comprehensive Plan	Yes (2015)	Yes (2020)	Yes (2017)	No	No	No
Emergency Operations Plan	Yes (currently updating)	Yes (2020)	County	No	No	No
Watershed Plan	Yes (2005)	Yes (2020)	No	No	No	Yes
Ordinances						
Zoning Ordinance	Yes	Yes	Yes	No	No	No
Building Codes/ Ordinance	Yes	Yes	Yes	No	No	No
Floodplain Ordinance*	Yes	County	No	No	No	No

Capabilities	Zionsville	Lebanon Community School Corp	Trader's Points Christian Academy	Western Boone School Corp	Zionsville Community Schools	Boone County SWCD
Storm Water Ordinance	Yes	County	Yes	No	No	No
Erosion Ordinance	Yes	No	No	No	No	No
Burning Ordinance	Yes	Yes	Yes	State	State	State

** The floodplain ordinance date is based upon the currently effective map date provided by the FEMA status book report for Communities Participating in the National Flood Program.)*

Many of these plans or policies can help implement the goals, objectives, and strategies in Boone County's MHMP. The Boone County EMA Director is responsible for meeting with each jurisdiction yearly throughout the next five years. During these meetings, the local EMA Director will collaborate with the Cities and Towns to ensure the MHMP is becoming as integrated into local plans as possible. These Local Planning Mechanisms are meant to work cooperatively together to ensure the health, safety, and welfare of Boone County and its corresponding jurisdictions. All the participants contribute to the Comprehensive Emergency Management Plan and will use this plan update as guidance for future Comprehensive Emergency Management Plan updates. In addition, the Local Emergency Planning Committee (LEPC) Plan is updated every year that is a county-wide collaborative effort that utilizes this plan. Boone County EMA will work with city, town, and county officials in the future to integrate this MHMP with related plans that have hazard mitigation goals, objectives, and strategies when feasible and appropriate. For example, as indicated in Table 37 the Town of Ulen is in the progress of creating their own zoning ordinance that considers the information provided in this plan update. To expand on and improve the capabilities in this plan, Boone County, Lebanon, Thorntown, Whitestown, and Zionsville will pursue funding opportunities for the mitigation action items, use the mitigation actions to guide future projects, and refer to this plan regarding mitigation options for future development. The Towns of Advance, Jamestown, and Ulen have minimal ability to expand on and improve the capabilities in the plan due to lack of resources. These towns are small and have few staff to expand on and improve the capabilities in the plan.

The Boone County Area Planning Commission is responsible for reviewing all building and land use to ensure compliance with local ordinances and laws. Boone County has enacted multiple ordinances to regulate development and land use, which include the Zoning Ordinance, Floodplain Ordinance, and Unsafe Building Ordinance. To access detailed information about these regulations, please visit this website: https://boonecounty.in.gov/offices/area-plan/ordinance-downloads/. The Town of Advance development and land use changes are reviewed by the Boone County Area Plan. The Advance Zoning Ordinance is available via this link, as well.

The City of Lebanon has a robust planning department equipped to assess significant development and land use change projects. For comprehensive insights into their zoning ordinance regulations, you can refer to this document: https://lebanon.in.gov/wp-content/uploads/2020/06/3_15_2019_UDO.pdf. Lebanon will continue to use the mitigation action items outlined in this update to guide city projects.

New development and land use change proposals are evaluated and endorsed by the Town of Jamestown Board of Zoning Appeals and Plan Commission. To delve into their zoning ordinance regulations, you may find more information in this document: https://jamestownin.com/wp-content/uploads/2018/01/Jamestown-UDO-2018.pdf.

The Thorntown Planning Advisory Commission reviews proposed development plans and land use changes within town limits. To access details on their zoning ordinance regulations, you can explore the following resource: https://codelibrary.amlegal.com/codes/thorntown/latest/overview.

The Town of Whitestown Planning Department acts as an intermediary with the Board of Zoning Appeals and Plan Commission, which is responsible for reviewing development and land use changes. To gain a comprehensive understanding of their zoning ordinance regulations, you can consult their Unified Development Ordinance, available at this link: https://whitestown.in.gov/wp-content/uploads/2021/12/Whitestown_UDO_Adopted_2020-06-12_Amended_August_2020.pdf.

The Town of Zionsville operates a Plan Commission that evaluates development projects. To access information about the regulations governing land use and development in Zionsville, please refer to their zoning ordinance, which is available here: https://www.zionsville-in.gov/307/Zoning-Ordinance-Maps-Districts.

Per state law that went into effect in July 2023, communities are required to use the State Building Ordinance. The 2023 Indiana General Assembly passed HEA 1575 that greatly modified the Commission's structure and process to updating codes. This law states only three codes can be updated per year and local building codes cannot exceed the State's codes. Since this is state law, the county and towns do not have the ability to adjust for mitigation purposes in excess of State regulations.

5.2 General Mitigation Goals

Chapter 4 identified several natural hazards that Boone County experiences. The MHMP planning team members understand that although hazards cannot be eliminated, Boone County can work toward building disaster-resistant communities. Following are a list of goals, objectives, and actions identified in the previous Boone County MHMP. These goals remain valid and represent long-term, broad visions of the overall vision the county would like to

achieve for mitigation. The objectives are strategies and steps that will assist the communities in attaining the listed goals.

Goal 1: Lessen the impacts of hazards to new and existing infrastructure

- Objective (a): Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weatherproofing.
- Objective (b): Equip public facilities and communities to guard against damage caused by secondary effects of hazards.
- Objective (c): Minimize the amount of infrastructure exposed to hazards.
- Objective (d): Evaluate and strengthen the communication and transportation abilities of emergency services throughout the community.
- Objective (e): Improve emergency sheltering in the community.

Goal 2: Create new or revise existing plans/maps for the community

- Objective (a): Support compliance with the NFIP.
- Objective (b): Review and update existing, or create new, community plans and ordinances to support hazard mitigation.
- Objective (c): Conduct new studies/research to profile hazards and follow up with mitigation strategies.

Goal 3: Develop long-term strategies to educate community residents on the hazards affecting their county

- Objective (a): Raise public awareness on hazard mitigation.
- Objective (b): Improve education and training of emergency personnel and public officials.

5.3 Mitigation Actions and Projects

Upon completion of the risk assessment and development of the goals and objectives, the planning committee was provided a list of the six mitigation measure categories from the FEMA State and Local Mitigation Planning How to Guides. The types of mitigation actions are listed as follows:

- **Prevention**: Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.

- **Public Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection**: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services**: Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- **Structural Projects**: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide, based upon many factors, which action will be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions is important. The plan team assessed the status and priority of the existing strategies using the FEMA mitigation evaluation criteria using the STAPLE + E criteria. Table 38 lists the factors to consider in the analysis and prioritization of actions. Some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action.

Table 38. STAPLE+E Criteria

Criteria	Description
S – Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

E – Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
E – Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, comply with federal, state, and local environmental regulations, and are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Understanding the dynamics of STAPLE + E leads to the project's success. Developing questions evolving around the evaluation criteria, similar to those outlined below, helps the team prioritize the projects.

Social:

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

Political:

- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

Legal:

- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolution in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

Economic:

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?

- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered but be "tabled" for implementation until outside sources of funding are available?

Environmental:

- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?

5.3.1 Hazard Mitigation Actions

Boone County and its included municipalities share a common Hazard Mitigation Plan and worked closely to develop it. These communities work together with their governing bodies and the Boone County Emergency Management Director to ensure that the hazards and mitigation actions included in this plan are accurate and addressed in their jurisdictions. The jurisdictions responsible for each action consist of the following:

- Boone County
- City of Lebanon
- Town of Zionsville
- Town of Advance
- Town of Jamestown
- Town of Thorntown
- Town of Ulen
- Town of Whitestown
- Lebanon Community Schools
- Trader's Point Academy
- Western Boone Community Schools
- Zionsville School District
- Boone Soil & Water Conservation District

Table 39 lists all mitigation actions for Boone County and its jurisdictions. Each of these mitigation actions detail the hazard, the mitigation action to address the identified hazard, its current stage of implementation, the timeframe for implementation going forward, the jurisdictions who have identified they will work to implement the action, and the responsible parties to carry through with implementation.

Additionally, the Boone County planning team assigned the mitigation actions priority rankings for implementation (1=High Priority; 2= Medium Priority; 3= Low Priority). Mitigation actions given a "high" priority ranking will ideally be implemented within 5 years of the MHMP plan adoption date. Mitigation actions ranked as a "medium" priority may be addressed within 5-10 years from the MHMP plan adoption date, and "low" priority mitigation actions may take over 10 years before action completion. Although higher ranking priorities may constitute a greater county concern than lower ranking priorities, the availability of funds may cause some mitigation actions to take longer to implement.

Mitigation actions identified in the 2018 Boone County Hazard Mitigation Plan have been carried over into the 2023 plan based on the advisement of the Boone County Emergency Management Director and the consensus of the steering committee. Not all the 2018 mitigation actions have been fully completed, and they are identified in this plan to reflect their ongoing implementation.

The status designations include the following:

- **Identified** – actions are in the preliminary stages and have not yet started
- **Complete** – the action is complete
- **Ongoing** – actions require continuing application
- **In Progress** – actions are currently being acted upon
- **Deferred** – no progress has been made
- **Deleted** – the action is no longer relevant

The mitigation action types encompass the following areas:

- **Prevention** – expand mapping, loss-prevention programs, buyouts, regulations
- **Property Protection** – identify vulnerable areas and populations, retrofit vulnerable buildings, structural improvement
- **Public Education** – information sessions, presentations, disclosure, website information, brochures, educational resources, and hazard awareness
- **Natural Resource Protection** – conservation, erosion control, stream corridor restoration, wetland restoration, resource management
- **Emergency Services** – emergency alerts, evacuation plans, expand emergency operations
- **Structural Improvement** – acquisitions and elevations of structures in flood prone areas, structural retrofits, retaining walls, retention structures, culverts, and safe room.

5.3.2 Mitigation Actions by Community

This is a multi-jurisdictional plan that covers Boone County, its school districts, and the communities of City of Lebanon, Town of Zionsville, Town of Advance, Town of Jamestown, Town of Thorntown, Town of Ulen, Town of Whitestown, and the Soil and Water Conservation District. The Boone County risks and mitigation activities identified in this plan also incorporate the concerns and needs of townships and other entities participating in this plan.

Table 39. Mitigation Actions

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
1	Hazmat	Property Prevention	1/c	Create an ordinance that requires all mobile homes to have tie- downs	Boone County	Complete				2018 MHMP	
2	All Hazards	Public Education	3/a	Develop programs to educate the public on hazards within Boone County	All Communities	Complete				2018 MHMP	
3	Multiple Hazards	Emergency Services	1/d	Implement Rave Emergency Alerts for mass media release via email and text messages	All Communities	Complete				2018 MHMP	
4	Multiple Hazards	Emergency Services	1/d	Install warning sirens throughout the county	All Communities	Complete				2018 MHMP	
5	Flood	Property Prevention	1/c	Institute buy-outs for five homes on SR 75 and Franklin Street	Thorntown	Complete				2018 MHMP	
6	Flood	Property Prevention	1/c	Evaluate the homes along Prairie Creek and identify homes that may need bought out.	Lebanon	Complete	High	IDNR, FEMA, EMA, local FPA	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
7	Cyberattack	Prevention	1/c	Conduct IT security audit	Advance	Complete	High	local IT	BRIC grants, HMA grants, local IT operation funds	2023 MHMP	
8	Flood	Prevention	1/b	Map and manage Sanitary Ditch	Lebanon	Identified	Medium	IDNR, FEMA, local FPA	BRIC grants, HMA grants,	2023 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
									FMA grants, local operation funds		
9	Flood	Prevention	2/b	Conduct a detailed floodplain study for Mann Ditch	Boone County	Identified	Medium	EMA, IDNR, FEMA, local FPA	BRIC grants, HMA grants, FMA grants	2023 MHMP	
10	Flood	Prevention	2/c	Conduct a detailed study of the stream, bridges, and inventory of the structures impacted by the flood boundary of Prairie Creek. Identify which bridges cause the greatest impact on flooding and propose possible solutions.	Lebanon	Identified	Medium	EMA, IDNR, FEMA, local FPA	BRIC grants, HMA grants, FMA grants	2023 MHMP	
11	Multiple Hazards	Prevention	2/c	Conduct a study to determine shelter capacity in the county	Boone County	Identified	Medium	EMA, local communities	BRIC grants, HMA grants, FMA grants, public/private grants	2018 MHMP	
12	Flood	Prevention	2/a	Encourage Ulen to participate in the NFIP	Ulen	Identified	High	EMA	local operation funds	2018 MHMP	
13	Hazardous Incident	Prevention	3/b	Establish a first response hazmat team, conduct appropriate training, and procure equipment	Boone County	Identified	Medium	EMA	BRIC grants, HMA grants, FMA grants, local operation funds, State agency grants,	2018 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
									private/public grants		
14	Flood	Property Prevention	1/c	Institute a voluntary buy-out plan for the following areas: SR 47 and Stillcock, Old Mill SRA, Creek Road and Fall Road	Boone County	Identified	Medium	EMA	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
15	All Hazards	Property Prevention	1/a	Harden fire and police stations; electric, water, and sewer plants, and government buildings	All Communities	Identified	High	EMA	BRIC grants, HMA grants, FMA grants, local operation funds, public/private grants	2018 MHMP	
16	Multiple Hazards	Emergency Services	1/d	Replace warning sirens	All communities	Identified	High	EMA	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
17	Thunderstorms		1/d	Add lightning detection devices/sirens	All communities and schools	Identified	High	EMA, School boards	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
18	All Hazards	Emergency Services	1/e	Facilitate the development of a strategy to provide shelter for animals in the event of a disaster	All Communities	Identified	Medium	EMA, Animal Control, Sheriff	BRIC grants, HMA grants, FMA grants, local operation funds	2018 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
19	Flood	Prevention	1/b	Install new gage in Prairie Creek up stream of the area near Grant St. and Washington St.	Lebanon	Identified	High	EMA, local FPA, USGS	BRIC grants, HMA grants, USGS or USACE grants	2023 MHMP	
20	Infectious Diseases	Prevention	2/b	Develop plan for preparedness in case of future health emergencies	All communities, all schools	Identified	High	County Health Dept	Public/private grants	2023 MHMP	Plan should include identifying volunteers to help and needed training and equipment.
21	Cyberattack	Property Protection	1/a	Identify areas of need to secure IT infrastructure	All communities, all schools	Identified	High	County IT, local IT, school IT	Public/private grants, local operation funds	2023 MHMP	
22	Cyberattack	Prevention	1/a	Develop plan to secure IT infrastructure, and implement	All communities, all schools	Identified	High	County IT, local IT, school IT	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
23	Cyberattack	Prevention	2/c	Create disaster recovery plan for IT/cybersecurity	Advance	In progress	High	local IT	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
24	Infectious Diseases	Prevention	2/c	Develop plan for preparedness in case of future health emergencies from animal diseases	All communities	Identified	High	Animal Control, Boone County Exchange	BRIC grants, HMA grants, FMA grants, local operation funds IBOAH	2023 MHMP	Plan should include animal disposal areas.

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
25	Multiple Hazards	Natural Resource Protection	2/b	Create a debris management plan.	Boone County	Ongoing			BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
26	All Hazards	Emergency Services	2/b	Create county evacuation plans.	Boone County	Ongoing			BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
27	Earthquake	Prevention	1/b	Regularly evaluate bridge structures in the county.	Boone County	Ongoing	Medium	County Highway, local FPA	local operation funds	2023 MHMP	
28	Multiple Hazards	Emergency Services	3/a	Educate the public about the mass notification system and promote the use of Rave emergency notification.	All Communities	Ongoing	Medium	EMA, County Health, Sherriff, Zionsville Planning	BRIC grants, HMA grants, FMA grants, local operation funds	2023 MHMP	
29	Flood	Structural Improvement	1/a	Elevate Creek Road and Fall Road and install culverts.	Boone County	Ongoing	Medium	County Highway	local operation funds	2023 MHMP	
30	Multiple hazards	Public Education	3/a	Increase safety education and drills at schools.	All Schools	Ongoing	High	EMA, School boards	EMA operation funds, BRIC grants, HMA grants	2023 MHMP	
31	All Hazards	Emergency Services	2/c	Develop a database of special needs populations.	All Communities	Ongoing	Low	EMA, local non-profits	BRIC grants, HMA grants, private/public grants	2023 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
32	Multiple Hazards	Emergency Services	1/a	Ensure that all schools are covered by an early alert system.	All Schools	Ongoing	High	EMA, School boards	BRIC grants, HMA grants, private/public grants	2023 MHMP	
33	Multiple Hazards	Emergency Services	1/d	Install new sirens in unincorporated areas of the county.	Boone County	Ongoing	Low	EMA	BRIC grants, HMA grants	2023 MHMP	
34	Flood	Natural Resource Protection	1/b	Maintain ditches and creeks.	Boone County	Ongoing	Medium	County Highway, County Surveyor	local operation funds	2023 MHMP	
35	Multiple Hazards	Prevention	1/a	Maintain a plan to address the maintenance of ditches for stormwater drainage and to mitigate potential flooding.	All communities	Ongoing	High	Local communities, County Highway Dept, County Surveyor	BRIC grants, HMA grants, local operation funds	2023 MHMP	
36	Flood	Prevention	2/a	Continued compliance of the NFIP for all NFIP communities. Participating communities will continue compliance by protecting existing critical facilities in floodplains.	All NFIP Communities	Ongoing	High	Local FPA, County Surveyor	IDNR grants, BRIC grants, HMA grants. FMA grants, local operation funds	2023 MHMP	
37	Flood	Prevention	2/a	NFIP communities will continue compliance by enforcing floodplain	All NFIP Communities	Ongoing	High	Local permitting officials, IDNR	IDNR grants, BRIC grants, HMA grants. FMA grants,	2023 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objects Met	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Notes
				ordinances that prohibit development of new facilities in 100-year floodplains.					local operation funds		
38	Flood	Prevention	2/a	NFIP communities will continue compliance by collaborating with residential owners to buyout and mitigate properties subject to flooding.	All NFIP Communities	Ongoing	High	Local permitting officials, IDNR	IDNR grants, BRIC grants, HMA grants. FMA grants, local operation funds	2023 MHMP	
39	Flood	Prevention	2/a	NFIP communities will continue compliance by instituting steps to relocate, buyout, or flood proof existing non-residential facilities subject to repetitive flood loss.	All NFIP Communities	Ongoing	High	Local permitting officials, IDNR	IDNR grants, BRIC grants, HMA grants. FMA grants, local operation funds	2023 MHMP	
40	Hazmat	Prevention	2/c	Conduct a commodities study regarding hazardous materials transports focusing on I-74 and the CSX rail.	Jamestown	Identified	High	Jamestown council	Local operation funds	2023 MHMP	
41	Hazmat	Prevention	2/c	Create an evacuation plan and exercise for the Town of Jamestown.	Jamestown	Identified	High	Jamestown council	Local operation funds	2023 MHMP	

6 Chapter 6 – Plan Maintenance and Implementation

6.1 Implementation and Maintenance

The Boone County MHMP is intended to serve as a guide for dealing with the impact of both current and future hazards for all people and institutions within the jurisdiction. As such it is not a static document but must be modified to reflect changing conditions if it is to be an effective plan. The goals, objectives and mitigation strategies will serve as the action plan. Even though individual strategies have a responsible party assigned to it to ensure implementation, overall responsibility, oversight, and general monitoring of the action plan has been assigned to the Boone County Emergency Management Director.

Goals identified by the county will be addressed by the County Commission. The Town Boards and City Councils will be responsible for implementing their corresponding strategies.

It will be the community's responsibility to gather a Local Task Force to update the MHMP on a routine basis. Every year, the County Emergency Management Director will call a meeting to review the plan, mitigation strategies and the estimated costs attached to each strategy. All participating parties of the original Local Task Force and cities will be invited to this meeting. Responsible parties will report on the status of their projects. It will be the responsibility of the committee to evaluate the plan to determine whether:

- Goals and objectives are relevant.
- Risks have changed.
- Resources are adequate or appropriate.
- The plan as written has implementation problems or issues.
- Strategies have happened as expected.
- Partners participating in the plan need to change (new and old).
- Strategies are effective.
- Any changes have taken place that may affect priorities.
- Any strategies should be changed.

In addition to the information generated at the local task force (LEPC and CEMP) meetings, the County Emergency Management Director will also annually evaluate the MHMP and update the plan in the event of a hazardous occurrence. After the fourth annual update meeting, the Boone County Emergency Management Director will finalize a new Local Task Force to begin the required five-year update process. This will be accomplished in coordination with Boone County jurisdictions and the entire MHMP shall be updated and submitted to FEMA for approval (within 5 years of plan adoption). These revisions will include public participation by requiring a public hearing and published notice in addition to multiple local task force meetings to make detailed updates to the plan.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing will be duplicated for any future update processes – direct

mailing list of interested parties, public meetings, press releases, surveys, questionnaires, and resolutions of participation and involvement. Additional methods of getting public input and involvement are encouraged, such as placing copies of the plan in the Boone County Emergency Management Director's office and the offices of the participating incorporated communities in addition to placing the plan on the Boone County and social media websites. Furthermore, jurisdictions will be encouraged to place a notice on their websites stating the plan is available for review at the city offices. Notifications of these methods could be placed in chamber newsletters and local newspapers. Committee responsibilities will be the same as with updates.

Chapters 5 focuses on mitigation strategies for natural hazards and jurisdiction-specific mitigation strategies for both natural and man-made/technological hazards. The MHMP proposes a number of strategies, some of which will require outside funding in order to implement. If outside funding is not available, the strategy will be set aside until sources of funding can be identified. In these situations, Boone County and its communities will also consider other funding options such as the local general funds, bonding, and other sources. Based on the availability of funds and the risk assessment of that hazard, the county will determine which strategies should be continued and which should be set aside. Consequently, the action plan and the risk assessment serve as a guide to spending priorities but will be adjusted annually to reflect current needs and financial resources.

The last step requires an evaluation of the strategies identified in the goals and policies framework, selecting preferred strategies based on the risk assessment, prioritizing the strategy list, identifying who is responsible for carrying out the strategy, and the timeframe and costs of strategy completion. Boone County and its jurisdictions have incorporated the preferred strategies including identification of the responsible party to implement, the timeframe and the cost of the activity with the goals and policies framework.

6.2 Local Plan Integration

The Hazard Mitigation Planning Team and the Local Task Force members shall recognize this document as an important planning tool for their communities and will recommend its use as a reference as their communities complete other related plans. The county Emergency Management Director will contact the Boone County Area Plan Commission, Lebanon, Thorntown, and Zionsville to ensure they will use this plan as they update their Comprehensive Plan as well as any other relevant community ordinances such as zoning, floodplain, capital improvement plans, etc. The county Emergency Management Director shall also contact the head of other departments as they work other stand-alone plans that might relate to this one or its strategies such as those for park and recreation, sustainability, etc.

The City of Lebanon, the Town of Whitestown, the Town of Zionsville, and the Town of Thorntown each have their own town planning department dedicated to incorporating pertinent aspects of this plan. They collaborate with the county on countywide initiatives, such as this plan update.

The Towns of Advance, Jamestown, and Ulen, which heavily rely on county policies and actions, will utilize this plan update to steer their town goals and development towards integrating mitigation actions suitable for their communities. For example, the Town of Ulen is in progress of creating local policies and procedures that consider information in this plan update.

The four participating school districts (Lebanon Community School Corporation, Trader's Point Christian Academy, Western Boone County Community School Corporation, Zionsville Community Schools) intend to incorporate this plan update into their local school strategies. This includes leveraging the information provided in the plan update to conduct drills that enhance student safety in disaster situations.

The Boone County Soil and Water Conservation District will use this plan update as guidance for their daily operations, prioritizing disaster-prone areas, and crucial mitigation actions for the county.

As each planning mechanism is updated, the Local Task Force will reevaluate the status of the mitigation strategies and determine whether any changes in them is needed. The Emergency Management Advisory Council (EMAC) will continue to serve as the advisory body that provides general supervision and control over the emergency management and the disaster programs for the county and its multiple jurisdictions. The quarterly meetings will continue to be available to the public and other mitigation team members through the EMAC and other mitigation projects avenues such as RiskMAP.

6.3 Adoption, Implementation, and Maintenance

6.3.1 County Adoption

The MHMP for Boone County is a multijurisdictional plan. All participating communities in the county, listed in Table 1, were represented on the task force, and were involved in the various stages of the planning process. Mitigation strategies have been identified for each jurisdiction and hazard type. The task force and the public provided comments on the draft plan, which were reviewed and implemented. Participating communities passed a resolution to adopt the plan. Once FEMA reviewed and approved the plan, those communities that adopted it were provided a letter from FEMA to indicate the plan was approved for their community. Copies of these adoption resolutions are included in Appendix G.

6.3.2 Implementation and Maintenance Guidelines.

The Boone County MHMP is intended to serve as a guide/reference to mitigate the impact of both current and future hazards for all county residents and institutions. As such, it is not a static document but must be modified to reflect changing conditions. The goals, objectives, and mitigation strategies serve as a work or action plan. Individual strategies have a party assigned to it to help ensure implementation, oversight, and general monitoring of the action plan. The following guidelines will help implement the goals, objectives, and strategies of the plan. An

implementation committee will be used to assist in this process. The existing task force, the planning commission, other appropriate county committee, or any other group of stakeholders could serve as the implementation committee to review implementation opportunities identified in the plan. Implementation of strategies should be a collaborative effort of the participating jurisdictions. This committee should operate by group consensus and create recommendations for implementation to bring forward to the proper governing entity for consideration. Guidelines for the committee include:

1. Commitment to the plan and overall mitigation vision.
2. Protect sensitive information.
3. Take inventory of strategies in progress.
4. Determine strategies that no longer are needed or new strategies that have emerged.
5. Set priorities. Assign responsibilities to complete.
6. Seek funding.
7. Meet bi-annually – one meeting to set the course of action and a second to monitor progress.

Assigning strategies and implementation activities in this plan to certain entities does not guarantee completion. The strategies and activities addressed in this plan will be addressed as funding and other resources become available and approval by the responsible jurisdiction takes place.

The county Emergency Management Director has the overall responsibility of tracking the progress of mitigation strategies. The County Emergency Manager will request updates from responsible agencies and cities on their mitigation actions after each disaster and at least annual to coincide with plan evaluation. Post disaster monitoring will evaluate the effectiveness of mitigation actions that have been completed and determine implementation of planned strategies. Monitoring may lead to developing a project that may be funded by FEMA's Hazard Mitigation Assistance Programs.

After five years, the County Emergency Manager has responsibility for revising this plan or notifying successor the need to revise the plan.

6.3.2.1 Continued Public Involvement

Annual reviews to change the plan will be led by the County Emergency Manager using the implementation committee. It will be their responsibility to review the plan and mitigation. Responsible parties and the implementation committee will report on the status of their projects. Committee responsibility will be to evaluate the plan to determine whether:

- Goals, objectives, and strategies are relevant or need changed.
- Risks that have changed including the nature, magnitude, and/or type of risks.
- The plan as written has any implementation problems or issues.
- Deadlines are being met as expected.

- Partners participating in the plan are appropriate.
- Strategies are effective.
- New developments affecting priorities.

Revisions in five years will include public participation by requiring a public hearing and published notice. Future updates should address potential dollar losses to vulnerable structures identified. Any major changes in the plan may include additional public meetings besides just a public hearing.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing should be duplicated for any updates. Additional methods of getting the public input and involvement are encouraged, such as placing the plan on county and city websites. Notifications of these methods could be placed in newsletters and the local newspapers. Committee responsibilities will be the same with updates as the original plan.

This plan will be integrated into other county plans such as the County Comprehensive Plan, the Zoning Ordinance, the County Transportation Plan, and all Emergency Operations Plans. Chapter one can serve as an executive summary to be attached to those plans as necessary. The County Board encourages jurisdictions to address hazards in their comprehensive plans, land use regulations, zoning ordinances, capital improvement, and building codes by including some of the mitigation strategies in their plans. They are meant to blend and complement each other so that strategies are duplicated and occur in different plans as appropriate.

Bibliography & Quick Reference

References are separated from the county specific resources. The Quick Reference is a guide to the federal & state programs discussed within the plan.

References

Any Place America. “Indiana Topo Maps & Elevations.” www.anyplaceamerica.com/directory/in/.

Bekker, E. (2021, April 15). “What Are Your Odds of Getting Your Identity Stolen?” www.identityforce.com/blog/identity-theft-odds-identity-theft-statistics

Becker’s Hospital Review. (2018, September 19). “Cyberattack forces Indiana hospital to cancel elective surgeries, divert ambulances.” www.beckershospitalreview.com/cybersecurity/cyberattack-forces-indiana-hospital-to-cancel-elective-surgeries-divert-ambulances.html

Centers for Medicare & Medicaid Services. “Health Care Provider Guidance- Emergency Preparedness for Every Emergency.” www.cms.gov.

Centers for Disease Control and Prevention. “Fact Sheet: Protect Yourself from Animal- and- Insect-Related Hazards After a Disaster.” cdc.gov/disasters/animalhazards/facts.html. Accessed 2017.

Costello, Becca, “State Confirms 2 Cases of Tick-Borne Heartland Virus In 2 Years. Indiana Public Media. 12 Jul. 2017. indianapublicmedia.org.

Department of Defense. (2018, February 13). *Cyber Tops List of Threats to U.S., Director of National Intelligence Says*. Retrieved from U.S. Department of Defense: https://dod.defense.gov/News/Article/Article/1440838/cyber-tops-list-of-threats-to-us-director-of-national-intelligence-says/

Doak, J. D. (2017, March 29). Oklahoma insurance commissioner: Enhanced building code protects against tornadoes. The Oklahoman. https://eu.oklahoman.com/

Federal Emergency Management Agency. (2020, November). Protecting Communities and Saving Money. https://www.fema.gov/sites/default/files/2020-11/fema_building-codes-save_brochure.pdf

Federal Emergency Management Agency. “Nationwide Building Code Adoption Tracking.” FEMA, 5 Oct. 2022, https://www.fema.gov/emergency-managers/risk-management/building-science/bcat.

Franzmeier, D.P., G.C. Steinhardt, D.G. Schulze. Indiana Soil and Landscape Evaluation Manual. Purdue University. Version 1.0. https://www.extension.purdue.edu/extmedia/ay/ay-323.pdf

Haim Omer and Nahman Alon, “The Continuity Principle: A Unified Approach to Disaster and Trauma”, American Journal of Community Psychology 22, no. 2 (April 1994): 275–276 https://doi.org/10.1007/BF02506866

Imperva. (2018, February 20). New Research: Crypto-mining Drives Almost 90% of All Remote Code Execution Attacks | Imperva. Retrieved from Cyber Security Leader | Imperva: https://www.imperva.com/blog/new-research-crypto-mining-drives-almost-90-remote-code-execution-attacks/

Indiana Broadband. “Home.” Indiana Broadband, 9 Sept. 2022, https://www.in.gov/indianabroadband/.

Indiana Community Action Poverty Institute. “The Status of Working Families in Indiana.” Status of Working Families 2018, Indiana Institute of Working Families, 2018, https://institute.incap.org/assets/docs/Fact-Sheets/FactSheet-2018-StatusOfWorkingFamiliesInfographic.pdf.

Indiana Department of Homeland Security & The Polis Center. (2019). 2019 State of Indiana Standard Multi-Hazard Mitigation Plan. https://www.in.gov/dhs/files/Indiana-State-Mitigation-Plan-2019-Optimized.pdf

Indiana Department of Natural Resources: Division of Water. “Indiana’s Water Shortage Plan.” 20 Mar. 2015. https://www.in.gov/dnr/water/files/watshplan.pdf.

Indiana Department of Natural Resources. Emerald Ash Borer Locations. indnr.maps.arcgis.com/apps/webappviewer/index.html?id=496c7e33f2e74e4f842d926e0.

Indiana State Department of Health. “Mosquito Bourne Diseases.” www.in.gov/isdh/23592.htm.

IndyStar. (2018, January 17). “Hackers held patient data ransom, so Greenfield hospital system paid $50,000.” www.indystar.com/story/news/crime/2018/01/17/hancock-health-paid-50-000-hackers-who-encrypted-patient-files/1040079001/

IndyStar. (2018, March 23). Iranian hackers targeted Indiana Department of Education, feds say. Retrieved from IndyStar: Indianapolis Star, Indiana news, breaking news and sports: https://www.indystar.com/story/news/2018/03/23/indiana-state-computer-system-among-hundreds-targeted-iranian-hackers/454363002/

Infectious disease profiles. http://www.in.gov/isdh/files/2015_County_Profiles.pdf

Jafari, Najmeh. Armindokht Shahsanai, Mehrdad Memarzadeh, Amir Loghmani. “Prevention of Communicable Diseases after Disaster: A Review.” Journal of Research in Medical Sciences. Jul. 2011, pp. 956-962. ncbi.nlm.nih.gov/pmc/articles/PMC3263111. Accessed 2017.

Logan, William Newton, Edgar Roscoe Cumings, Clyde Arnett Malott, Stephen Sargent Visher, William Motier Tucker, John Robert Reeves, William B. Burford. Handbook of Indiana Geology. Indiana Division of Geology. The Department of Conservation, 1922. Pg. 84-88. books.google.com

Martins, Tim. “Clean Water Act Abstracts.” National Aeronautics and Space Administration. www.grc.nasa.gov/WWW/k-12/fenlewis/cwa.htm.

Morgan, S. (2022, December 12). *Top 10 cybersecurity predictions and statistics for 2023.* Cybercrime Magazine. Retrieved January 11, 2023, from https://cybersecurityventures.com/top-5-cybersecurity-facts-figures-predictions-and-statistics-for-2021-to-2025/

National Fire Protection Association. “Fire Loss in the United States.” http://www.nfpa.org.

Pascual-Leone, Alvaro, et al. “Beware of Optimism Bias in the Context of the COVID-19 Pandemic.” Annals of Neurology, U.S. National Library of Medicine, Mar. 2021, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8014543/.

National Weather Service. “Indiana Local Climate.” National Oceanic and Atmospheric Administration. www.weather.gov.

National Weather Service. StormReady® in Indiana. http://www.weather.gov/stormready/in-sr.

Norton by Symantec. (2018, December 20). *10 cyber security facts and statistics for 2018*. Retrieved from Official Site | Norton™ - Antivirus & Anti-Malware Software: https://us.norton.com/internetsecurity-emerging-threats-10-facts-about-todays-cybersecurity-landscape-that-you-should-know.html

Sapp, A.D., T.G. Huff, G.P. Gary, D.J. Icove, P. Horbert. “Report of Essential Findings from a Study of Serial Arsonists.” National Criminal Justice Reference Service. www.ncjrs.gov. 1994.

Shang, Qingxue, et al. “Seismic Resilience of Internet Data Center Building with Different Disaster Mitigation Techniques.” Resilient Cities and Structures, vol. 1, no. 2, 22 June 2022, pp. 42–56., https://doi.org/10.1016/j.rcns.2022.06.003

STATS Indiana, 2012. “Indiana County Profile.” www.stats.indiana.edu/profiles.

Storm Events Database. (2021). National Centers for Environmental Information. https://www.ncei.noaa.gov/

United States Census Bureau. “Explore Census Data.” Data.census.gov, 17 Nov. 2022, https://data.census.gov/cedsci/profile?g=0500000US18125. Accessed 17 Nov. 2022.

United States Bureau of the Census. Population of Counties by Decennial Censuses. https://www.census.gov/population/cencounts/in190090.txt

United States Census Bureau. American Community Survey 5-year estimates, 2009-2013. www.census.gov.

United States Department of Agriculture- Farm Service Agency. “County FSA Updates.” content.govdelivery.com.

United States Department of Agriculture. “Published Soil Surveys for Indiana.” Natural Resources Conservation Service. www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=IN.

United States Department of Homeland Security. “Communications Sector.” www.dhs.gov/communications-sector.

United States Environmental Protection Agency. “Climate Change Indicators in the United States.” www.epa.gov/climate-indicators.

United State Department of Transportation Federal Railroad Administration “Hazardous Materials.” Hazardous Materials, 13 July 2022, https://railroads.dot.gov/divisions/hazardous-materials/hazardous-materials.

United States Environmental Protection Agency. “Hazard Mitigation Assistance Available to Water and Wastewater Utilities.” www.epa.gov/fedfunds.

United States Fire Administration. “Fire Prevention and Public Education.” www.usfa.fema.gov/statistics.

United States Fish and Wildlife Service: Endangered Species. “Indiana: County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species.” www.fws.gov/midwest/endangered/lists/indiana-cty.html.

United States Geological Society. Landslide Map of the Conterminous United States. https://landslides.usgs.gov/hazards/nationalmap/legend.php

United States Geological Society. USGS Definition of “Streamgage.” https://water.usgs.gov/nsip/definition9.html

United States Geological Society. “Earthquake Hazards Program.” http://earthquake.usgs.gov/learn/glossary/?termID=105.

United States Government Accountability Office. “Budgeting for Disasters: Approaches to Budgeting for Disasters in Selected States. “U.S. GAO, Mar. 2015. www.gao.gov/assets/670/669277.pdf.

Watson, John T., Michelle Gayer, Marie A. Connolly. “Epidemics after Natural Disasters.” National Center for Biotechnology Information. Emerging Infectious Diseases. Jan. 2007. ncbi.nlm.nih.gov/pmc/articles/PMC2725828.

WFYI Indianapolis. (2018, October 19). Server With National Guard Personnel Data Target Of Attack. Retrieved from Indianapolis' Public Radio, TV & News Station | WFYI: https://www.wfyi.org/news/articles/server-with-national-guard-personnel-data-target-of-attack

County Specific Resources

Home. Boone County, Indiana. (2022, November 4). Retrieved December 15, 2022, from https://boonecounty.in.gov/

Quick Reference State & Federal Programs

State Resources

All Agency, Indiana Drainage Handbook: http://www.in.gov/dnr/water/4893.htm

DNR, NFIP and Floodplain management resources: floodmaps.in.gov

DNR, lake and river construction regulations: http://www.in.gov/dnr/water/4963.htm

DNR authority under the Flood Control Act is further described: 312 IAC 10: Floodplain Management

DNR, LARE resource: “LARE Project Reports.” http://www.in.gov/dnr/fishwild/3303.htm

DNR, SHAARD: “SHAARD Database.” http://www.in.gov/dnr/historic/4505.htm

DNR, State historical county survey: http://www.in.gov/dnr/historic/2824.htm

DNR, Invasive Species, Gypsy Moth and EAB: http://www.in.gov/dnr/3123.htm to report, call: (317) 232-412

Evaluating Earthquake Losses due to Ground Failure and Identifying their Relative Contribution can be accessed through the following link: http://www.iitk.ac.in/nicee/wcee/article/13_3156.pdf.

IDEM, State Rule 5, Land Management: http://www.in.gov/idem/permits/water/wastewater/wetwthr/storm/rule5.html

IDEM, Meth Cleanup Information: http://www.in.gov/idem/health/2385.htm

IDNR, Water Shortage Plan: https://www.in.gov/dnr/water/files/watshplan.pdf

Indiana State Police, Meth Resources: https://socratadata.iot.in.gov/Government/ISP-Meth-Lab-Locations-Map/ktyc-iiu7

Indiana State Department of Health, HIV Outbreak: http://www.in.gov/isdh/files/2015_County_Profiles.pdf

INDOT, Traffic Wise, Real-time traffic Conditions: http://pws.trafficwise.org/pws/

INDOT, Preservation Initiative: http://www.in.gov/indot/3371.htm

Purdue, Invasive Species, EAB Resources: https://extension.entm.purdue.edu/EAB/

Federal Resources

EPA, Local Emergency Planning Committees: https://www.epa.gov/epcra/energize-your-local-emergency-planning-committees-lepc

EPA, Excessive Heat Events Guidebook: https://www.epa.gov/heat-islands/excessive-heat-events-guidebook

ESRI Map:
https://www.arcgis.com/apps/PublicInformation/index.html?appid=4ae7c683b9574856a3d3b7f75162b3f4

Extreme Heat: https://www3.epa.gov/climatechange/pdfs/print_heat-deaths-2014.pdf

FEMA Training Guide: https://training.fema.gov/emiweb/is/is393a/is393.a-lesson4.pdf

FEMA, Commuter Emergency Plans: http://www.fema.gov/media-library/assets/documents/90370

FEMA, Safe Room Guidance: https://www.fema.gov/media-library/assets/documents/3140

FEMA, Local Mitigation Planning Handbook: https://www.fema.gov/media-library/assets/documents/31598

US Fish and Wildlife, endangered and threatened species:
https://www.fws.gov/midwest/endangered/saving/outreach.html

US Fish and Wildlife, Bat Children Resources:

https://www.fws.gov/midwest/endangered/mammals/inba/curriculum/InbaKidsCavesOhMy.pdf

USGS, FIM maps: http://water.usgs.gov/osw/flood_inundation/

USGS, NHD Data: https://nhd.usgs.gov/data.html

US Fish and Wildlife, Endangered and Threatened Species:
https://www.fws.gov/midwest/endangered/saving/outreach.html

Tornado Buffers: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

Indiana State Department of Health County Profiles: http://www.in.gov/isdh/files/2015_County_Profiles.pdf

Appendix A: MHMP Planning Team Meeting Documentation

Meeting #1

Hazard Mitigation Plan Update Meeting Number: #1 Date: 12-1-22

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Rachel Hanson	EMA Admin Assistant	Boone County	rhanson@co.boone.in.us	22 miles	
Mike Martin	EMA Director	Boone County	wmartin@co.boone.in.us	20 miles	
Russell Dulin	EMA Deputy Dir.	Boone County	rdulin@co.boone.in.us	6 miles	
Steve Smith	Lebanon Schools		steves@leb.k12.in.us		
Carol Leeke	Town Council	Jamestown	[illegible]@gmail	10 miles	
[illegible]	Town Comm.	Advance	[illegible]@gmail	10 [illegible]	
Jason Potts	Div Chief, ZFD	Town of Zionsville	jpotts@zionsville-in.gov	18 miles	60 min
Marianne Cardwell	Director	Polis Center	mcardwe@iu.edu	—	
Danielle Lafever	GIS Analyst	Polis Center	DBlafeve@iu.edu	—	
Abby Messenger	Boone Co Health Dept	County	amessenger@co.boone.in.us		
Traci Hoffman	Co-Exec Dir	Boone County [illegible]	traci@[illegible].org	—	
Max Mendenhall		Boone Co	mmendenhall@co.boone.in.us	4 miles	
Josh Westrich	Fire Chief	Whitestown	jwestrich@whitestown.in.gov		
Jimmie Hieston	Assistant Fire Chief	Jamestown	jhieston@pittsboro fire.org		

Hazard Mitigation Plan Update Meeting Number: #1 Date: 12-1-22

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Lance Lantz	DPW Dir.	Zionsville	llantz@zionsville-in.gov	20	60 min
Sean Horan	IT Dir. BC	Boone	seanh@g-uts.com	45	0 min
Rob Ramey	Superintendent	WBCCSC	rob.ramey@weba.k12.in.us	20	30 min
Jeff Spidel	Team Lead	Boone Co Hwy	jspidel@co.boone.in.us	5	30 m
John Jurkash	Police Captain	Whitestown	jjurkash@whitestownpolice.org	10	60 min
Chad Martin	Director of Operations	Lebanon Schools	martinc@leb.k12.in.us	2	40 min
Chuck Batts	LFD Fire Chief	City of Lebanon	cbatts@lebanon.in.gov	20	60 min
Jason Hendricks	LFD LT	City of Lebanon	jhendricks@lebanon.in.gov	10	30
Shane Childress	Jamestown Council	Jamestown	council2@jamestownin.com	40	30 min
Shari Johnson	Clerk-Treasurer	Advance	advanceclt@townofadvance.com	20	30 m
Kraig Cox	Dir. of Op's	Traders Point Christian Schools	kcox@tpcs.org	8	15 m
Sara Stanfield	Thorntown Town Council	Thorntown	sstanfield@thorntown.in.gov		
Sam Sotter	Boone County Sheriff's office	Boone County	ssotter@co.boone.in.us	14	
Marius Klykken	Zionsville Police Captain.	Zionsville P.D.	mklykken@zionsville-in.gov	14	15 m.

Hazard Mitigation Plan Update Meeting Number: #1 Date: 12-1-22

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Clint Jackson	Chief Deputy	Jamestown	CJackson@Jamestownin.com	21 m	
Chad Smith	Dir. Safety ZCS	Zionsville	chad.smith@zcs.k12.in.us	12	

The planning team met on December 1, 2022, from 7 to 8:30PM. During the meeting, the Polis Center gave an overview of the planning process, why it is required, and the benefits to the participating communities. The planning team came together to determine the probability and consequence of the hazards analyzed in the plan, a tornado track was chosen for the analysis, and participants discussed potential locations for the hazardous materials release.

Meeting #2

Hazard Mitigation Plan Update Meeting Number: 2 (Boone Co.) Date: 2/15/2023

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
SHANE CHILDRESS	TOWN COUNCIL	JAMESTOWN	COUNCIL2@JAMESTOWNIN.COM	40mi	2 HR
Rachel Hanson	EMA	Boone	rhanson@co.boone.in.us		
JASON POTTS	DIV CHIEF	ZIONSVILLE	JPOTTS@ZIONSVILLE-IN.GOV	20	2HR
RUSSELL DULIN	DEPUTY DIRECTOR	BOONE CTY	rdulin@co.boone.in.us	-	
Tony Harris	Sheriff - Boone Cty	Boone Cty	tharris@co.boone.in.us		
Mike Beard	Chief Deputy - Boone Cty	Boone Cty	mbeard@co.boone.in.us		
Marcia Overfield	Co Director	LoveINC of BooneCo	marcia@loveincbc.org	—	—
James Hierton	Chief Jamestown Fire	Jamestown	JVFd@jamestownin.com	—	—
Jeff Spidel	Team Lead/Traffic Engineer	BooneCo Highway	jspidel@co.boone.in.us	—	—
J. [illegible]	CHIEF ADVANCE FD	ADVANCE	JDALLOWAY 550 3@gmail.com		8 HR
Chad Martin	Director of Operations	Lebanon Schools	~~Jeff~~ Martin@Leb.k12.in.us	6	1 hr
Steve Smith	Chief of Police	Lebanon Schools	steves@leb.k12.in.us	7	1 hr
Chuck Betts	LFD CHIEF	LEBANON			3hr
Jason Hendricks	LFD Deputy Chief	Lebanon			3hr

Hazard Mitigation Plan Update Meeting Number: 2 (Boone Co.) Date: 2/15/2023

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Derek Warren	Planning Deputy Director	Lebanon, IN	dwarren@lebanonin.gov	5	3
Rob Ramey	Superintendent	Western Boone	rob.ramey@weboo.k12.in.us	20	3
Mary Ann Herny	Clerk-Treasurer	Ulen	mherny@comcast.net	2	none yet
Abby Messenger	Health Department	Boone County	amessenger@co.boone.in.us	5	2
Mike Martin	EMA	Boone County	wmartin@co.boone.in.o		4
Aaron Clapp	Jamestown Police	Jamestown	townmarshal@jamestownin.com	32	
Max Mendenhall		Boone Co	mmendenhall@co.boone.in.us		

The planning team met on February 15, from 6 to 7:30PM. During the meeting, the Polis Center reviewed the results of hazard risks, provided estimate losses due to the risks, and discussed next steps. The planning team came together to review and update the existing mitigation action items from the 2018 plan and add new items. The EMA Director from Hamilton County, a surrounding county, attended the meeting.

Boone County Soil & Water Conservation District

Hazard Mitigation Plan Update Meeting Number: 3 Date: 4-10-23

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)
Rachel Hanson	Administrative Assistant Boone County EMA	Boone County	rhanson@caboone.in.us	
Sheryl Vaughn	District Admin Boone SWCD	Boone SWCD	svaughn@co.boone.in.us	5

The Boone County EMA met with Boone County Soil and Water Conservation District on April 10, 2023. At the meeting, the Boone County EMA reviewed the Plan, covered topics discussed in meetings 1 and 2 with Polis, and provided feedback on the Plan including review of the mitigation actions. The feedback was provided to Polis. Polis implemented the changes or comments in the Plan.

Appendix B: Local Public Notice

Meeting #1

INDIANA MEDIA GROUP
PO BOX 607
GREENSBURG IN 47240-0607
(877)253-7755
Fax (765)648-4229

ORDER CONFIRMATION

Salesperson: JENNIFER HENSLEY — Printed at 11/10/22 14:35 by jhen1

Acct #: 85589 — Ad #: 1801709 — Status: New WHOLD

BOONE COUNTY EMERGENCY MANAGEMEN
1905 INDIANAPOLIS AVE
LEBANON IN 46052

Start: 11/15/2022 — Stop: 11/15/2022
Times Ord: 1 — Times Run: ***
LEG 1.00 X 22.00 — Words: 105
Total LEG 22.00
Class: 105 PUBLIC NOTICES
Rate: LGOVT — Cost: 11.59

Contact:
Phone: (765)483-4428
Fax#:
Email:
Agency:

Ad Descrpt: THE MULTI-HAZARD MITIGATI
Given by: *
P.O. #:
Created: jhen1 11/10/22 14:34
Last Changed: jhen1 11/10/22 14:35

PUB	ZONE	EDT	TP	RUN DATES
TLR	TLR		95 S	11/15
LBOL	TLR		95 S	11/15

AUTHORIZATION

Under this agreement rates are subject to change with 30 days notice. In the event of a cancellation before schedule completion, I understand that the rate charged will be based upon the rate for the number of insertions used.

Name (print or type) _____ Name (signature) _____

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The Multi-Hazard Mitigation Planning Committee of Boone County will host a public information session on December 1, 2022 at 6:00 pm at the Boone County Sheriff's Office, 1905 Indianapolis Ave, Lebanon, IN 46052.

Boone County, with the Polis Center at Indiana University-Purdue University Indianapolis (IUPUI), has started the process of updating its Multi-Hazard Mitigation Plan. Once the plan is updated, the committee will submit it to FEMA for approval.

The planning committee is interested in receiving public input on the plan. Anyone that would like to provide input or has any questions should contact Boone County Emergency Management Agency at 765-483-4428.

TLR-869 11/15 hspaxlp 1801709

Meeting #2

INDIANA MEDIA GROUP
PO BOX 607
GREENSBURG IN 47240-0607
(877)253-7755
Fax (765)648-4229

ORDER CONFIRMATION

Salesperson: LORI GAITHER — Printed at 01/03/23 12:56 by lgait

Acct #: 85589 — Ad #: 1809270 — Status: New CHOLD

BOONE COUNTY EMERGENCY MANAGEMEN
1905 INDIANAPOLIS AVE
LEBANON IN 46052

Start: 01/10/2023 Stop: 01/10/2023
Times Ord: 1 Times Run: ***
LEG 1.00 X 25.00 Words: 115
Total LEG 25.00
Class: 105 PUBLIC NOTICES
Rate: LGOVT Cost: 13.54

Contact:
Phone: (765)483-4428
Fax#:
Email:
Agency:

Ad Descrpt: THE MULTI-HAZARD MITIGATI
Given by: *
P.O. #:
Created: lgait 01/03/23 12:53
Last Changed: lgait 01/03/23 12:56

PUB	ZONE	EDT	TP	RUN DATES
TLR	TLR	95	S	01/10
LBOL	TLR	95	S	01/10

AUTHORIZATION

Under this agreement rates are subject to change with 30 days notice. In the event of a cancellation before schedule completion, I understand that the rate charged will be based upon the rate for the number of insertions used.

Name (print or type) _____ Name (signature) _____

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The Multi-Hazard Mitigation Planning Committee of Boone County will host a public information and strategy planning session on February 15, 2023 at 6:00 pm in the Connie Lamar Room, 116 West Washington Street, Lebanon, IN 46052.

Over the last several months, a planning committee, consisting of community members, has worked with the Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) to update the county Multi-Hazard Mitigation Plan. Once the plan is updated, the committee will submit it to FEMA for approval.

The planning committee is interested in receiving public input on the plan. Anyone that would like to provide input or has any questions should contact Boone County EMA at 765-483-4428.

TLR-13 1/10 hspaxlp 1809270

Appendix C: NCEI Historic Storm Events since 2018

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Eagle vlg	June 20, 2021	Hail	0	0	0	0	NULL	NULL	NULL
Boone county	February 15, 2021	Heavy Snow	0	0	0	0	NULL	NULL	Snowfall amounts ranged from 7.3 to 9.2 inches with the heaviest snowfall west of Lebanon. A travel warning was issued for the county which is the highest level of local travel advisory due to the extreme impacts of the snow on road conditions.
Eagle vlg	March 27, 2021	Hail	0	0	0	0	NULL	NULL	Relayed via mPing.
Max	March 27, 2021	Hail	0	0	0	0	NULL	NULL	Relayed via mPing.
Boone county	March 26, 2021	High Wind	0	0	0	0	0.00K	25.00K	A 52 mph wind gust was reported at an automated surface observation system 2 miles southeast of Whitestown. Power outages across the county peaked over 1000 with several reports of trees and powerlines downed due to the strong gradient winds.
Whitestown	June 10, 2020	Thunderstorm Wind	0	0	0	0	0.00K	2.00K	Tree downed due to thunderstorm wind gusts at the 4600 block of South 700 East. Another tree was downed nearby.
Ind terry arpt	April 8, 2020	Hail	0	0	0	0	NULL	NULL	NULL
Ind terry arpt	April 8, 2020	Hail	0	0	0	0	NULL	NULL	NULL
Lebanon	April 8, 2020	Thunderstorm Wind	0	0	0	0	NULL	100.00K	Emergency manager reports severe tree damage across county due to thunderstorm wind gusts. Numerous snapped tree limbs and small trees with widespread power outages.
Lebanon	April 8, 2020	Thunderstorm Wind	0	0	0	0	0.00K	10.00K	Semi-trailer blown over by thunderstorm wing gusts on Indiana State Road 32.
Thorntown	April 8, 2020	Hail	0	0	0	0	NULL	NULL	NULL
Elizaville	April 8, 2020	Thunderstorm Wind	0	0	0	0	NULL	20.00K	Two reports of minor structural damage due to thunderstorm wind gusts.
Whitestown	March 28, 2020	Hail	0	0	0	0	NULL	NULL	Report was relayed through broadcast media.

Advance	March 28, 2020	Hail	0	0	0	0	NULL	NULL	NULL
Advance	March 28, 2020	Hail	0	0	0	0	NULL	NULL	Relayed via Skywarn network.
Thorntown	April 8, 2020	Thunderstorm Wind	0	0	0	0	NULL	NULL	Trained spotter estimated 75 mph thunderstorm wind gust at this location.
Eagle vlg	October 21, 2020	Flood	0	0	0	0	0.00K	1.00K	Standing water noted at the intersection of US 421 and Valley Meadow Drive.
Boone county	January 12, 2019	Heavy Snow	0	0	0	0	0.00K	NULL	Snowfall of 5 to 6.6 inches was observed in Boone County, with the heaviest falling near Ulen.
Stringtown	June 5, 2019	Flash Flood	0	0	0	0	5.00K	5.00K	Dispatch reported three county roads north of Lebanon were closed during the evening due to water flowing over the roads.
Thorntown	June 5, 2019	Flash Flood	0	0	0	0	50.00K	5.00K	A river of water and debris was observed on farm land due to heavy thunderstorm rainfall.
Thorntown	June 5, 2019	Flood	0	0	0	0	0.00K	3.00K	Water was reported over multiple roads in Thorntown due to heavy rainfall.
Thorntown	May 19, 2019	Thunderstorm Wind	0	0	0	0	0.00K	1.00K	A large 12-inch diameter, live tree limb was downed due to damaging thunderstorm wind gusts.
Whitestown	May 16, 2019	Thunderstorm Wind	0	0	0	0	NULL	NULL	An estimated thunderstorm wind gust of 60 mph was observed in this location. A gust of 53 mph was measured in this location as well.
Boone county	December 15, 2019	Heavy Snow	0	0	0	0	NULL	NULL	Snowfall amounts ranged from 5 inches to as high as 7.7 inches over the course of the event. The heaviest amount was recorded near New Ross.
Elizaville	July 10, 2019	Thunderstorm Wind	0	0	0	0	0.00K	15.00K	Numerous trees and utility lines were downed across the eastern portion of the county due to damaging thunderstorm wind gusts. No specific locations were able to be provided.
Boone county	November 27, 2019	High Wind	0	0	0	0	NULL	NULL	A 60 mph non-thunderstorm wind gust was measured at the KTYQ AWOS.
Boone county	March 24, 2018	Heavy Snow	0	0	0	0	NULL	NULL	Snowfall of 5 to 10 inches was reported from Boone County. The highest amount reported came in from one mile east of New Ross at 9.7 inches. Owing partially to the event being well forecast and on a Saturday, no other impacts were reported.
Whitestown	August 6, 2018	Thunderstorm Wind	0	0	0	0	NULL	1.00K	Shingles were ripped off of roofs and large trash cans were blown away due to damaging thunderstorm wind gusts.
Thorntown	September 25, 2018	Flood	0	0	0	0	0.50K	0.50K	Heavy rainfall produced water over the road in low-lying areas on County Road 350 North and State Road 75.

Thorntown	August 6, 2018	Thunderstorm Wind	0	0	0	0	NULL	NULL	An estimated 60 mph thunderstorm wind gust was observed in this location. This report was relayed by social media.

Appendix D: Essential & Critical Facilities List and Maps

Essential Facilities

Table 40. Medical Care Facilities

Facility Name	Address	City
Witham Hospital	2605 N Lebanon St.	Lebanon
Boone County Senior Services	515 Crown Pointe Dr #8335	Lebanon
Crown Point Retirement Center	610 Crown Pointe Dr	Lebanon
Base Mental Health	1122 N Lebanon St	Lebanon
Walgreens Lebanon	1130 N Lebanon St	Lebanon
Behavior Corp Mental Health	940 Lasley Dr	Lebanon
Boone County Health Department	116 W Washington St # B202	Lebanon
Crawford Manor Retirement Center	9940 Hoosier Village Dr	Indianapolis
Hoosier Village Retirement Center	9891 Purple Plum Lane	Zionsville
Homewood Healthcare	2494 N Lebanon St	Lebanon
Essex Nursing Home	301 W Essex St	Lebanon
Hickory Creek Nursing Home	1585 Perry Worth Rd	Lebanon
Kroger Pharmacies	5 Boone Village	Lebanon
Witham Hospital	2605 N Lebanon St	Lebanon
Lebanon Manor Village	770 Maple Dr	Lebanon
Parkside Drugs	1639 N Lebanon St	Lebanon
CVS Lebanon	207 S Lebanon St	Lebanon
Cowan Drugs	112 N Lebanon St.	Lebanon
CVS Whitestown	6511 Whitestown Pkwy	Zionsville
Express Scripts	4750 E 450 S	Whitestown
Parkwood Health Care	1001 N Grant St	Lebanon
Walmart Pharmacy	2440 N Lebanon St	Lebanon
Walgreens Zionsville	200 S Ford Rd	Zionsville
CVS Zionsville	1466 W Oak St	Zionsville

Table 41. School Facilities

Facility Name	Address	City
Boys & Girls Club	5964 S 700 E	Whitestown
Colonial Village Day Care	7998 S 775 E	Zionsville
Dawn Til Dusk Daycare	11706 N Michigan Rd	Zionsville
Fellowship Friends Daycare	208 E Wall St	Advance
Interactive Academy	3795 US421	Zionsville
Just Be Kids Learning Center	356 N Mt Zion Rd	Lebanon
Lebanon Ballet School	111 N Meridian St	Lebanon
Presbyterian Church	123 N East St	Lebanon

Facility Name	Address	City
Stonegate Elementary	7312 W Stonegate Dr	Zionsville
The Goddard School	1640 W Oak St	Zionsville
Traders Point Christian Academy	5608 Whitestown Pkwy	Whitestown
Pixie Playhouse	924 S Meridian St	Lebanon
Kiddie Corner Day Care	410 E Williams St	Lebanon
Little Blessings	901 S Patterson St	Lebanon
Dawn Til Dusk Pre-K	11706 N Michigan Rd	Zionsville
Kristy's Little Rascals Daycare	1850 S 925 E	Zionsville
Zionsville West Middle School	5565 S 700 E	Whitestown
Zionsville Presbyterian Church	4775 W 116th St	Zionsville
Primrose School At Anson	6484 Central Bvld	Zionsville
The Children's Courtyard of Indianapolis	5909 Technology Center Dr	Zionsville
Childrens Learning Program	9644 Whitestown Rd	Zionsville
YMCA	2791 N Lebanon St	Lebanon
Central Elementary School	515 E Willams St	Lebanon
Lebanon High School	510 Tiger Wy	Lebanon
Lebanon Middle School	1800 N Grant St	Lebanon
Eagle Elementary	350 N 6th St	Zionsville
Perry Worth Elementary School	3900 E 300 S	Lebanon
Thorntown Elementary School	200 W Mill St	Thorntown
Granville Wells Elementary School	5046 SR75	Jamestown
Western Boone Jr/Sr High School	1205 SR75	Thorntown
Harney Elementary School	1500 Garfield St	Lebanon
Stokes Elementary School	1005 Hendricks Dr	Lebanon
Little Angels Daycare	925 Hendricks Dr	Lebanon
Zionsville High School	1000 Mulberry St	Zionsville
Zionsville Middle School	900 Ford Rd	Zionsville
Union Elementary	11750 E 300 S	Zionsville
Boys & Girls Club	403 W Main St	Lebanon
Boys & Girls Club	1575 Mulberry St	Zionsville
Boone Meadow Elementary	5555 S Main St	Whitestown
Pleasant View Elementary	4700 S 975 E	Zionsville
Trailside Elementary	4200 S 875 E	Zionsville

Table 42. Police Stations

Facility Name	Address	City
Thorntown Police Department	101 W Main St	Thorntown
Zionsville Police Dept	1075 Parkway Dr	Zionsville
Lebanon Police Dept	201 E Main St	Lebanon
Boone County Sheriff	1905 Indianapolis Ave	Lebanon

Facility Name	Address	City
Whitestown Police Department	7 S Main Street	Whitestown
Advance Police Department	112 N Main Street	Advance
Jamestown Police Department	421 E Main Street	Jamestown

Table 43. Fire Stations

Facility Name	Address	City
Zionsville Fire Dept	100 N Ford Rd	Zionsville
Lebanon Fire Dept	975 Lasley Dr	Lebanon
Center Twp Fire Dept	525 Ransdell Rd	Lebanon
Perry Twp Fire Dept	7470 S State Road 267	Fayette
Advance Fire Dept	106 E Wall Street	Advance
Jamestown Fire Dept	29 East Main Street	Jamestown
Thorntown Fire Dept	400 N Pearl St	Thorntown
Whitestown Fire Dept	2965 S 575 East	Whitestown
Advance Volunteer Fire Dept	7984 Sr 32	Lebanon
Lebanon Fire Station #2	18 East Anderson Lane	Lebanon
Zionsville Fire Dept	998 South Us 421	Zionsville
Zionsville Fire Dept Headquarters	1100 West Oak Street	Zionsville

Table 44. Emergency Operations Center

Facility Name	Address	City
Boone County EOC	1905 Indianapolis Ave	Lebanon

Critical Facilities

Table 45. Airport Facilities

Facility Name	Use	City
Larsh	Public	Colfax
Indianapolis Executive Airport	Public	Zionsville
Reimer Aerodrome	Private	Jamestown
Hood Field	Private	Jamestown
Boone County	Public	Lebanon
Sport Aircraft Flight Park	Private	Thorntown
Summe Farm	Private	Zionsville

Table 46. Communication Facilities

Facility Name	Use	Address	City
Siren	Siren	Elm St And Grant St	Lebanon
Siren	Siren	Sam Rolston Rd At Triangle Asphalt	Lebanon
Siren	Siren	1935 Lafayette Ave At Kise Estates	Lebanon
Siren	Siren	2214 N Lebanon St At Northfield	Lebanon
Siren	Siren	Elm Swamp Rd And Elizaville Rd	Lebanon

Facility Name	Use	Address	City
Siren	Siren	Grant St And Claiborne St	Lebanon
Siren	Siren	400 N Pearl At Thorntown Fire Station	Thorntown
Siren	Siren	101 W Main At Thorntown Town Hall	Thorntown
Siren	Siren	Oak St And Grant St	Thorntown
Siren	Siren	Morris St And Bow St	Thorntown
Siren	Siren	W Franklin St	Thorntown
Siren	Siren	200 W Mill St At Thorntown Elem	Thorntown
Siren	Siren	7 South Main Behind Police Dept	Whitestown
Siren	Siren	Ne Cnr Of Starkey And Ford Rd	Zionsville
Siren	Siren	Nw Cnr Of Elm And Hawthorn St	Zionsville
Siren	Siren	Ne Cnr Of Willow And Clarkson Rd	Zionsville
Siren	Siren	Ne Cnr Of Ford And Mulberry	Zionsville
Siren	Siren	10890 Andrade Dr	Zionsville
Siren	Siren	Se Cnr Greenthread And Cr 400S	Zionsville
Siren	Siren	11750 E Cr 300S	Zionsville
Sinder	Comm	10890 Andrade Street	Zionsville
Crown Castle	Comm	1000 Mulberry Street	Zionsville
Crown Castle	Comm	900 Mulberry Street	Zionsville
Crown Castle	Comm	1238 West Oak Street	Zionsville
Sba	Comm	10795 East 300 South	Zionsville
Zionsville Fire Dept	Comm	100 North Ford Road	Zionsville
Tvc	Comm	10816 De Andra	Zionsville
Communication Tower	Comm	1905 Indianapolis Ave	Lebanon
Communication Tower	Comm	631 N High Street	Jamestown
Communication Tower	Comm	109 West Main Street	Thorntown
Communication Tower	Comm	11100 Andrade Dr	Zionsville
Siren	Siren	3500 Block Of Indianapolis Road	Lebanon
Siren	Siren	2000 Block Of Indianapolis Rd	Lebanon
Siren	Siren	John Shaw Rd And Cr 150 South	Lebanon
Siren	Siren	Elm And Stockton	Jamestown
Siren	Siren	1075 Parkway Drive	Zionsville
Crown Castle	Comm	4909 W 106 St	Zionsville
Siren	Siren	100 Block Of W Wall St	Advance
Siren	Siren	5046 S State Road 75	Jamestown
Siren	Siren	1201 N State Road 75	Thorntown
Siren	Siren	3900 E 300 South	Lebanon
Siren	Siren	State Road 334 And 700	Zionsville
Siren	Siren	W Main St At Jamestown Park	Jamestown

Facility Name	Use	Address	City
Siren	Siren	Washington St And Meridian St	Lebanon
Siren	Siren	Elm St And Ryan St	Lebanon
Siren	Siren	Enterprise Blvd And Mt. Zion	Lebanon
Siren	Siren	State Road 39 And Cox Ave.	Lebanon
Siren	Siren	Boone County 4H Fairgrounds	Lebanon

Table 47. Electric Power Facilities

Facility Name	Address	City
Eagle Worth Substation	CR 850 E And CR 450 S	Zionsville
Duke	6210 E SE 334	Zionsville
Boone Remc	1207 Indianapolis Ave	Lebanon
Lebanon Utilities	401 S. Meridian St	Lebanon
Thorntown Utilities	109 W. Main St	Thorntown
Boone Remc	SR 334 And CR 700 E	Zionsville
Boone Remc	CR 450 S & CR 575 E	Zionsville
Duke	5400 Turkey Foot Rd	Zionsville
Duke	5298 W 106 St	Zionsville
Boone Remc	2900 S US 421	Zionsville
Jamestown Utilities	421 E Main St	Jamestown
Elizaville Substation	Intersection SR 47 & US 421	Elizaville
Whitestown Substation	CR 300 S & CR 650 E	Whitestown
Enterprise Substation	I-65 And SR 32	Lebanon
Advance Substation	CR 450 S & CR 800 W	Advance
Pike Substation	SR 39 & SR 47	Thorntown
Thorntown Substation	CR 675 N & CR 850 W	Thorntown
Dover Substation	CR 75 N & CR 600 W	Thorntown
Marathon Substation	CR 50 N & CR 500 E	Lebanon
Central Substation	521 Evans St	Lebanon
Enterprise Substation	150 Enterprise Blvd	Lebanon
Lau Substation	900 Spencer Ave	Lebanon
West Substation And Stock Storage	806 Lafayette Ave	Lebanon
North Substation	701 W CR 250 N	Lebanon

Table 48. Hazmat

Facility Name	Chemical Name	Address	City
Hendrickson Intl. - Trailer Suspension S	Toluene	180 Mount Zion Rd	Lebanon
Lau-Cif	Xylene (Mixed Isomer)	843 Indianapolis Ave	Lebanon
Electrochemical Coatings Inc.	Lead	1301 Indianapolis Ave	Lebanon
Stalcop L.P.	Zinc Compounds	1217 W Main St	Thorntown
Wedzeb Enterprises Inc.	Other	320 S Ballard St	Lebanon

Facility Name	Chemical Name	Address	City
Northside Sanitary Landfill	Other	985 S SR 421	Zionsville
Envirochem Corp.	Unknown	865 S SR 421	Zionsville
Third Superfund Site	Unknown	Route 32 & US 421	Zionsville
Great Lakes Paving/Asphalt	Other	11875 E 200 S	Zionsville
Co-Alliance	Anhydrous Ammonia	200 S Main St	Advance
Amerigas Propane	Lp Gas	1324 W Main St	Lebanon
Air-Systems Components	Sulfuric Acid	843 Indianapolis Ave	Lebanon
Co-Alliance	Propane	400 S Coombs St	Lebanon
Imi	Silica Srystalline	417 W South St	Lebanon
Lebanon Berg Vault	Cement	720 E Elem St	Lebanon
Lebanon Utilities Wastewater	Chlorine Gas	806 Lafayette Ave	Lebanon
Haynes International	Lead Acid	317 Enterprise Blvd	Lebanon
Lebanon Concrete	Oil (Used)	3450 S Indianapolis Rd	Lebanon
Pamida	Sulfuric Acid	185 Mt. Zion Rd	Lebanon
Pearson Education	Sulfuric Acid	185 Mt. Zion Rd	Lebanon
White Castle	Ammonia	1520 W Main St	Lebanon
Case New Holland	Diphenylmethane	420 Enterprise Dr	Lebanon
Ferrel Gas	Gasoline	407 S Patterson	Lebanon
Prarie Industries	Oil	320 N Patterson	Lebanon
Sem Stream	Aluminum Oxide	550 W 125 South	Lebanon
Shell	Gasoline	1230 SR 32	Lebanon
Family Express	Oil	2430 N Lebanon St	Lebanon
Speedway	Oil	1618 N Lebanon St	Lebanon
Bernies Food Shop	Oil	2120 N Lebanon St	Lebanon
Casey'S General Store	Oil	723 Indianapolis Ave	Lebanon
Lebanon Citgo	Gasoline	1902 Indianapolis Ave	Lebanon
Village Pantry	Oil	702 W South St	Lebanon
Country Mark	Gasoline	815 West South St	Lebanon
Farris Standard	Gasoline	1510 W South St	Lebanon
Culley'S Station	Oil	101 E South St	Lebanon
Flying J Truckstop	Gasoline	520 S SR 39	Lebanon
Exxon-Mobil Lubricants	Oil	435 Ransdell Rd	Lebanon
Mcclure Oil Company	Gasoline	I-65 & SR 32	Lebanon
At&T	Sulfuric Acid	302 W Washington St	Lebanon

Table 49. Potable Water

Name	Address	City
Lebanon Water		Thorntown
Lebanon Utilities	401 S Meridian St	Lebanon
Zionsville Water Tank	Bloor Lane	Zionsville

Name	Address	City
Advance Water Tank	Wall Street	Advance
Lebanon Water Tower	East Elm Street	Lebanon
Lebanon Water Tower	Park Street	Lebanon
Lebanon Well Field	Chicago Street	Lebanon
Whitestown Water Tank	2 North Walnut	Whitestown
Whitestown Water Treatment	2 North Walnut	Whitestown
Whitestown South Water Tower	S Cr 650 East	Whitestown
Whitestown South Booster Station	Sr 334 Stonegate	Whitestown
Indianapolis Water	6750 South Ford Road	Zionsville
Jamestown Utilities	421 East Main Street	Jamestown
Jamestown Water Tank	600 North High Street	Jamestown

Table 50. Waste Water Treatment Plants

Facility Name	Address	City
Advance Wwtp	112 N Main St	Advance
Clay Township Reg Waste Dist.	4950 W 106th St	Zionsville
Irishman'S Run Farm Utility Co	West Of Ford Road	Zionsville
Whitestown Municipal Wwtp	75 Main St	Whitestown
Thorntown Utilities	109 W Main St	Thorntown
Zionsville Town Of	855 Starkey Rd	Zionsville
Lebanon Utilities	410 S Meridian St	Lebanon
Jamestown Utilities	421 E Main St	Jamestown

Appendix E: Hazard Maps

Table 51. Table of critical facilities in SFHA

Facility Type	Facility Name
Hazmat	Mcclure Oil Company
Wastewater	Irishman's Run Farm Utility Co
Wastewater	Thorntown Utilities

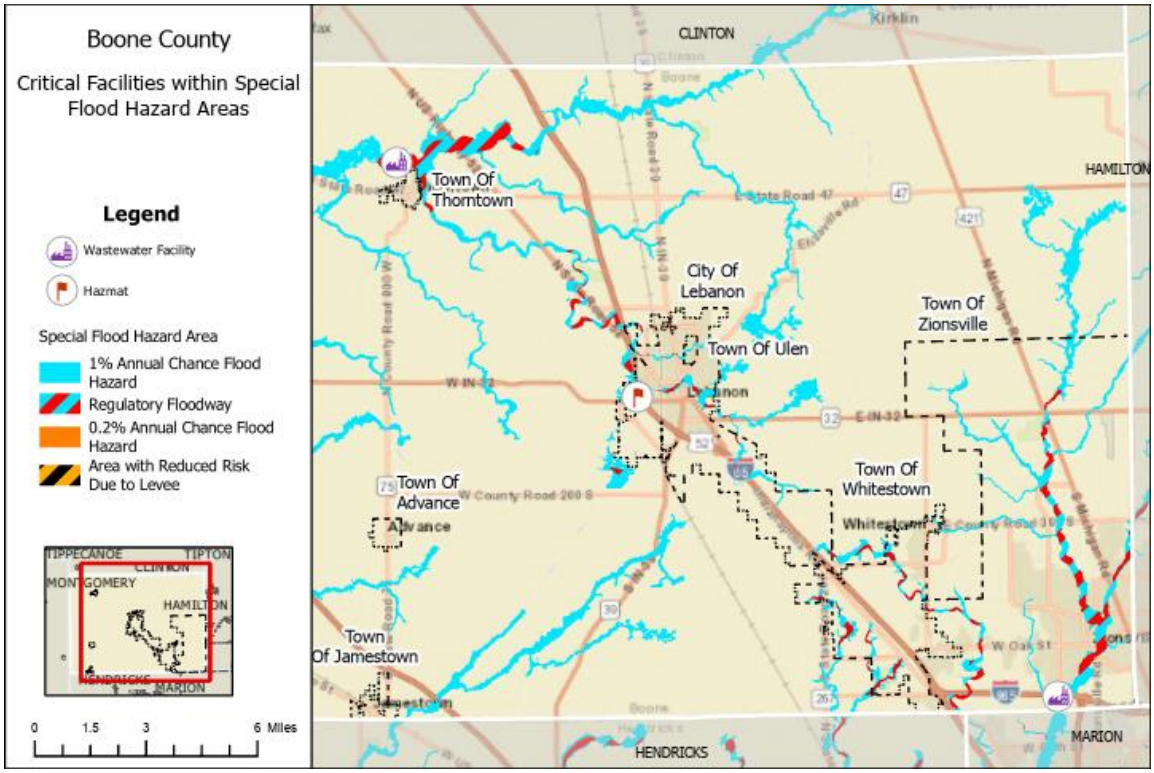

Figure 63. Critical facilities in SFHA

Table 52. Table of critical facilities in plume threat zone

Facility Type	Facility Name
Wastewater	Lebanon Utilities
Potable Water	Lebanon Utilities
Potable Water	Lebanon Water Tower
Potable Water	Lebanon Well Field
Electric Power	Boone REMC
Electric Power	Lebanon Utilities
Electric Power	Enterprise Substation
Electric Power	Central Substation
Electric Power	Enterprise Substation
Electric Power	Lau Substation

Facility Type	Facility Name
Electric Power	West Substation And Stock Storage
Communication Tower	990510Mg
Communication Tower	990510Mg
Communication Tower	980918Mg
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Communication Tower
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Communication Tower	Siren
Hazmat	Hendrickson Intl. - Trailer Suspension S
Hazmat	Lau-Cif
Hazmat	Electrochemical Coatings Inc.
Hazmat	Wedzeb Enterprises Inc.
Hazmat	Amerigas Propane
Hazmat	Air-Systems Components
Hazmat	Co-Alliance
Hazmat	Imi
Hazmat	Lebanon Berg Vault
Hazmat	Lebanon Utilities Wastewater
Hazmat	Haynes International
Hazmat	Pamida
Hazmat	Pearson Education
Hazmat	Pearson Education
Hazmat	Total Logistics
Hazmat	Total Logistics
Hazmat	White Castle
Hazmat	Case New Holland
Hazmat	Ferrel Gas
Hazmat	Prarie Industries
Hazmat	Sem Stream
Hazmat	Shell
Hazmat	Family Express
Hazmat	Speedway

Facility Type	Facility Name
Hazmat	Bernies Food Shop
Hazmat	Casey'S General Store
Hazmat	Lebanon Citgo
Hazmat	Village Pantry
Hazmat	Country Mark
Hazmat	Farris Standard
Hazmat	Culley'S Station
Hazmat	Flyining J Truckstop
Hazmat	Exxon-Mobil Lubricants
Hazmat	Mcclure Oil Company
Hazmat	At&T

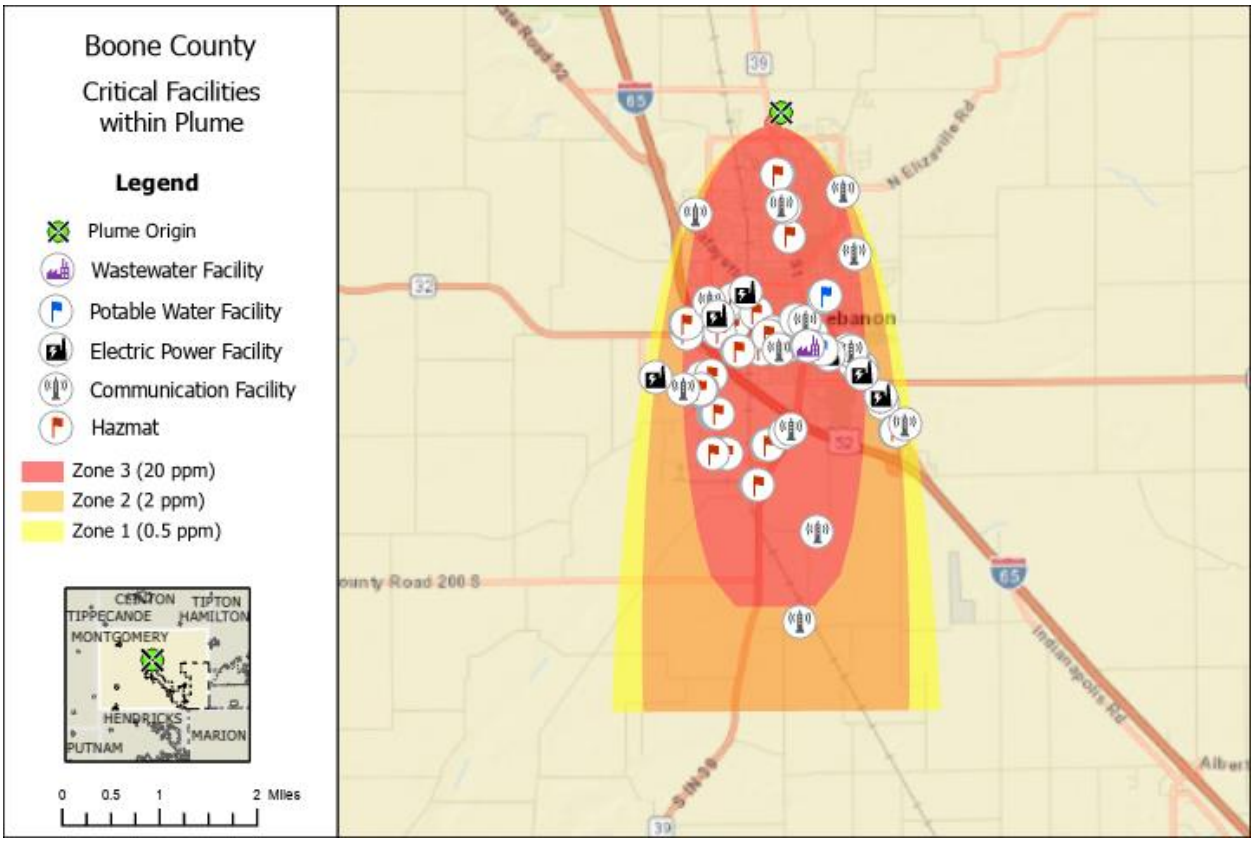

Figure 64. Critical facilities in plume threat zone

Appendix F: Community Capability Assessment Result

Multi-Hazard Mitigation Plan Update

Mitigation Strategies

Community Name Advance

The purpose of this planning effort is to identify the hazard that most affect your community and then identify projects and strategies that could reduce the potential for loss of life or property in the event of future disasters. This worksheet is meant to help prepare materials for the planning document and meetings. **We want to make sure every community is represented in the plan.**

Flood:

- Is flooding a major problem in your community (YES or (NO))
- What is the major reason or source of flooding?

- What could be done to reduce future flooding? EXAMPLE: Voluntary Buyouts

N/A

Dam/Levee Failure:

- Will your community be impacted by any dam/levee failure? (YES or (NO))
- If so what could be done to reduce the risk of failure? EXAMPLE: enforce dam/levee inspections.

N/A

Tornado:

- What could be done to reduce damage and loss of life? EXAMPLE: install warning sirens in mobile home communities.

Safety areas @ Town Hall & Fire Station for residents
Install more warning sirens

Earthquake: N/A

The Polis Center

- What could be done to reduce damage and loss of life? EXAMPLE: bolt bookshelves to walls in all schools.

Na

Severe Summer Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: develop family emergency plans during Severe Weather Week in schools.

Tree Maintenance) - Secure & Make Sure
Utility Poles are Maintained

Winter Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: purchase back- up generators for public facilities.

Generators installed @ Town Hall & Fire
Station - Plans for local maintenance of roads

Hazardous Material Spills:

- What could be done to reduce damage and loss of life? EXAMPLE: identify current and establish alternate approved routes for transporting hazardous materials.

Work with local industry to work with responders
on how to mitigate Hazards

Which of the hazards listed above is the biggest threat to your community? Explain why in detail.

Severe Storms / Hazardous Spills - Co-alliance (Chemical company)
Tornado in 1995

Submitted by: <Name>,<Title> Shari Johnson - Clerk - Treasurer

The Polis Center

Multi-Hazard Mitigation Plan Update

Mitigation Strategies

Community Name Western Boone Schools

The purpose of this planning effort is to identify the hazard that most affect your community and then identify projects and strategies that could reduce the potential for loss of life or property in the event of future disasters. This worksheet is meant to help prepare materials for the planning document and meetings. **We want to make sure every community is represented in the plan.**

Flood:

- Is flooding a major problem in your community (YES or (NO))
- What is the major reason or source of flooding?

- What could be done to reduce future flooding? EXAMPLE: Voluntary Buyouts

Dam/Levee Failure:

- Will your community be impacted by any dam/levee failure? (YES or (NO))
- If so what could be done to reduce the risk of failure? EXAMPLE: enforce dam/levee inspections.

Tornado:

- What could be done to reduce damage and loss of life? EXAMPLE: install warning sirens in mobile home communities.

  + Continue placing an emphasis on drills at K-12 level
  + Educating general population on the safest places to seek shelter in their homes and workplaces

The Polis Center

Earthquake:

- What could be done to reduce damage and loss of life? EXAMPLE: bolt bookshelves to walls in all schools.
  + More stringent building codes
  + Educate general public on nearest fault lines and seismic activity

Severe Summer Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: develop family emergency plans during Severe Weather Week in schools.
  + Public Service Announcements used to educate public on difference between watch & warning.
  + Consistent testing of equipment and/or methods for notifying public of severe weather.

Winter Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: purchase back- up generators for public facilities.

Hazardous Material Spills:

- What could be done to reduce damage and loss of life? EXAMPLE: identify current and establish alternate approved routes for transporting hazardous materials.
  + Keeping hazardous materials on the interstate as much as possible

Which of the hazards listed above is the biggest threat to your community? Explain why in detail.

+ Tornado/Severe Summer Storms - Severe damage to any of our buildings would result in closure for extended periods of time.
+ Winter Storms - Jr/Sr High School is an all electric building. Extended power outages would pose a threat to the building because of potential water damage from frozen pipes
+ Hazardous Spills - Jr/Sr High School is located on St. Rd. 32 and subject to possible ramifications from a spill

Submitted by: <Name>,<Title> Rob Ramey, Superintendent

The Polis Center

Ulen – risks and mitigation initiatives

Risks	Mitigating Actions
Residents who have limited mobility or special needs	• Create a list of households with members who have special needs; collect contact information • Determine how this information can be best shared with appropriate emergency services
Inadequate communications during an emergency	• Research available emergency communications mechanisms; identify gaps for Ulen residents • Update all-resident contact information list • Develop and implement a plan for communications, education and outreach relating to risks and available emergency resources • Educate residents about Lebanon text messaging systems; explore use of Ulen Country Club text messaging system as needed
Need to clarify which emergency services would be available via the state, county, City of Lebanon, and Town of Ulen	• Research departments that support disaster response, their jurisdictions, nature of their support, range and methods of communications, and points of contact during an emergency • Identify an emergency/disaster coordinator as the point of contact within Ulen • Document this information and share with residents • Research possibility of Ulen Country Club building as a temporary shelter; identify requirements and resources that may be needed
Limited access to the neighborhood	• Identify potential alternate routes via pass-through driveways and secure usage agreements with residents • Share information with appropriate emergency service agencies as needed
Need for protection of historic district sites and artifacts	• Research FEMA recommendations for protection of historic buildings and artifacts • Engage a historic preservation expert to assist in developing a preservation plan for disasters or emergencies
Aging infrastructure	• Consider re-engaging engineering firm to review and update sewer/storm drain maintenance activities
No participation in NFIP	• Include relevant flood plain management ordinances into Ulen's comprehensive plan (in progress) in order to qualify for the National Flood Insurance Program • Submit Ulen application to NFIP

Capabilities	Boone County	Whitestown	Jamestown	Lebanon	Advance	Thorntown	Ulen	Zionsville	Lebanon Community School Corp	Trader's Point Christian Academy	Western Boone School Corp	Zionsville Community Schools	Boone County SWCD
Funding Sources													
Capital Improvements Project Funding	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No
Authority to Levey Taxes for Specific Purposes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	No
Impact fees for new development	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No
Storm Water Utility Fee	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No
Incur Debt through general obligation bonds and/or special tax bonds	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No
Community Development Block Grant	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Staff													
Chief Building Officer	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	No
Floodplain Administrator	Yes	Yes	No	Yes	No	No	No	Yes	No	No	No	No	No
Emergency Manager	Yes	Yes	County	Yes	Yes	Yes	No	Yes	No	No	No	No	No
Community Planner	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	No
Civil Engineer	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	No	No	No
GIS Coordinator	Yes	Yes	County	Yes	Yes	Yes	No	Yes	No	No	No	No	No

Capabilities	Boone County	Whitestown	Jamestown	Lebanon	Advance	Thorntown	Ulen	Zionsville	Lebanon Community School Corp	Trader's Point Christian Academy	Western Boone School Corp	Zionsville Community Schools	Boone County SWCD
Administrative & Planning													
Planning Commission	Yes	Yes	Yes	Yes	Yes	Yes	In progress	Yes	No	No	No	No	No
Mitigation Planning Committee	Yes	No	County	No	Yes	No	In progress	No	No	No	No	No	No
Maintenance Programs to Reduce Risk	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Warning Systems/Services (i.e. Reverse 911, Outdoor Warning Signals)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Hazard Data & Information	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Grant Writing	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	No	No	No	Yes
Education & Outreach													
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No
Ongoing public education o-r information	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes	No	Yes

Capabilities	Boone County	Whitestown	Jamestown	Lebanon	Advance	Thorntown	Ulen	Zionsville	Lebanon Community School Corp	Trader's Point Christian Academy	Western Boone School Corp	Zionsville Community Schools	Boone County SWCD
program (e.g., responsible water use, fire safety, household preparedness, environmental education)													
Natural disaster or safety related school programs	No	No	N/A	No	Yes	Yes	No	No	No	No	Yes	No	No
StormReady certification	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Firewise Communities Certification	No	Yes (2022)	No	No	No	No	No	No	No	No	No	No	No
Public-private partnership initiatives addressing disaster-related issues	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No

Appendix G: Adopting Resolutions

RESOLUTION 2023-10

JAMESTOWN, BOONE COUNTY, INDIANA

A RESOLUTION OF TOWN OF JAMESTOWN, ADOPTING THE 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS the Jamestown Town Council recognizes the threat that natural hazards pose to people and property within the Town of Jamestown; and

WHEREAS the Jamestown Town Council has prepared a multi-hazard mitigation plan, hereby known as 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Town of Jamestown from the impacts of future hazards and disasters; and

WHEREAS adoption by the Jamestown Town Council demonstrates its commitment to hazard mitigation and achieving the goals outlined in the 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF JAMESTOWN, INDIANA, THAT:

Section 1. In accordance with local rules for adopting resolutions, the Jamestown Town Council adopts the 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN. While content related to Town of Jamestown may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the Jamestown Town Council to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of 3 in favor and 0 against, and ____ abstaining, this **4th** day of **April,** 2023.

By: _____ Shane Childress, President Town Council

ATTEST: By: Lori Hieston Lori Hieston, Clerk-Treasurer

RESOLUTION OF THE TOWN OF ULEN, INDIANA

RESOLUTION NO. R2023-1

A RESOLUTION OF THE TOWN OF ULEN, ADOPTING THE 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS the Town of Ulen Council recognizes the threat that natural hazards pose to people and property within the Town of Ulen; and

WHEREAS Boone County has prepared a multi-hazard mitigation plan, hereby known as 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Town of Ulen from the impacts of future hazards and disasters; and

WHEREAS adoption by the Town of Ulen Council demonstrates its commitment to hazard mitigation and achieving the goals outlined in the 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF ULEN, INDIANA, THAT:

Section 1. In accordance with local rules for adopting resolutions, the Town of Ulen Council adopts the 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN. While content related to the Town of Ulen may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the Town of Ulen to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of 3 in favor and 0 against, and 0 abstaining, this 28 day of February, 2023.

By: Mark Ranson (print name) MARK RANSOM

ATTEST: By: _____ (print name) Jennifer Jones

APPROVED AS TO FORM: By: Mark Ranson (print name) MARK RANSOM

RESOLUTION OF WESTERN BOONE COUNTY COMMUNITY SCHOOL CORPORATION (WBCCSC, THORNTOWN, INDIANA

RESOLUTION NO. 2023-04-10

A RESOLUTION OF THE BOARD OF TRUSTEES OF THE WESTERN BOONE COUNTY COMMUNITY SCHOOL CORPORATION (BOARD), ADOPTING THE 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS the Board recognizes the threat that natural hazards pose to people and property within WBCCSC and

WHEREAS the Boone County Emergency Management Agency has prepared a multi-hazard mitigation plan, hereby known as 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in WBCCSC from the impacts of future hazards and disasters; and

WHEREAS adoption by the Board demonstrates its commitment to hazard mitigation and achieving the goals outlined in the 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN.

NOW THEREFORE, BE IT RESOLVED BY THE Board in Thorntown, INDIANA, THAT:

Section 1. In accordance with local rules for adopting resolutions, the Board adopts the 2023 BOONE COUNTY MULTI-HAZARD MITIGATION PLAN. While content related to WBCCSC may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the Board to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of 7 in favor and 0 against, and 0 abstaining, this 10th day of April, 2023.

By: Shane Stermel Shane Stermel (print name)

ATTEST: By: Brian Gast Brian Gast (print name)