Boone County, Illinois Multi-Hazard Mitigation Plan

A 2022 Update of the 2014 Countywide MHMP

FEMA

IEMA
ILLINOIS EMERGENCY MANAGEMENT AGENCY

SIU
Southern Illinois University
CARBONDALE

Multi-Hazard Mitigation Plan

Boone County, Illinois

Adoption Date: -- _____ --

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Section 1. Introduction

Hazard mitigation is any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) makes reducing hazards one of its primary goals; hazard-mitigation planning and the subsequent implementation of mitigation projects, measures, and policies is a primary mechanism in achieving FEMA's goal.

The Multi-Hazard Mitigation Plan (MHMP) is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000). The development of a local government plan is required in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. In order for the National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt an MHMP.

In recognition of the importance of planning in mitigation activities, FEMA created Hazus Multi-Hazard (Hazus-MH), a powerful geographic information system (GIS)-based disaster risk assessment tool. This tool enables communities of all sizes to estimate losses from floods, hurricanes, earthquakes, and other natural hazards and to measure the impact of various mitigation practices that might help reduce those losses. The Illinois Emergency Management Agency (IEMA) has determined that Hazus-MH should play a critical role in the risk assessments performed in Illinois.

Boone County completed their previous Multi-Hazard Mitigation Plan in 2014. Southern Illinois University Carbondale (SIU) and Boone County have joined efforts in updating the County's mitigation plan. The update process addresses changes in the probability and impact of specific hazards to the county, as well as changes in land-use, population, and demographics. The plan incorporates detailed GIS and Hazus-MH Level 2 analyses to improve the risk assessment. The plan also revises and updates mitigation strategies. This document hereby serves as Boone Multi-Hazard Mitigation Plan update.

Section 2. Planning Process

2.1 Timeline

The MHMP update process is broken into a series of four meetings. These meetings were organized by SIU and hosted by the Boone Emergency Management Agency. At these meetings, various tasks were completed by SIU and the Boone Mitigation Planning Team.

Meeting 1: Introduction of the MHMP process and organize resources. SIU gathered local resources that contributed to the detailed county risk assessment and presented the county's historical hazards. Based on this information, the Planning Team identified natural hazards to include in the plan, and ranked hazard mitigation priority by potential damages and frequency of occurrence.

Meeting 2: The aim of meeting 2 is development of mitigation strategies for the various jurisdictions based on identified needs and the informed by hazard rankings derived from meeting 1. FEMA requires the plan to contain mitigation strategies specific to each hazard and for each incorporated area within the county. This meeting was intended for the third week of March 2020. However, due to the COVID-19 response, the formal assembly was unable to take place. In lieu of this, SIU (Dr. James Conder) and the Boone County EMA director (Dan Zaccard) had a formal phone call on April 6, discussing previous and future mitigation strategies for the county. SIU presented options for funding implementation of different mitigation strategies, including a printed guide. It was decided that the county EMA would work directly with the participating jurisdictions to help develop their respective mitigation strategies. This was achieved over the subsequent weeks. The Planning Team lent local knowledge to identify and prioritize mitigation strategies and projects that can address the threats identified in the previously developed risk assessments.

Meeting 3: The aim of meeting three is to invite public involvement. Again, because of the COVID-19 crisis, this could not take place as a formal assembly. In lieu of a formal assembly, the plan including draft risk assessments derived from the Hazus-MH and GIS modeling of the identified disasters and mitigations strategies identified by the planning team were posted on the County website for comment and/or questions. The formal comment period spanned May 19 – May 28, but was left open to later comments as well. In addition to the website itself, the general public was notified of the week-long comment period through various social media and a newspaper announcement. The gathered public input was utilized in the planning process, fulfilling one of FEMA's requirements for public input.

Meeting 4: The Planning Team reviewed the draft plan and, proposed revisions, and accepted the plan after SIU incorporated the necessary changes. This was accomplished via email with SIU and the County EMA acting as contact points for edit updates. Subsequently, SIU forwarded the county MHMP to the mitigation staff at the Illinois Emergency Management Agency (IEMA) for review prior to submitting it to FEMA.

2.2 Jurisdiction Participation Information

Six jurisdictions participated in the development of this MHMP with the intent of formally adopting the plan and subsequently fulfill the requirements of the DMA 2000. Various representatives from each jurisdiction were present at the meetings (see Section 2.3 Planning Team Information). Each jurisdiction falls under the one of the following categories: County, City, Village, Town, School, or Non-Profit Organization.

2.3 Planning Team Information

Dan Zaccard, Boone EMA Coordinator, heads the Planning Team. The Planning Team includes representatives from various county departments, municipalities, and public and private utilities. Members of the Planning Team have a common vested interest in the County's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. Members of the Planning Team actively participated in the meetings, reviewed, and provided comments on the draft plan, participated in the public input process and the county's formal adoption of the plan.

Boone Planning Team Members

Jurisdiction	Name	Title
Boone County	Dan Zaccard	Coordinator
Boone County	Pat Molloy	Lieutenant
Boone County	Joe Shadden	Information Technology Director
Boone County	Dan Streed	Deputy Director of Administration
City of Belvidere	Al Hyser	Fire Chief
City of Belvidere	Brent Anderson	Director of Public Works
Boone County	Sherry Giesecke	Board Member
Boone County Health Department	Ellen Genrich	Emergency Response
Winnebago and Boone Counties	Paul Chiodine	Paramedic Supervisor
Poplar Grove	Owen Costanza	Mayor
Timberlane	Steve Rapp	Village President
Capron	Conrad Labinsky	Mayor

The DMA 2000 planning regulations require that Planning Team members from each jurisdiction actively participate in the MHMP process. The Planning Team was actively involved on the following components:

- Attending the MHMP meetings
- Providing available assessment and parcel data and historical hazard information
- Reviewing and providing comments on the draft plans
- Coordinating and participating in the public input process
- Coordinating the formal adoption of the plan by the county

Participating Jurisdictions

Boone County	City of Belvidere	Village of Poplar Grove
Boone County Health Department	Village of Capron	Village of Timberlane

The first MHMP update meeting was held in Belvidere, Illinois on December 9, 2019. Representatives from SIU explained the rationale behind the MHMP update process and answered questions from the

jurisdictional representatives and other interested stakeholders. SIU representatives also provided an overview of GIS/Hazus-MH, described the timeline and the process of mitigation planning.

Due to the COVID-19 crisis, the Boone Planning Team was only able to formally assemble for the first meeting, lasting approximately two hours in length. The Additional meetings were held outside of the four formal meetings. Appendix A includes the minutes for all meeting. During these meetings, the Planning Team successfully identified critical facilities, reviewed hazard data and maps, identified and assessed the effectiveness of existing mitigation measures, established mitigation projects for the future, and assisted with preparation of the public participation information.

Planning Meetings

MEETING 1	Dec 9th, 2019
MEETING 2	April 6th, 2020
MEETING 3	May 19th, 2020
MEETING 4	June 10th, 2020

2.4 Public Involvement

The Boone County EMA solicited and encouraged public input throughout the planning process. The public was explicitly invited to give input from May 19 – May 28, 2020 with the plan posted on the county website enabling review of the County's risk assessment and mitigation strategies. Appendix B contains a press release sent to the local newspaper and screen shots of the county website where the plan was posted for public review.

2.5 Neighboring Community Involvement

The Planning Team invited participation from various representatives of county government, local city and town governments, community groups, local businesses, and universities. The Planning Team also invited participation from adjacent counties to obtain their involvement in the planning process.

Person Participating	Neighboring Jurisdiction	Title/Organization
Michele Pankow	City of Rockford	EMA Director
David Christensen	McHenry County	EMA Director

2.6 Review of Technical Documents

The Boone Planning Team identified technical documents from key agencies to assist in the planning process. These documents include land use plans, comprehensive plans, emergency response plans, municipal ordinances, and building codes. The planning process incorporated the existing natural hazard mitigation elements from previous planning efforts. The following technical data, reports, and studies were utilized:

Federal Emergency Management Agency
- *Developing the Mitigation Plan*
- *Mitigation Ideas*
- *Local Mitigation Planning Handbook*
- *Flood Insurance Study*

United States Census Bureau

County Profile Information
2018 Census Data
American Community Survey (2013-2017)

U.S. Army Corp of Engineers
2019 Executive Summary - Levee System

NOAA National Climatic Data Center
Climate Data

NOAA / National Water Service Storm Prediction Center
Severe Weather Data

Illinois Emergency Management Agency
2014 Illinois Natural Hazard Mitigation Plan

Illinois Environmental Protection Agency
2014 303d Listed Waters and Watershed Maps

Illinois State Water Survey
Climate Data

Illinois Department of Commerce and Economic Opportunity
Community Profiles

Boone County
2019 Assessment Records
2019 Countywide GIS Parcel Database
2014 Multi-Hazard Mitigation Plan

2.7 Adoption by Local Government

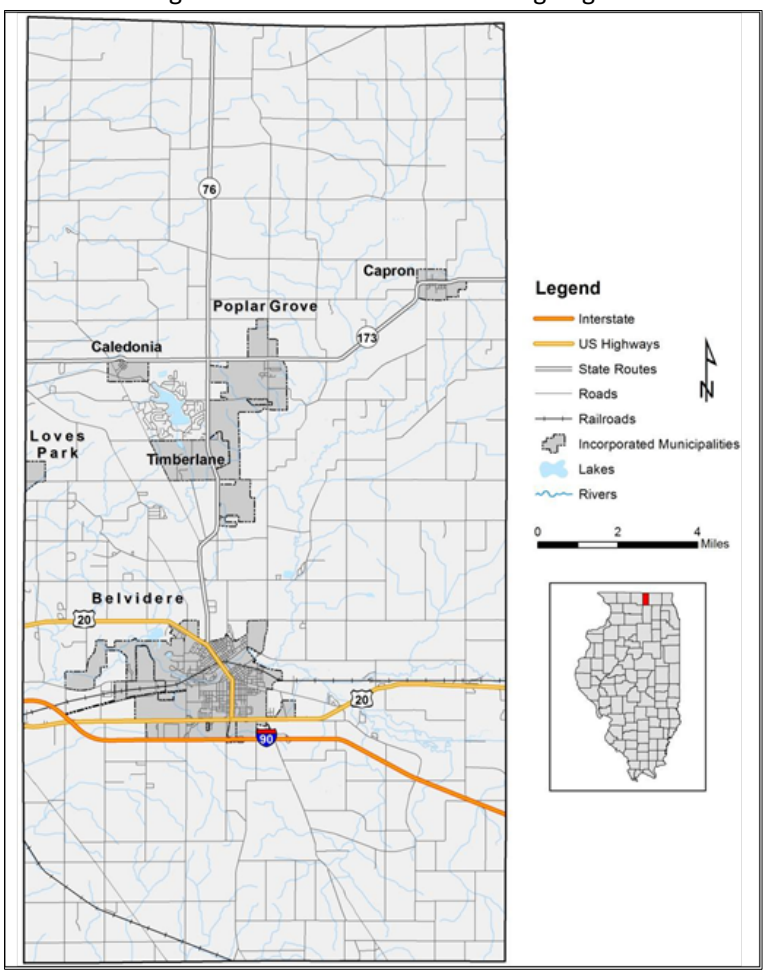
Upon IEMA and FEMA approval, the Planning Team presented and recommended the plan to the County Board for formal adoption. The plan was formally adopted by the Boone County Board on <adoption date>. The Planning Team worked with the County and its jurisdictions to ensure all parties formally adopted the plan. Appendix C contains the Adopting Resolutions for each participating jurisdiction.

Section 3. County Profile

3.1 County Background

Boone County is located in northern Illinois along the Illinois-Wisconsin border. Boone County is surrounded by McHenry County to the east, Winnebago County to the west and DeKalb County to the south. Boone County was formed out of Winnebago County in 1837. The county is named after the American pioneer, Daniel Boone. Figure 3-1 displays the geographical location of Boone County and its incorporated municipalities. Belvidere has remained the county seat since 1843.

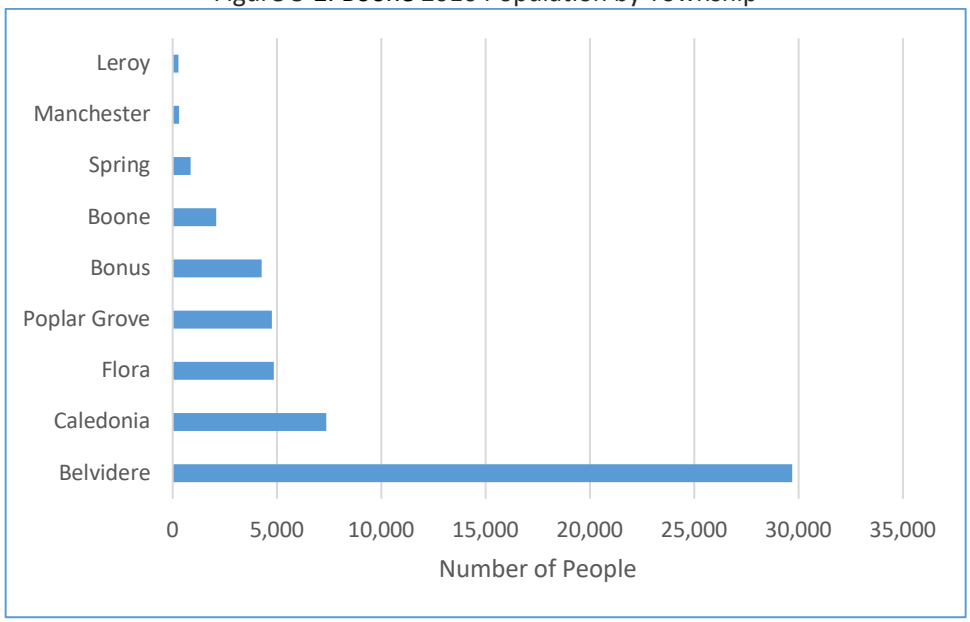
Figure 3-1. Boone and Surrounding Region



3.2 Demographics

Boone County's population is 53,577, a decrease of 0.97% from 2010 to 2018 (U.S. Census Bureau, 2018 Estimate). The population is spread through nine townships: Belvidere; Bonus; Boone; Caledonia; Flora; Leroy; Manchester; Poplar Grove; and Spring. Boone County has six incorporated jurisdictions, including: Belvidere; Caledonia; Capron; Garden Prairie; Poplar Grove; and Timberlane. The largest incorporated jurisdiction in Boone County is Belvidere, which has a population of approximately 30,109 (U.S. Census Bureau, 2018 Estimate). Figure 3-2 includes the breakdown of population by township.

Figure 3-2. Boone 2010 Population by Township



3.3 Economy and Industry

The American Community Survey (2013-2017) reported that the civilian labor force comprised 46.8% of the workforce in Boone County. Table 3-1 includes the employment distribution by industrial sector. Manufacturing, retail trade, and education represent the largest sectors, employing 52.4% of the workforce. The annual per capita income in Boone County is $26,105 (American Community Survey, 2013-2017).

Table 3-1. Boone County's Major Employers

Employer	Industry	Approximate Number of Employees
Americold	Warehousing	138
Belvidere School District 100	Education	600
Capron Manufacturing	Manufacturing	150
Chrysler Belvidere Plant	Manufacturing	3900
Dean Foods	Food & Beverage	110
General Mills	Food & Beverage	560
Ipsen USA Belvidere	Heat Treat & Manufacturing	55
North Boone School District 200	Education	200
Syncreon	Logistics	75

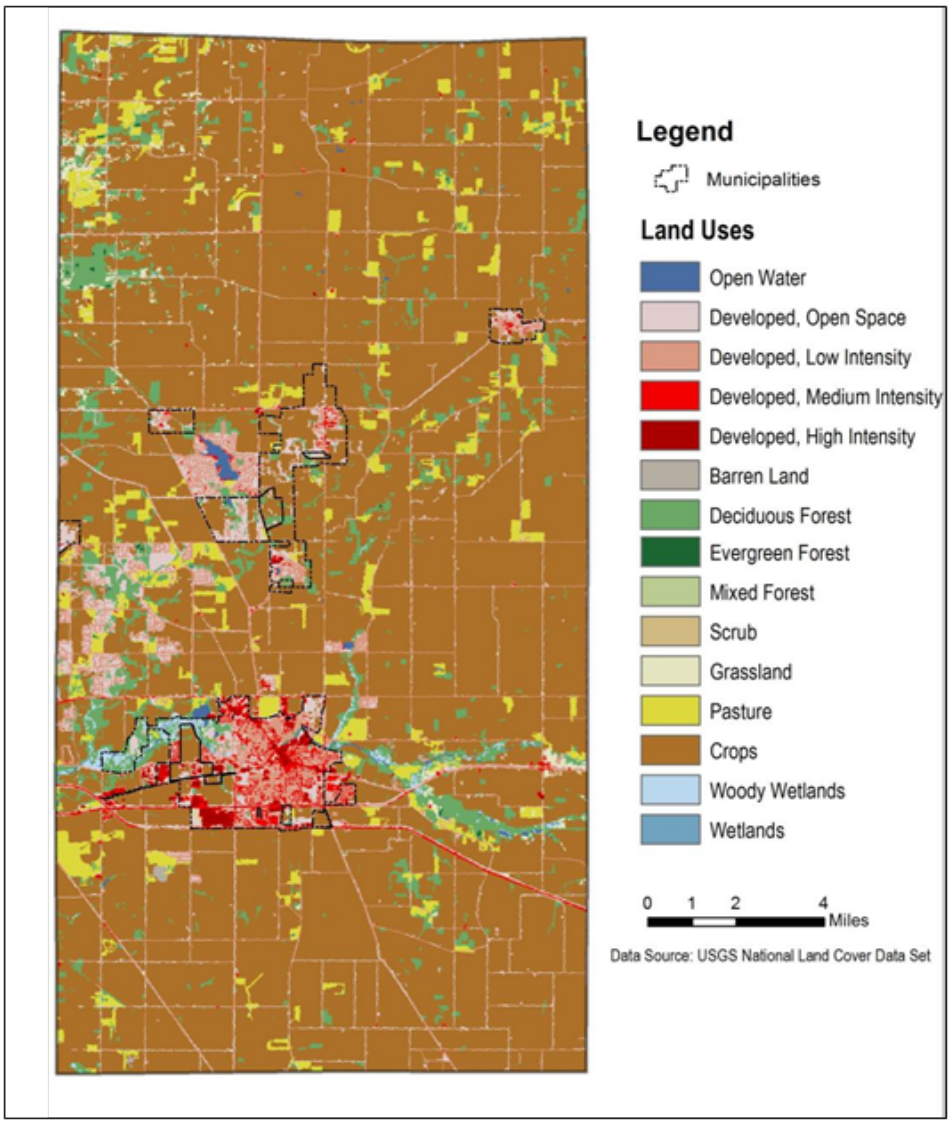
Source: https://factfinder.census.gov/

Land Use and Development Trends

Figure 3-3 depicts the land use within Boone County. The predominant land cover in Boone County is crops, followed by medium and low intensity urban development, pasture, and deciduous forest. Crops and pastures are distributed throughout the county, while areas of deciduous forest are usually found along rivers or around water bodies. Urban development is predominantly located within the triangle formed by US Business 20, Beloit Road, and the County Line. The city of Belvidere is the area of most significant urban development. Suburban development is located within the City of Belvidere, and to an

extent, in the Villages of Capron and Poplar Grove and Candlewick. Small village-character development is located within Caledonia, Capron, Poplar Grove, Garden Prairie, and to some extent, Herbert. While there are no state parks in Boone County, there are six structures in the National Register of Historic Places, including the Pettit Memorial Chapel designed by famous architect Frank Lloyd Wright. Since adoption of the 2014 plan, development in Boone County has been modest with no significant shifts in land use or development.

Figure 3-3. Land Use in Boone County



3.4 Climate

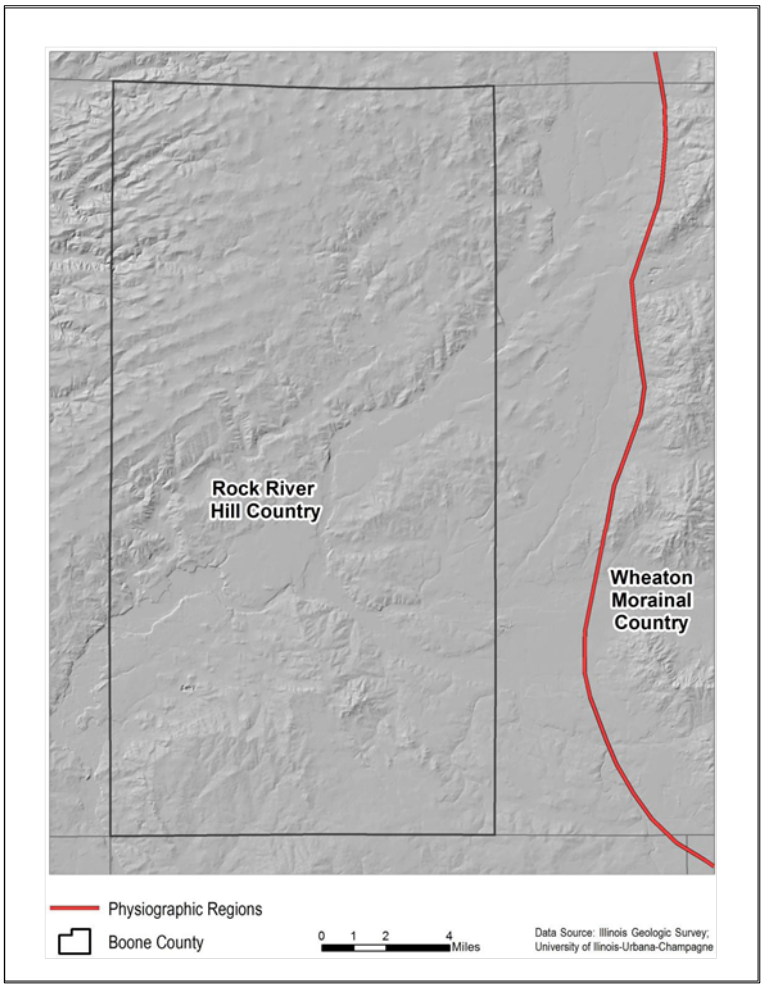
Boone County climate is humid continental with warm summers and cold winters. Seasonal temperatures range from highs in the 80s in summer months and lows in the teens in winter months. The highest temperature on record is 109 °F and the lowest is -29 °F. Average annual precipitation is 35.5 inches, with

most precipitation occurring in spring and summer months. Average annual snowfall is approximately 34 inches. Annual humidity averages around 75%. Wind is common, frequently with gusts around 20 mph.

3.6 Topography

Boone County is situated in the Rock River Hill County physiographic regions. Figure 3-5 depicts the physiographic regions of Boone County.

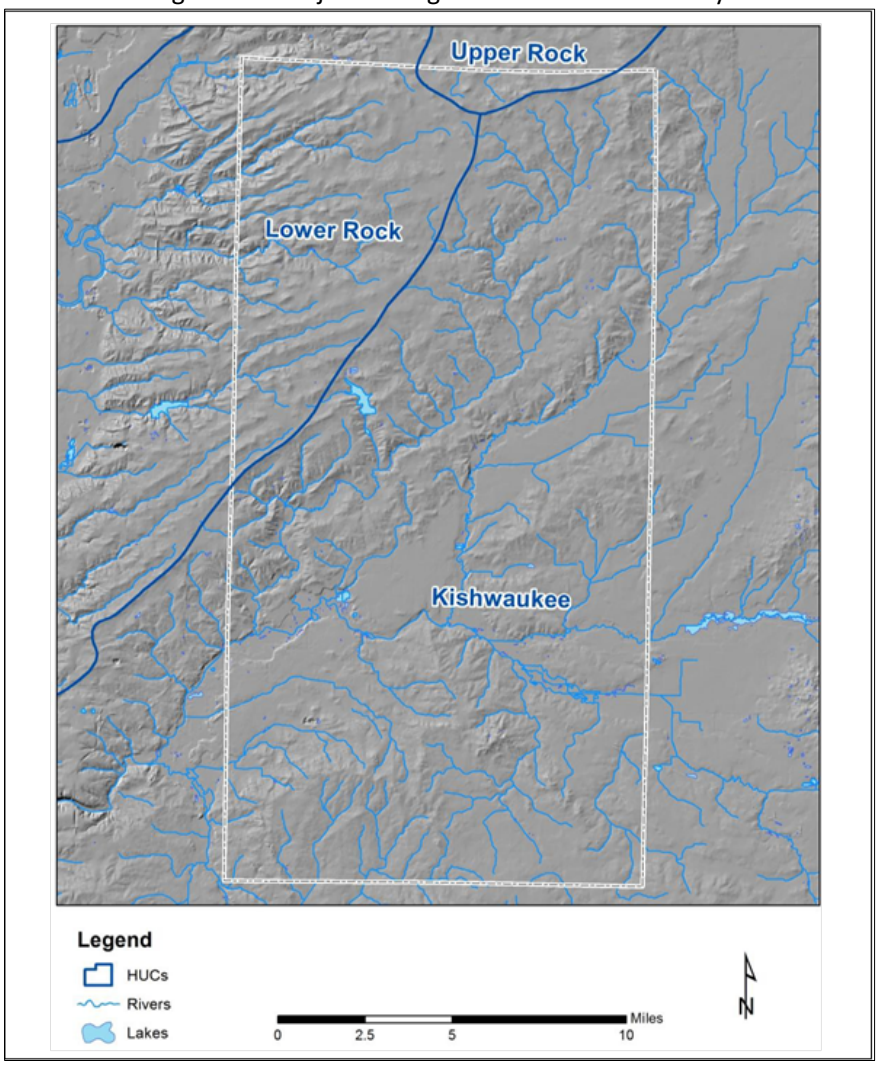
Figure 3-4. Physiographic Divisions of Boone and Surrounding Terrain



3.7 Major Lakes, Rivers, and Watersheds

Boone County has several water bodies, the most prominent of which is Candlewick Lake. The most prominent river in Boone County is the Kishwaukee River, which runs through the center of Belvidere. According to the USGS, Boone County consists of three drainage basins: Upper Rock; Lower Rock; and Kishwaukee. The majority of the population is located in the Kishwaukee drainage basin. Figure 3-5 depicts the hydrologic units within Boone County.

Figure 3-5. Major drainage basins in Boone County



Section 4. Risk Assessment

The goal of mitigation is to reduce future hazard impacts including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation requires a rigorous risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people. This assessment identifies the characteristics and potential consequences of a disaster, how much the disaster could affect the community, and the impact on community assets. This risk assessment consists of three components—hazard identification, vulnerability assessment, and risk analysis.

4.1 Hazard Identification

4.1.1 Existing Plans

The Planning Team identified technical documents from key agencies to assist in the planning process and incorporated the natural hazard mitigation elements from previous 2014 Boone Multi-Hazard Mitigation Planning efforts. Several other documents were used to profile historical hazards and guide the Planning Team during the hazard ranking exercise. Section 2-6 contains a complete list of the technical documents utilized to develop this plan.

4.1.2 National Hazard Records

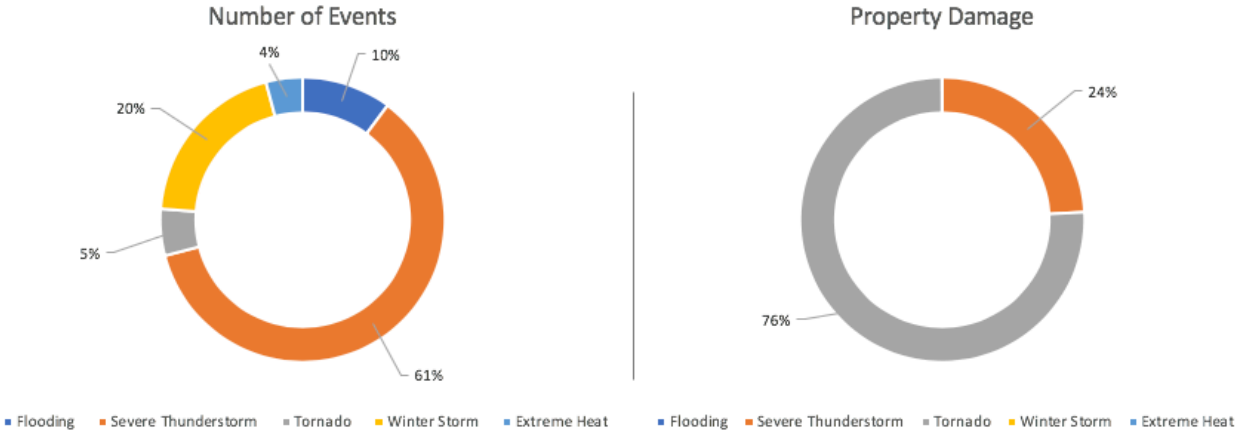
To assist the Planning Team, historical storm event data from the National Climatic Data Center (NCDC) was complied. NCDC records are estimates of damages reported to the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses.

The NCDC database included 265 reported meteorological events in Boone from 1950-2020 (the most updated information as of the date of this plan). The following hazard-profile sections each include a summary table of events related to each hazard type. Table 4-1 summarizes the meteorological hazards reported for Boone. Figure 4-1 summarizes the relative frequency of NCDC reported meteorological hazards and the percent of total damage associated with each hazard for Boone. Full details of individual hazard events are on the NCDC website. In addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail was mapped using SPC-recorded latitudes and longitudes. Appendix D contains a map of these events.

Table 4-1. Summary of Meteorological Hazards Reported by the NCDC for Boone County

Hazards	Time Period		Number of Events	Property Damage	Deaths	Injuries
	Start	End				
Flooding	1950	2020	27	0	0	0
Severe Thunderstorm	1950	2020	161	0.86	1	0
Tornado	1950	2020	14	2.70	24	414
Winter Storm	1950	2020	52	0.001	11	0
Extreme Heat	1950	2020	11	0	0	0

Figure 4-1. Distribution of NCDC Meteorological Hazards for Boone County



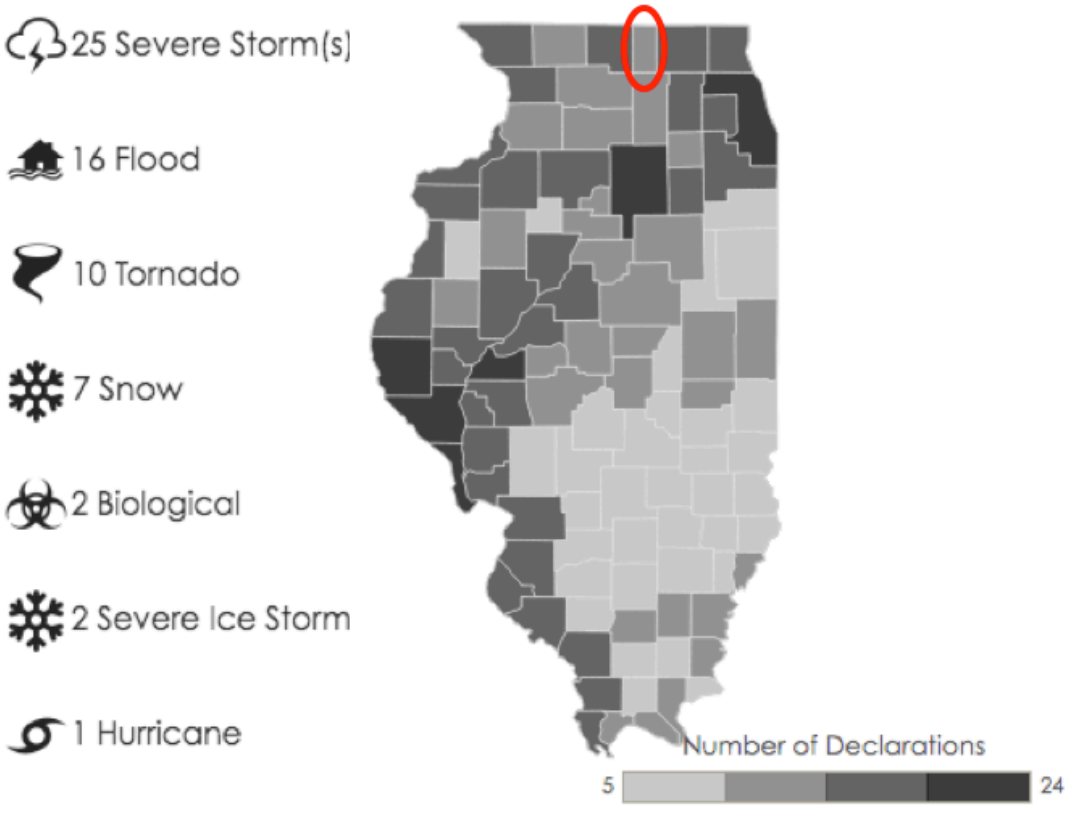
4.1.3 FEMA Disaster Information

Since 1957, FEMA has declared 63 major disasters and emergencies for the State of Illinois. Emergency declarations allow states to access FEMA funds for Public Assistance (PA); disaster declarations allow for even more PA funding, including Individual Assistance (IA) and the Hazard Mitigation Grant Program (HMGP). Boone has received federal aid for 6 declared disasters and emergencies since 1957. Table 4-2 lists shows each disaster declaration in Boone. Figure 4-2 depicts the disasters and emergencies that have been declared for the State of Illinois since 1957.

Table 4-2. Details of FEMA-declared Emergencies and Disasters in Boone

Declaration Number	Date of Declaration	Description
227	4/25/1967	Tornadoes
373	4/26/1973	Severe Storms/Flooding
3068	1/16/1979	Blizzards/Snowstorms
997	7/9/1993	Severe Storms/Flooding
3161	1/17/2001	Winter Snowstorms
3230	7/7/2005	Hurricane Katrina Evacuation
3269	12/19/2006	Snow
3283	3/13/2008	Record Snow and Near Record Snow
1960	3/17/2011	Severe Winter Storm/Snowstorm
3435	3/13/2020	COVID-19
4489	3/26/2020	COVID-19 Pandemic

Figure 4-2. FEMA-declared Emergencies and Disasters in Illinois



4.1.4 Hazard Ranking Methodology

Based on Planning Team input, national datasets, and existing plans, the Boone Planning Team re-ranked the list of hazards from the 2014 MHMP. These hazards ranked the highest based on the Risk Priority Index discussed in Section 4.1.5. While not specifically ranked by the county, the Boone County Health Department ranked disease outbreak/pandemic as a public health hazard and is included in this plan. Disease Outbreak/Pandemic has also come to the forefront of importance with the ongoing COVID-19 Pandemic.

Boone County Hazard List

TORNADOES

HAZARDOUS MATERIALS RELEASE

FLOODING

WINTER STORMS

THUNDERSTORMS

FIRE

EXTREME HEAT AND DROUGHT

DAM/LEVEE FAILURE

EARTHQUAKES

DISEASE OUTBREAK/PANDEMIC

4.1.5 Risk Priority Index

The Risk Priority Index (RPI) quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards. Planning Team members use historical hazard data to determine the probability, combined with knowledge of local conditions to determine the possible severity of a hazard. Tables 4-3 and 4-4 display the criteria the Planning Team used to quantify hazard probability and magnitude.

Table 4-3. Hazard Probability Ranking

Probability	Characteristics
4 – Highly Likely	Event is probable within the next calendar year This event has occurred, on average, once every 1-2 years in the past
3 – Likely	Event is probable within the next 10 years Event has a 10-50% chance of occurring in any given year This event has occurred, on average, once every 3-10 years in the past
2 – Possible	Event is probable within the next 50 years Event has a 2-10% chance of occurring in any given year This event has occurred, on average, once every 10-50 years in the past
1 – Unlikely	Event is probable within the next 200 years Event has a 0.5-2% chance of occurring in any given year This event has occurred, on average, once every 50-200 years in the past

Table 4-4. Hazard Severity Ranking

Magnitude/Severity	Characteristics
8 – Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50% of property is severely damaged
4 – Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least 14 days More than 25% of property is severely damaged
2 – Limited	Injuries and/or illnesses do not result in permanent disability Complete shutdown of critical facilities for more than seven days More than 10% of property is severely damaged
1 – Negligible	Injuries and/or illnesses are treatable with first aid Minor quality of life lost Shutdown of critical facilities and services for 24 hours or less Less than 10% of property is severely damaged

The product of hazard probability and magnitude is the RPI (Risk Priority Index). The Planning Team members ranked specified hazards based on the RPI, with larger numbers corresponding to greater risk. After evaluating the calculated RPI, the Planning Team adjusted the ranking to better suit the County. Table 4-5 identifies the RPI and adjusted ranking for each hazard specified by county representatives. This table averages probability and magnitude/severity rankings by the various representatives to come to a combined ranking. Some participating jurisdictions elected to use the same rankings as the county at large.

Table 4-5. Boone Hazard Priority Index and Ranking

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Tornado	3.25	3.5	11.375	1
Hazardous Materials Release	2	4.25	8.5	2
Flooding	2.75	2.25	6.1875	3
Winter Storms	3.25	1.5	4.875	4
Thunderstorms	3	1.5	4.5	5
Fire	1.75	1.75	3.0625	6
Extreme Heat & Drought	1.75	1.5	2.625	7
Dam or Levee Failure	1	1.75	1.75	8
Earthquakes	0.5	1.25	1.25	9

4.1.6 Jurisdictional Hazard Ranking

Two participating jurisdictions created their own RPIs as hazard susceptibility may differ by jurisdiction. The remaining jurisdictions elected to use the same rankings as the county. Table 4-6 lists the jurisdictions and their respective hazard rankings (Ranking 1 being the highest concern). The individual jurisdictions made these rankings after Meeting 1.

Table 4-6. Hazard Ranking by Jurisdiction

Jurisdiction	Tornado	Severe Storm	Winter Storm	Disease/ Pandemic	Flood	Hazmat	Fire	Dam / Levee Failure	Extreme Heat	Earthquake
Boone County Health	1	2	3	4	5	6	7	8	9	10
Belvidere	1	2	5	-	4	3	6	9	7	8
Capron	1	5	4	-	3	2	6	8	7	9
Poplar Grove	1	5	4	-	3	2	6	8	7	9
Timberlane	1	5	4	-	3	2	6	8	7	9

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

Processes and Sources for Identifying Assets

After meeting one, the Planning Team used their resources to update the list of critical facilities from the 2014 MHMP. Local GIS data was used to verify the locations of all critical facilities. SIU GIS analysts incorporated these updates and corrections to the Hazus-MH data tables prior to performing the risk assessment. The updated Hazus-MH inventory contributed to a Level 2 analysis, which improved the accuracy of the risk assessment. Boone also provided local assessment and parcel data to estimate the actual number of buildings susceptible to damage for the risk assessment.

Essential Facilities List

Table 4-7 identifies the number of essential facilities identified in Boone. Essential facilities are a subset of critical facilities. Appendix E include a comprehensive list of the essential facilities in Boone and Appendix F displays a large format map of the locations of the critical facilities within the county. The critical facilities in distribution and number remain unchanged from the 2014 plan.

Table 4-7. Boone Essential Facilities

Facility	Number of Facilities
Emergency Operations Center	1
Fire Station	7
Government	2
Medical Care Facility	8
Police Station	2
School	21

Facility Replacement Costs

Table 4-8 identifies facility replacement costs and total building exposure. Boone County Assessor's Office provided parcel-specific local assessment data for updates to replacement costs. Tax-exempt properties

such as government buildings, schools, religious and non-profit structures were excluded from this study because they do not have an assessed value. Table 4-8 also includes the estimated number of buildings within each occupancy class.

Table 4-8. Boone County's Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure
Residential	15200	$990,555,653
Commercial	565	$45,546,928
Industrial	170	$198,071,186
Education	1407	$64,981,608
Total:	17342	$1,299,155,374

Future Development

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

Boone County is vulnerable to a variety of natural hazards, therefore the county government—in partnership with state government—must make a commitment to hazard mitigation. Boone County is committed to ensuring that county elected, and appointed officials become informed leaders regarding community hazards so that they are better prepared to set and direct policies for emergency management in mitigation, preparedness, response, and recovery.

4.3 Risk Analysis

4.3.1 GIS and Hazus-MH

The third step in the risk assessment is the risk analysis, which quantifies the risk to the population, infrastructure, and economy of the community. The hazards were quantified using GIS analyses and Hazus-MH where possible. This process reflects a Level 2 Hazus-MH analysis. A level 2 Hazus-MH analysis involves substituting selected Hazus-MH default data with local data and improving the accuracy of model predictions.

Updates to the default Hazus-MH data include:

- Updating the Hazus-MH defaults, critical facilities, and essential facilities based on the most recent available data sources.
- Reviewing, revising, and verifying locations of critical and essential point facilities with local input.
- Applying the essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) to the Hazus-MH model data.
- Updating Hazus-MH reports of essential facility losses.

The following assumptions were made during analysis:

- Hazus-MH aggregate data was used to model the building exposure for all earthquake analyses. It is assumed that the aggregate data is an accurate representation of Boone.

- The analyses were restricted to the county boundaries. Events that occur near the county boundaries do not contain damage assessments from adjacent counties.
- For each tax-assessment parcel, it is assumed there is only one building that bares all the associated values (both structure and content).
- For each parcel, it is assumed that all structures are wood-framed, one-story, slab-on-grade structures, unless otherwise stated in assessment records. These assumptions are based on sensitivity analyses of Hazus and regional knowledge.

Depending upon the analysis options and the quality of data the user inputs, Hazus-MH generates a combination of site-specific and aggregated loss estimates. Hazus-MH is not intended as a substitute for detailed engineering studies; it is intended to serve as a planning aid for communities interested in assessing their risk to flood-, earthquake-, and hurricane-related hazards. This plan does not fully document the processes and procedures completed in its development, but this documentation is available upon request. Table 4-9 indicates the analysis type (i.e. GIS, Hazus-MH, or historical records) used for each hazard assessment.

Table 4-9. Risk Assessment Tool Used for Each Hazard

Hazard	Risk Assessment Tool(s)
Tornadoes	GIS-based
Earthquakes	Hazus-MH
Severe Thunderstorm	Historical Records
Winter Storms	Historical Records
Flooding	Hazus-MH
Hazmat Release	GIS-based
Levee / Dam Failure	Historical Records
Drought / Extreme Heat	Historical Records

4.3.2 Tornado Hazard

Hazard Definition

Tornadoes are violently rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently rotating column of air can reach the ground quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado.

Tornadoes are a significant risk to Illinois and its citizens. Tornadoes most frequently occur in the afternoon but can occur at any time on any day. The unpredictability of tornadoes makes them one of most dangerous hazards in Illinois. Tornado winds are violently destructive in developed and populated areas. Current estimates place maximum wind velocity at greater than 300 miles per hour. A wind velocity of 200 miles per hour results in a pressure of 102.4 pounds per square foot—a load that exceeds the tolerance limits of most buildings. Thus, it is easy to understand why tornadoes can devastate the communities they hit.

Tornadoes are classified according to the Enhanced Fujita tornado intensity scale. The Enhanced Fujita scale ranges from intensity EF0, with effective wind speeds of 40 to 70 miles per hour, to EF5 tornadoes,

with effective wind speeds of over 260 miles per hour. Table 4-TOR1 outlines the Enhanced Fujita intensity scale.

Table 4-TOR1. Enhanced Fujita Tornado Rating

Enhanced Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
0 Gale	40-72 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, signboards damaged, shallow-rooted trees blown over.
1 Moderate	73-112 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
2 Significant	113-157 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
3 Severe	158-206 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
4 Devastating	207-260 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
5 Incredible	261-318 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Previous Occurrences of Tornadoes

The NCDC database reported 11 tornadoes in Boone County since 1950. The most recent recorded event occurred on 5/17/2017, when a brief EF1 tornado was reported near Belvidere Airport.

Table 4-12 identifies NCDC-recorded tornadoes that caused damage, death, or injury in Boone County. Additional details of individual hazard events are on the NCDC website.

Table 4-TOR2. NCDC-Recorded Tornadoes That Caused Damage, Death, or Injury in Boone

Location or County*	Date	Scale	Deaths	Injuries	Property Damage
Boone County	9/26/1959	F1	0	0	25.00K
Boone County	4/21/1967	F4	24	410	250.00K
Boone County	6/22/1984	F1	0	0	25.00K
Boone County	5/15/1986	F0	0	0	2.50K
Boone County	4/29/1991	F0	0	0	25.00K
Boone County	1/7/2008	EF3	0	4	2.000M
Boone County	6/12/2008	EF1	0	0	25.00K
Boone County	4/9/2015	EF1	0	0	75.00K
Boone County	4/9/2015	EF0	0	0	20.00K
Boone County	4/9/2015	EF1	0	0	150.00K
Boone County	5/17/2017	EF1	0	0	100.00K

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

Geographic Location for Tornado Hazard

The entire county has the same risk of tornado occurrence. Tornadoes can occur at any location within the county.

Hazard Extent for Tornado Hazard

Historical tornadoes generally moved from southwest to northeast across the county. The extent of the hazard varies in terms of the size of the tornado, its path, and its wind speed.

Risk Identification for Tornado Hazard

Based on historical information, the probability of future tornadoes in Boone County is likely. The county should expect tornadoes with varying magnitudes to occur in the future. Tornadoes ranked as the number one hazard according to the RPI.

Risk Priority Index

Probability	x	Magnitude	=	RPI
3.25	x	3.5	=	11.375

Vulnerability Analysis for Tornado Hazard

Tornadoes can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Boone.

Critical Facilities

All critical facilities are vulnerable to tornadoes. Critical facilities are susceptible to many of the same impacts as any other building within the jurisdiction. These impacts vary based on the magnitude of the tornado but can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can all expect the same impacts, similar to those discussed for critical facilities. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of building function (e.g., damaged home will no longer be habitable, causing residents to seek shelter).

Infrastructure

The types of infrastructure that could be impacted during a tornado include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize

that any number of these structures could become damaged during a tornado. The impacts to these structures 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 rail lines. Bridges could fail or become impassable, causing risk to motorists.

GIS-based Tornado Analysis

One tornado scenario was conducted for Boone through the Cities of Belvidere and Garden Prairie. The following analysis quantifies the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure damaged.

GIS-overlay modeling was used to determine the potential impacts of an EF4 tornado. The analysis used a hypothetical path based upon the F4 tornado event that runs for 14 miles through the Cities of Belvidere and Garden. Table 4-TOR3 depicts tornado damage curves and path widths utilized for the modeled scenario. The damage curve is based on conceptual wind speeds, path winds, and path lengths from the Enhanced-Fujita Scale guidelines.

Table 4-TOR3. Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
5	2,400	100%
4	1,800	100%
3	1,200	80%
2	600	50%
1	300	10%
0	150	0%

Degrees of damage depend on proximity to the path centerline within a given tornado path. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. To model the EF4 tornado, a hypothetical tornado path was used in GIS with buffers added (damage zones) around the tornado path. Table 4-TOR4 and Figure 4-TOR1 illustrate the zone analysis. Figure 4-TOR2 depicts the selected hypothetical tornado path.

Table 4-TOR4. EF4 Tornado Zones and Damage Curves

Zone	Buffer (feet)	Damage Curve
1	0-150	100%
2	150-300	80%
3	300-600	50%
4	600-900	10%

Figure 4-TOR1. Tornado Analysis (Damage Curves) Using GIS Buffers

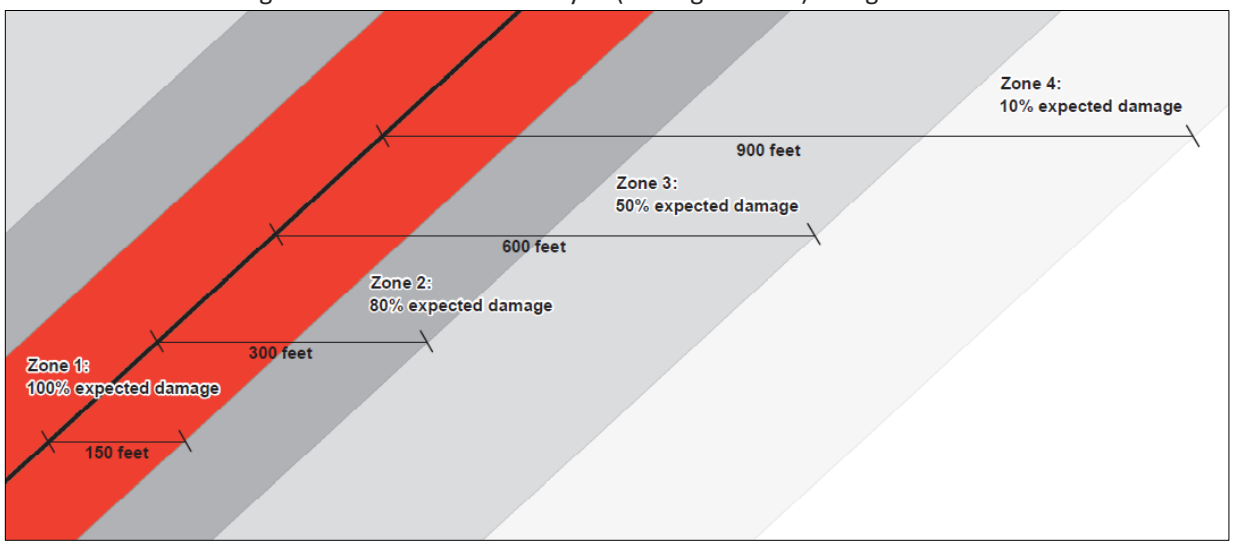
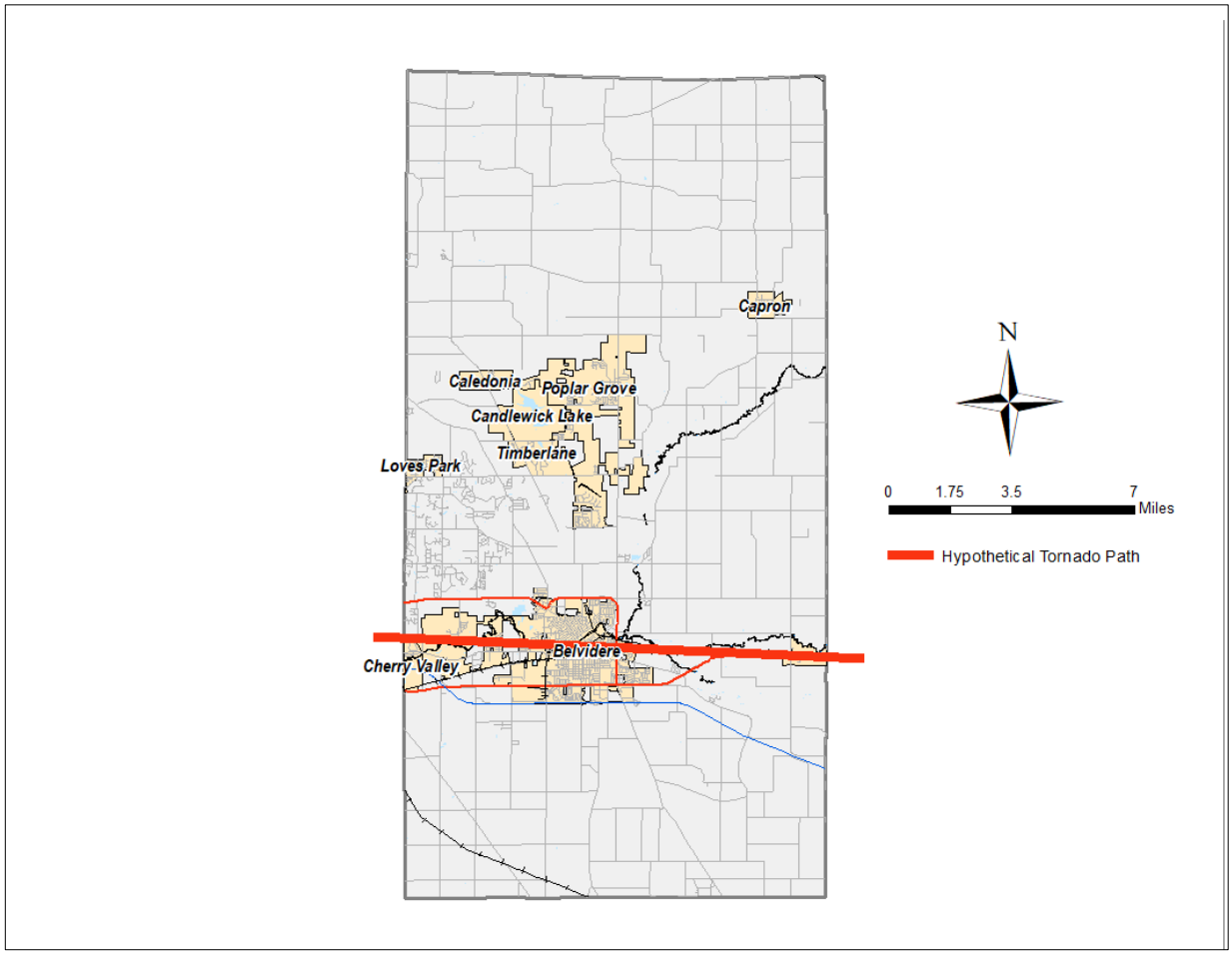


Figure 4-TOR2. Modeled Hypothetical EF4 Tornado Track for Boone County



Modeled Impacts of the EF4 Tornado

The GIS analysis estimates that the modeled EF4 tornado would damage 3,604 buildings. The estimated building losses are over $197,401,053. The building losses are an estimate of building replacement costs multiplied by the damage percent. Table 4-TOR5 and Figures 4-10 and 4-11 show the results of the EF4 tornado analysis.

Table 4-TOR5. Estimated Building Loss by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$36,099,879	$53,763,761	$61,402,284	$17,338,671
Commercial	$8,618,376	$8,875,267	$8,325,186	$1,970,050
Industrial	$0	$0	$0	$55,863
Educational	$301,004	$248,163	$432,550	$173,998
Total:	$45,019,259	$62,887,192	$70,160,020	$19,538,583

Figure 4-TOR3. Building Inventory Affected by the EF4 Tornadoes Modeled for Belvidere

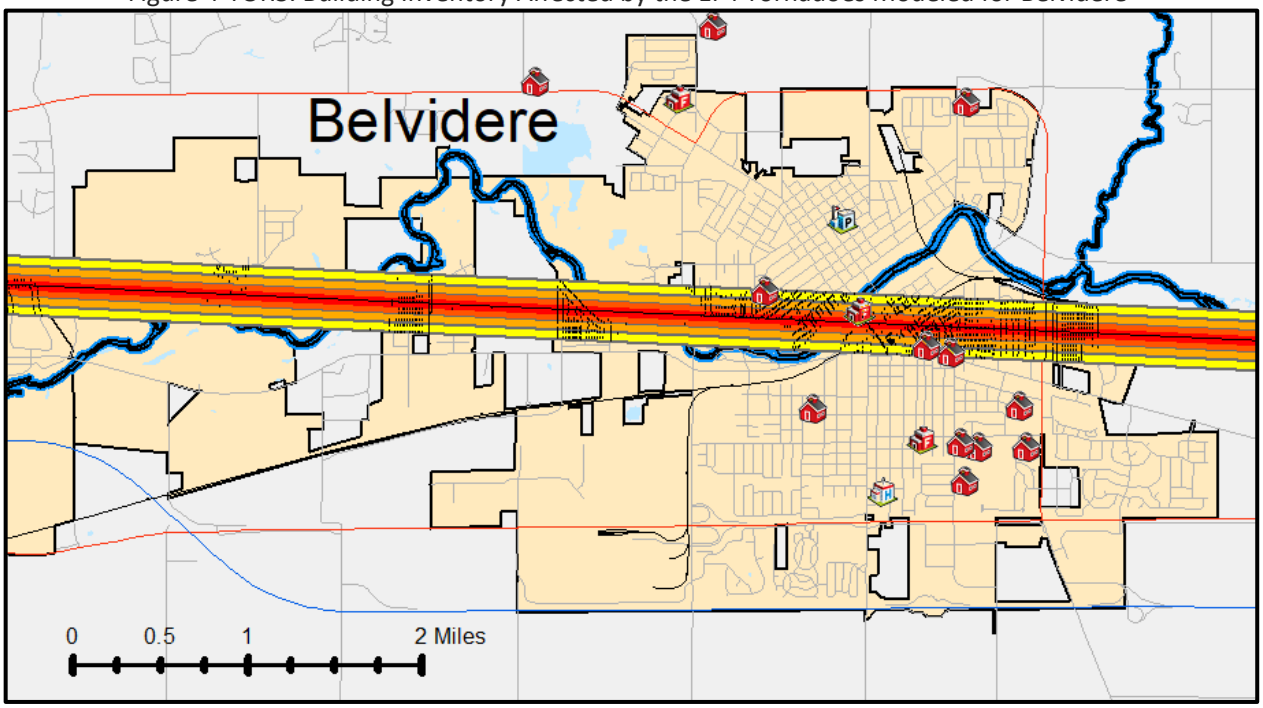
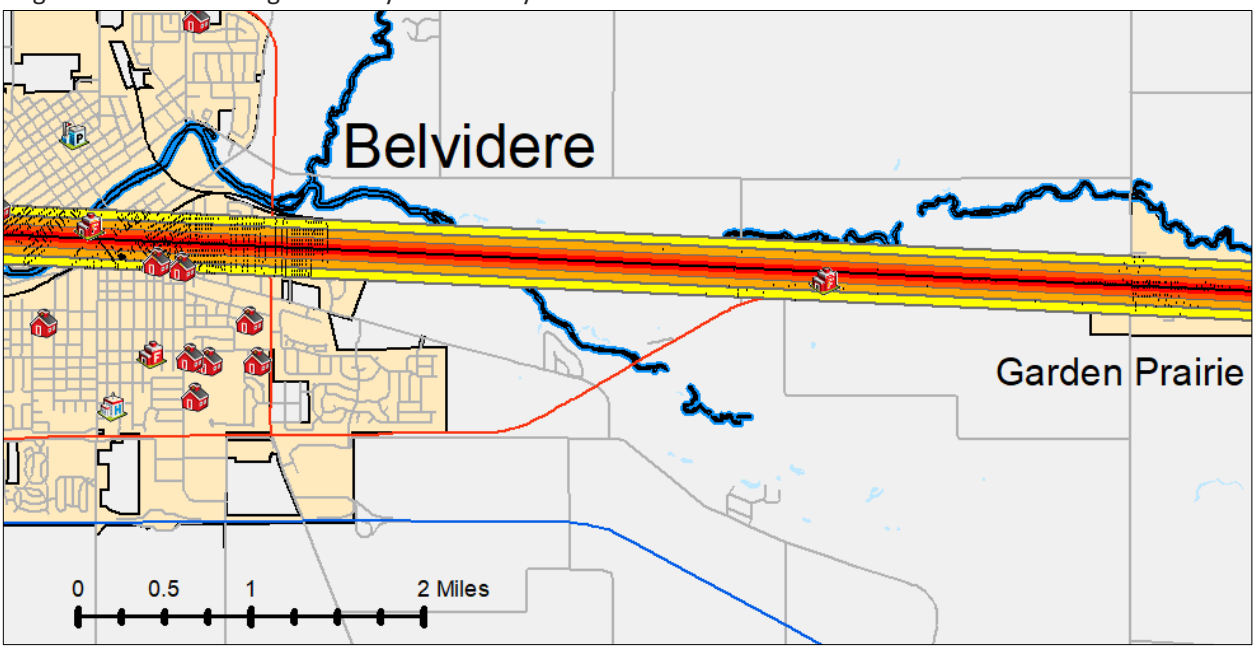


Figure 4-TOR4. Building Inventory Affected by the EF4 Tornadoes Modeled for Belvidere and Garden Prairie



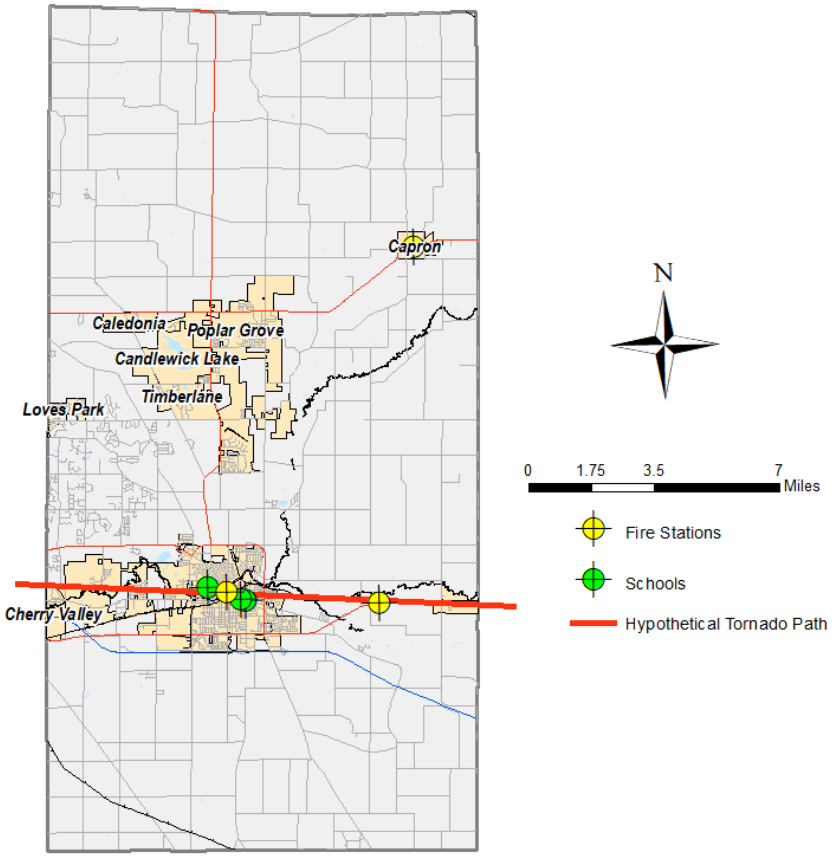
Essential Facilities Damage

There are five essential facility located within 900 feet of the EF4 tornado path. The model predicts that three schools and two fire stations would experience damage across Boone County. The affected facilities are identified in Table 4-TOR6, and their geographic locations are shown in Figure 4-TOR5.

Table 4-TOR6. Essential Facilities Affected by the EF4 Tornadoes Modeled for Boone

Essential Facility	Facility Name
Schools	St. James School
	Perry Elementary School
	Regional Learning Center Star Boone
Fire Departments	Belvidere Fire Department Station 1
	Boone County Rural Fire Protection

Figure 4-TOR5. Essential Facilities Affected by the EF4 Tornadoes Modeled for Boone



Vulnerability to Future Assets/Infrastructure for Tornado Hazard

The entire population and all buildings are at risk because tornadoes can occur anywhere within the state, at any time. Furthermore, any future development in terms of new construction within the county is at risk. Table 4-8 includes the building exposure for Boone. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Boone and Appendix F displays a large format map of the locations of all critical facilities within the county.

Suggestions for Community Development Trends

Preparing for severe storms will be enhanced if local officials sponsor a wide range of programs and initiative to address severe storm preparedness. It is suggested that the county should build new structures with construction resistant to high wind shear and harden existing structures to lessen the potential impacts of severe weather. Additional warning sirens can warn the community of approaching storms to ensure the safety of Boone County residents and minimizing property damage.

4.3.3 Hazardous Material Storage and Transportation Hazard

Hazard Definition

Illinois has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances across county and state lines every day. Transporting chemicals and substances along interstate routes is commonplace in Illinois. The rural areas of Illinois have

considerable agricultural commerce, meaning transportation of fertilizers, herbicides, and pesticides is common on rural roads. These factors increase the chance of hazardous material releases and spills throughout the state of Illinois.

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 can potentially 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/law enforcement, search and rescue, and hazardous materials units.

Previous Occurrences of Hazardous Materials Storage and Transportation Hazard

An ammonia leak occurred at Dean's Foods in May 2019. Emergency crews across multiple agencies responded to the scene. The event underscored the need to address the potential of hazardous material spills or leaks within the county.

Geographic Location of Hazardous Materials Storage and Transportation Hazard

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

Hazard Extent of Hazardous Materials Storage and Transportation Hazard

The extent of the hazardous material hazard varies both in terms of the quantity of material being transported as well as the specific content of the container.

Risk Identification of Hazardous Materials Storage and Transportation Hazard

Based on input from the Planning Team, future occurrence of hazardous materials accident in Boone is likely. According to the Risk Priority Index (RPI) and County input, hazardous materials and transportation is ranked as the number two hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
2	x	4.25	=	8.5

Vulnerability Analysis for Hazardous Materials Storage and Transportation Hazard

The entire county is vulnerable to a hazardous material release and can expect impacts within the affected area. The main concern during a release or spill is the affected population. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Boone.

Critical Facilities

All critical facilities and communities within the county are at risk. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include structural failure due to fire or explosion and loss of function of the facility (e.g., a damaged police station can no longer serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure due to fire or explosion or debris, and loss of function of the building (e.g., a person cannot inhabit a contaminated home, causing residents to seek shelter).

Infrastructure

During a hazardous material release, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that a hazardous materials release could damage any number of these items. The impacts to these items include: impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); and railway failure from impassable railways. Bridges could become impassable causing risk to motorists.

ALOHA Hazardous Chemical Release Analysis

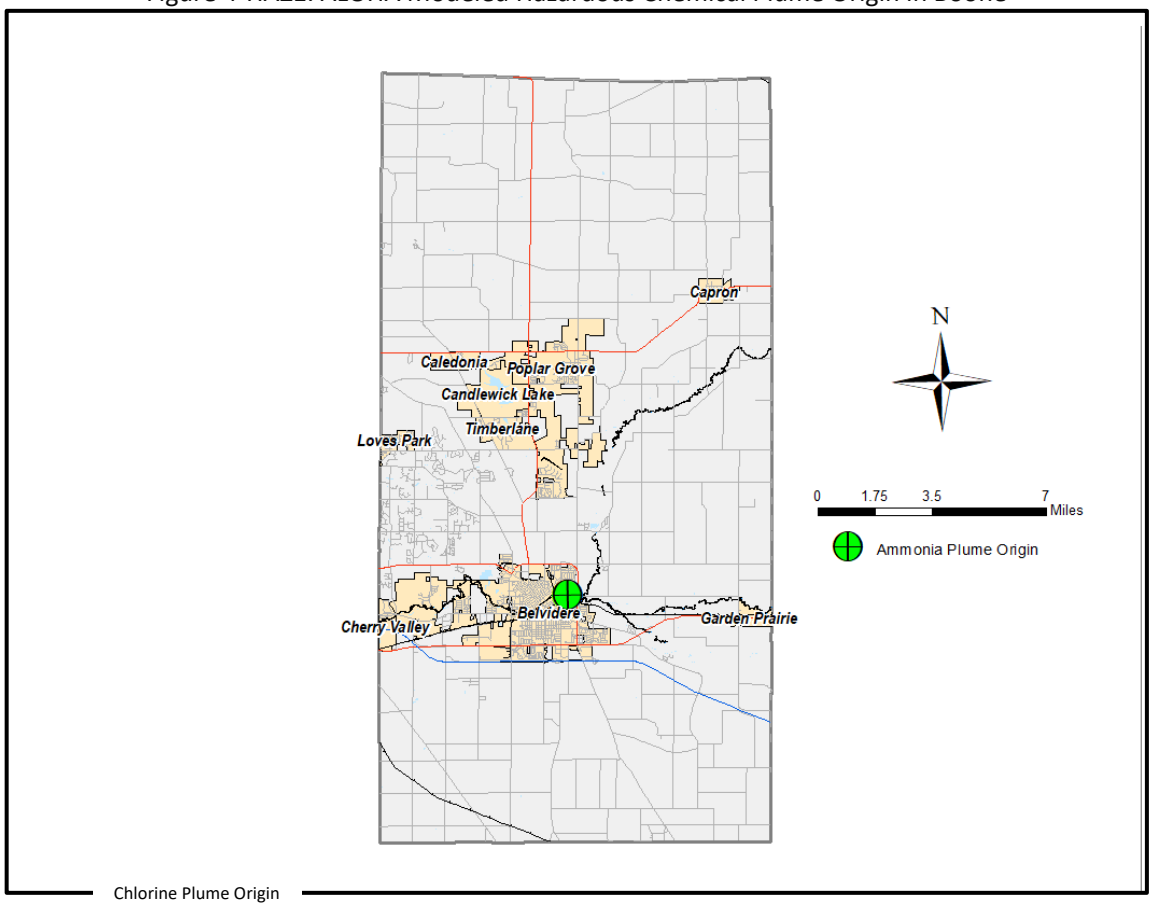
The U.S. Environmental Protection Agency's ALOHA (Areal Locations of Hazardous Atmospheres) model was used to assess the impacted area

ALOHA is a computer program designed for response to chemical accidents, as well as emergency planning and training. Ammonia, chlorine, and propane are common chemicals used in industrial operations and are found in either liquid or gas form. Rail and truck tankers haul ammonia, chlorine, and propane to and from facilities.

Ammonia is a clear colorless gas with a strong odor. Ammonia is shipped as a liquid under its own vapor pressure. The density of liquid ammonia is 6 lb/gal. Contact with the unconfined liquid can cause frostbite. Gas is generally regarded as nonflammable but does burn within certain vapor concentration limits and with strong ignition. Fire hazard increases in the presence of oil or other combustible materials. Although gas is lighter than air, vapors from a leak initially hug the ground. Prolonged exposure of containers to fire or heat may cause violent rupturing and rocketing. Long-term inhalation of low concentrations of the vapors or short-term inhalation of high concentrations have adverse health effects. Used as a fertilizer, as a refrigerant, and in the manufacture of other chemicals (NOAA Reactivity, 2007).

For an ammonia leak scenario, SIU assumed average atmospheric and climatic conditions with a breeze to the west. Figures 4-HAZ1 depicts the plume origin of the modeled hazardous chemical release in Boone County. The ALOHA atmospheric modeling parameters for the ammonia release, depicted in Figure 4-HAZ2, were based upon a westerly speed of 5 miles per hour. The temperature was 68°F with 75% humidity and a cloud cover of five-tenths skies. SIU used average weather conditions for the month of June reported from NOAA for wind direction, wind speed, and temperature to simulate summer conditions.

Figure 4-HAZ1. ALOHA Modeled Hazardous Chemical Plume Origin in Boone



The source of the chemical spill is a horizontal, cylindrical-shaped tank. The diameter of the tank was set to 8 feet and the length set to 33 feet (12,408 gallons). At the time of its release, it was estimated that the tank was 98% full. The ammonia in this tank is in its liquid state. This release was based on a leak from a 2.5-inch-diameter hole, 12 inches above the bottom of the tank. According to these ALOHA parameters, this scenario would release approximately 58,504 pounds of material per minute. Figure 4-HAZ2 shows the plume modeling parameters in greater detail.

Figure 4-HAZ2. ALOHA Modeling Parameters for Ammonia Release

```
CHEMICAL DATA:
  Chemical Name: AMMONIA
  CAS Number: 7664-41-7                  Molecular Weight: 17.03 g/mol
  AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100 ppm
  IDLH: 300 ppm      LEL: 150000 ppm     UEL: 280000 ppm
  Ambient Boiling Point: -29.2° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 5 miles/hour from E at 10 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 68° F                 Stability Class: B
  No Inversion Height                    Relative Humidity: 75%

SOURCE STRENGTH:
  Leak from hole in horizontal cylindrical tank
  Flammable chemical escaping from tank (not burning)
  Tank Diameter: 8 feet                  Tank Length: 33 feet
  Tank Volume: 12,408 gallons
  Tank contains liquid                   Internal Temperature: 68° F
  Chemical Mass in Tank: 30.9 tons       Tank is 98% full
  Circular Opening Diameter: 2.5 inches
  Opening is 12 inches from tank bottom
  Note: RAILCAR predicts a stationary cloud or 'mist pool' will form.
  Model Run: traditional ALOHA tank
  Release Duration: 14 minutes
  Max Average Sustained Release Rate: 7,740 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 58,504 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).
```

Using the parameters in Figure 4-HAZ2, approximately 7,740 pounds of material would be released per minute. As the substance moves away from the source, the level of substance concentration decreases.

Acute Exposure Guideline Levels (AEGL) are intended to describe the risk to humans resulting from once-in-a-lifetime, or rare exposure to airborne chemical (U.S. EPA AEGL Program). The National Advisory Committee for the Development of Acute Exposure Guideline Levels for Hazardous Substances (AEGL Committee) is involved in developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills, or other catastrophic exposures. AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. The three AEGLs have been defined as follows:

> AEGL-1: the airborne concentration, expressed as parts per million or milligrams per cubic meter (ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
>
> AEGL-2: the airborne concentration (expressed as ppm or mg/m3) of a substance above which 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.
>
> AEGL-3: the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Airborne concentrations below the AEGL-1 represent exposure levels that can produce mild and progressively increasing but transient and non-disabling odor, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentrations above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each

corresponding AEGL. Although the AEGL values represent threshold levels for the general public, including susceptible subpopulations, such as infants, children, the elderly, persons with asthma, and those with other illnesses, it is recognized that individuals, subject to unique or idiosyncratic responses, could experience the effects described at concentrations below the corresponding AEGL.

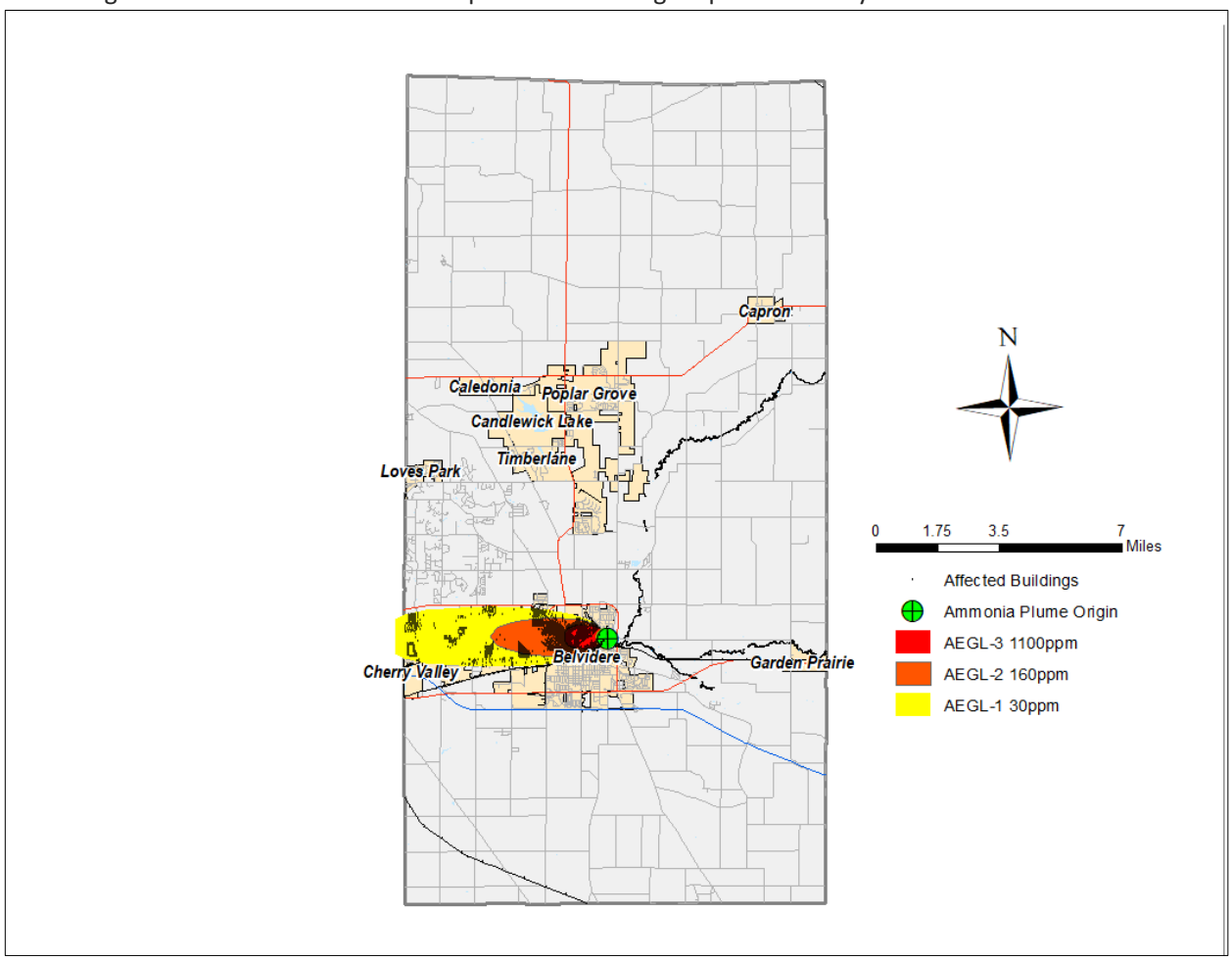
Results for Ammonia Release

An estimate of property exposed to the ammonia spill was calculated by using the building inventory and intersecting these data with each of the AEGL levels (AEGL 3: ≥ 1100.0 ppm, AEGL 2: ≥ 160.0 ppm and AEGL 1: ≥ 30.0 ppm). The Boone County assessment and parcel data was utilized for this analysis. There are 3,070 buildings within the chlorine plume. It should be noted that the results should be interpreted as potential degrees of loss rather than exact number of buildings damaged to the release. Table 4-HAZ1 lists the total amount of building exposure to each AEGL zone. Figure 4-HAZ3 depicts the ammonia spill footprint and location of the buildings exposed. The GIS overlay analysis estimates that the full replacement cost of the buildings exposed to the ammonia plume is approximately $464,671,708.

Table 4-HAZ1. Estimated Building Exposure as a Result of the Ammonia Release

	Building Exposure			**Number of Buildings**		
Occupancy	**AEGL 1**	**AEGL 2**	**AEGL 3**	**AEGL 1**	**AEGL 2**	**AEGL3**
Residential	$50,459,770	$137,951,199	$141,780,212	648	1321	745
Commercial	$7,073,652	$21,578,404	$25,278,792	80	78	91
Industrial	$12,307,158	$805,482	$54,784,647	34	10	48
Agricultural	$0	$1,728	$12,650,664	0	2	13
Total:	$69,840,580	$160,336,813	$234,494,315	762	1411	897

Figure 4-HAZ3. ALOHA Plume Footprint and Buildings Exposed to Anhydrous Ammonia Release



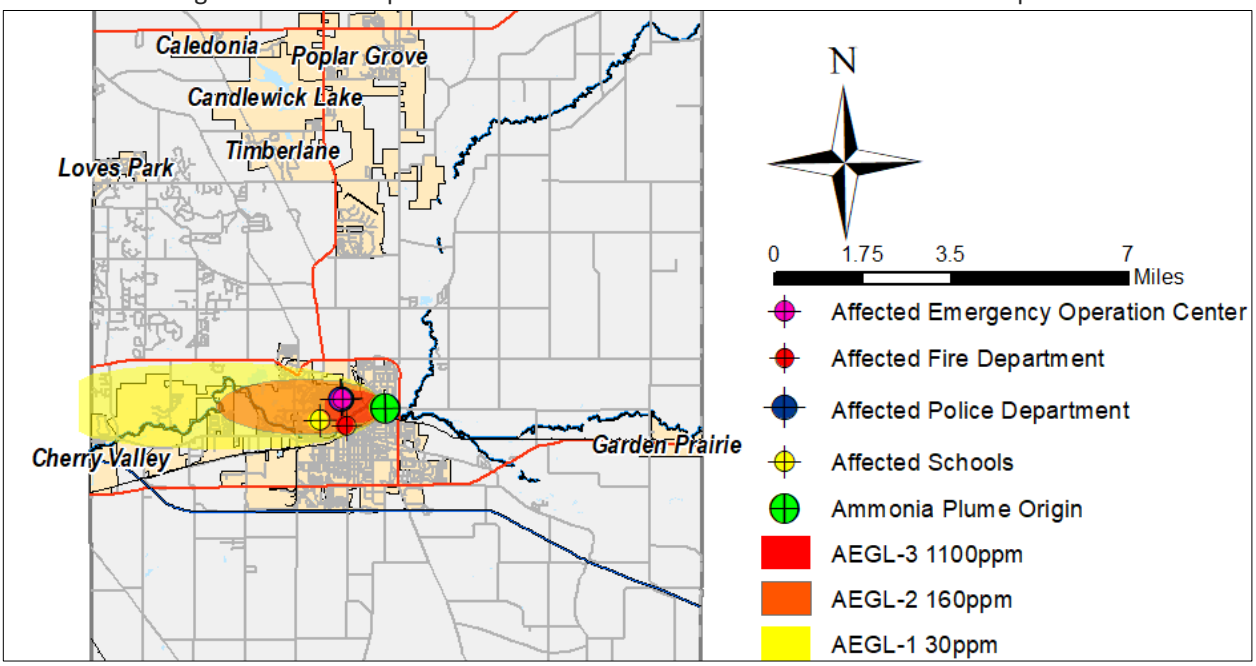
Essential Facilities Damage

There are five essential facilities within the limits of the ammonia scenario. Table 4-HAZ2 and Figure 4-HAZ4 identifies the affected facilities.

Table 4-HAZ2. Essential Facilities within the Ammonia Plume Footprint

Essential Facility	Facility Name
Fire Station	Belvidere Fire Department Station 1
EOC Facilities	Belvidere Emergency Management
Police Departments	Belvidere Police Department
	Belvidere Sheriff Department
Schools	Perry Elementary School

Figure 4-HAZ4. Map of Essential Facilities within the Ammonia Plume Footprint



Vulnerability to Future Assets/Infrastructure for Hazardous Materials Storage and Transportation Hazard

Boone is not expected to see substantial future economic expansion in the next few years. However, economic expansion areas are particularly vulnerable to chemical releases because of transportation of hazardous materials.

Hazardous material hazard events may occur anywhere within the county, future development is impacted. The major transportation routes and the industries located in Boone pose a threat of dangerous chemicals and hazardous materials release.

4.3.4 Flood Hazard

Hazard Definition for Flooding

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the magnitude and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods are classified as one of two types in this plan: upstream floods or downstream floods. Both types of floods are common in Illinois.

Upstream floods, also called flash floods, 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; 18 inches might carry off a car. Generally, upstream floods cause severe damage over relatively localized areas. Urban flooding is a type of upstream

flood. Urban flooding involves the overflow of storm drain systems and can result from inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Illinois, but they are most common in the spring and summer months.

Downstream floods, sometimes called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream 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 downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage. Riverine flooding on the large rivers of Illinois generally occurs during either the spring or summer.

Previous Occurrences of Flooding

The NCDC database reported 27 flood events in Boone County since 1950. The most significant flood event occurred on August 17th, 2007, when four to six inches of rain quickly fell over southern Boone County, resulting multiple flooded roads and basements. Table 4-F1 identifies NCDC-recorded flooding events that caused damage, death, or injury in Boone.

Table 4-F1. NCDC-recorded Flooding Events that caused Death, Damage (over $100,000) or Injury in Boone

Location or County*	Date	Deaths	Injuries	Property Damage
Belvidere	08/07/2007	0	0	$100,000
Boone County	06/28/2017	0	0	$100,000
Total:		**0**	**0**	**$200,000**

*NCDC 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.

There are several structures in Boone County that have experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is ≥ 25% of the market value of the structure at the time of each flood loss.

The Federal Emergency Management Agency was contacted to determine the location of repetitive loss structures in Boone. Ince the data are forthcoming, Table 4-F2 will describe the repetitive loss structures for each jurisdiction.

Table 4-F2. Repetitive Loss Structures for each Jurisdiction in Boone

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Payments
BOONE COUNTY					

Geographic Location of Flooding

Most riverine flooding in Illinois occurs during either the spring or summer and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Flash flooding of low-lying areas in Illinois can

occur during any time of the year but tends to be less frequent and more localized between mid-summer and early winter.

NOAA's Advanced Hydrologic Prediction Service provides information from stream gauges at points along various rivers across the United States. Boone County has one stream gage on the Kishwaukee River at Belvidere, IL (05438500).

Hazard Extent for Flooding

All floodplains are susceptible to flooding. The floodplain of concern is for the 100-year flood event which is defined as areas that have a 1% chance of flooding in any given year. Of course, specifics of any flooding event depends on various local factors including, but not limited to, impervious surfaces, amount of precipitation, river-training structures, etc.

Vulnerability Analysis for Flooding

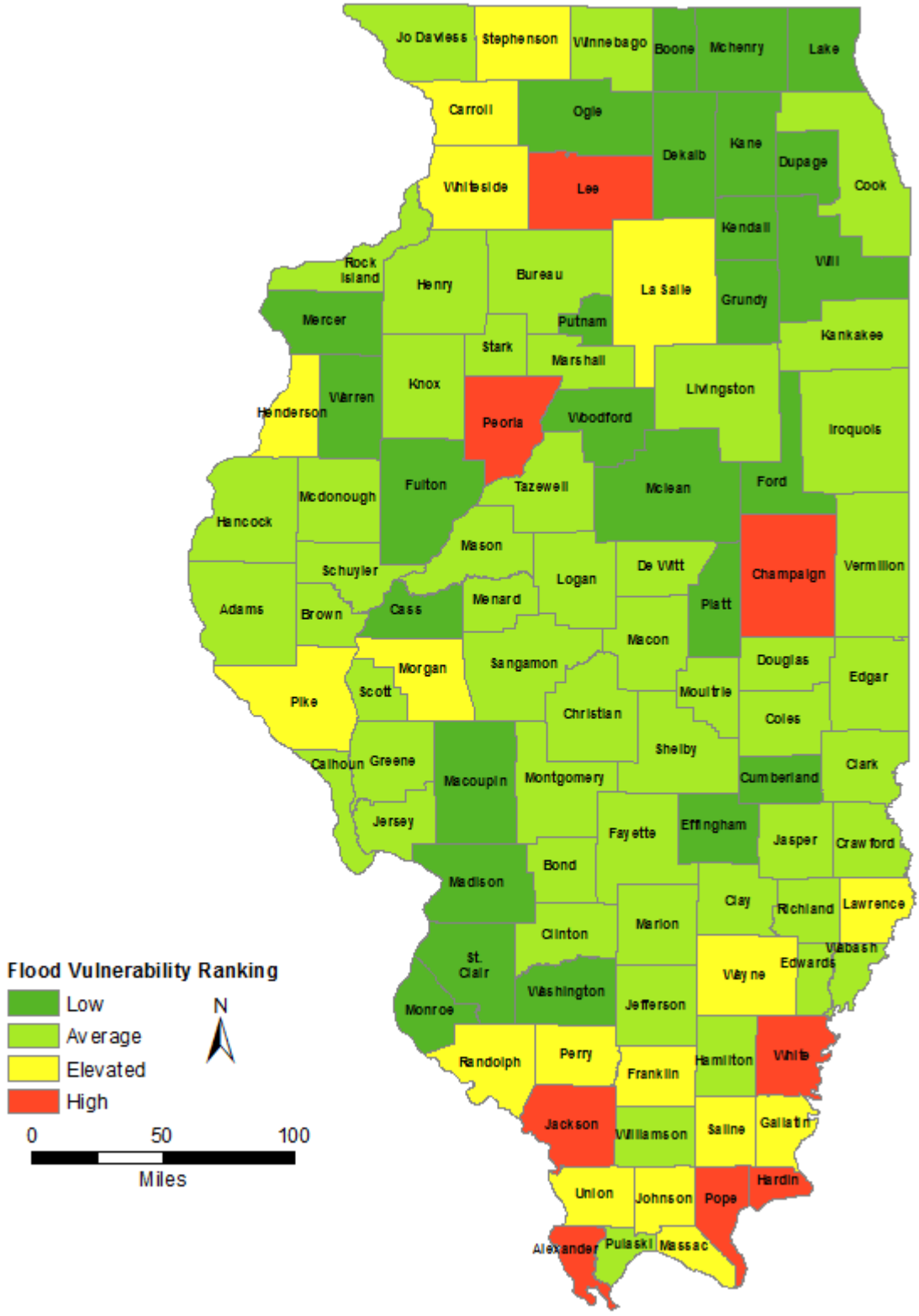
The 2018 Illinois Hazard Mitigation Plan analyzed a variety potential natural hazards including vulnerability to flooding. A Flood Vulnerability Index (FVI) was calculated for all counties and jurisdictions in Illinois. FVI combines Hazus-based estimates of flood exposure and loss with the widely utilized Social Vulnerability Index (SoVI). The highest vulnerability scores and vulnerability ratings were generally in rural counties and communities located along Illinois's large rivers (i.e., Mississippi, Green, Illinois, Kaskaskia, Rock and Ohio Rivers). Figure 4-F1 displays the Flood Vulnerability Ratings for the 102 Counties in Illinois. The vulnerability ratings are categorical representations (low, average, elevated, or high) of the flood vulnerability index. Boone County has an Low Flood Vulnerability Rating and ranks 96 out of the 102 Counties in Illinois in terms of loss estimation according to Hazus-MH for floods.

Table 4-F3 lists the jurisdictional Flood Vulnerability Ratings for Boone County. The jurisdictions all have a low Flood Vulnerability Rating. Cherry Valley ranks 685th in the State of Illinois.

Table 4-F3. Jurisdictional Flood Vulnerability Ranking for Boone

Jurisdiction	State Ranking	Flood Vulnerability Rating
Belvidere	763	Low
Cherry Valley	685	Low
Loves Park	702	Low
Capron	772	Low
Poplar Grove	770	Low

Figure 4-F1. County Flood Vulnerability Rating for Illinois



All floodplains are susceptible to flooding in Boone; therefore, the population and all buildings located within the floodplain are vulnerable to flooding. To accommodate this risk, this plan considers all buildings located within 100-year flood plain as vulnerable.

Risk Identification for Flood Hazard

Based on historical information and the Flood Vulnerability Rating, future occurrence of flooding in Boone is likely. According to the Risk Priority Index (RPI) and County input, flooding is ranked as the number three hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
2.75	x	2.25	=	6.1875

Critical Facilities

All critical facilities within the floodplain are vulnerable to floods. An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., a damaged police station cannot serve the community). Appendix E include a list of the essential facilities in Boone and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

All buildings within the floodplain are vulnerable to floods. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., damaged home will no longer be habitable, causing residents to seek shelter). This plan considers all buildings located within 100-year flood plain as vulnerable.

Infrastructure

The types of infrastructure potentially impacted by a flood include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available for this plan, it is important to emphasize that a flood could damage any number of these items. 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); or railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

ArcGIS-MH Flood Analysis

GIS-based analysis was utilized to overlay the area affected by flood with a 100-year return period with the County's detailed building inventory database created from assessor and parcel data. Buildings within the flood boundary were considered affected and their replacement costs were totaled by occupancy classes.

According to this analysis, there are 363 buildings located in the Boone 100-year floodplain. The replacement value exposed to the 100-year flood is $64.5 million. It should be noted that the results should be interpreted as value of buildings affected by the flood rather than the total damage that would be sustained due to flooding. Not all buildings will be affected equally. Figure 4-F2 depicts the building inventory within the 100-year floodplain and Table 4-F4 shows the loss estimates by occupancy class.

Figure 4-F2. Building Inventory Located within the 100-year Floodplain in Boone County

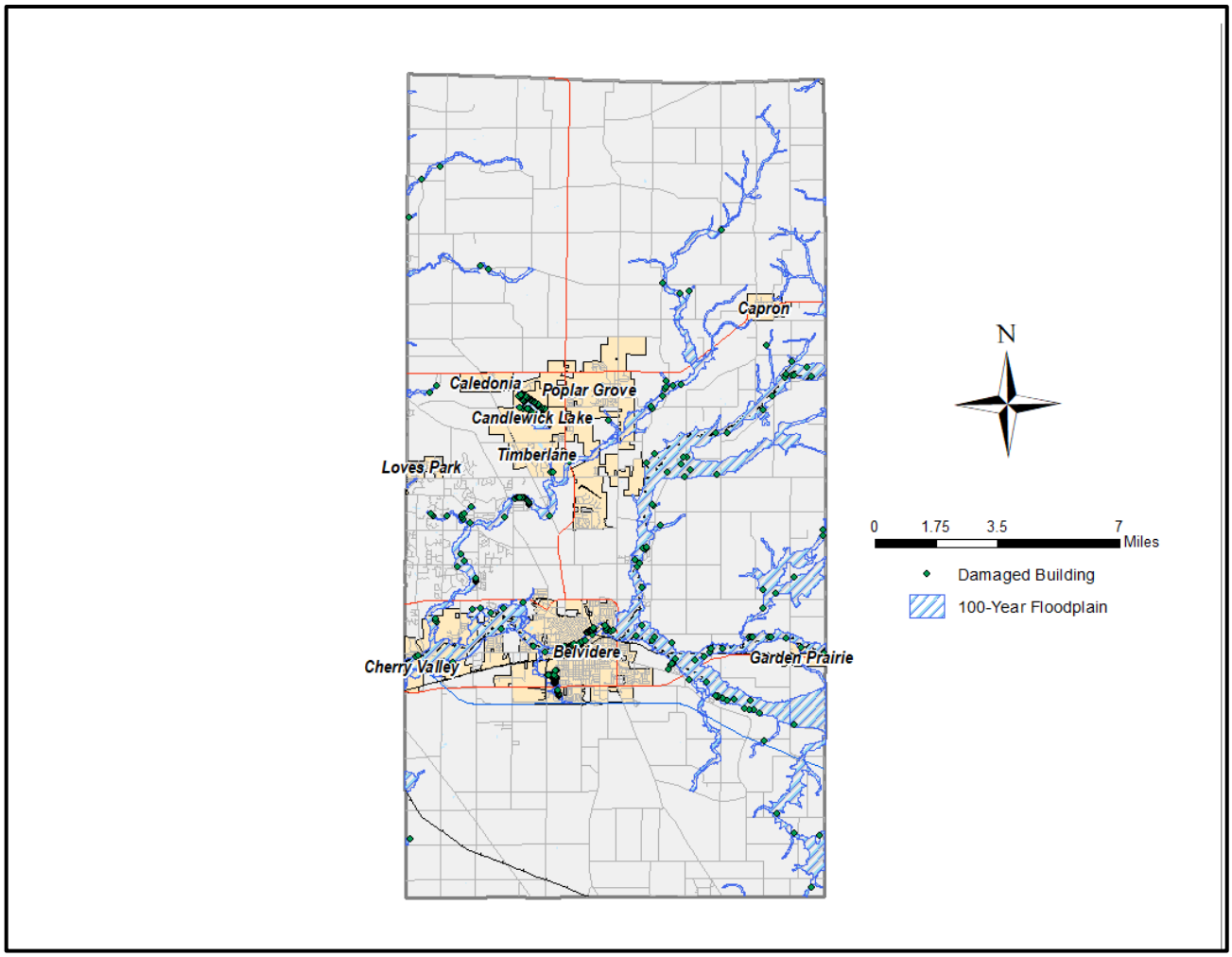


Table 4-F4. Estimated Flood Losses within the 100-year Floodplain

Occupancy Class	Number of Structures	Estimated Building Related Losses
Residential	282	$46,970,357
Commercial	16	$3,927,608
Industrial	3	$3,749,490
Agricultural	62	$9,843,892
Religious	0	$0
Government	0	$0
Education	0	$0
Total:	363	$64,491,347

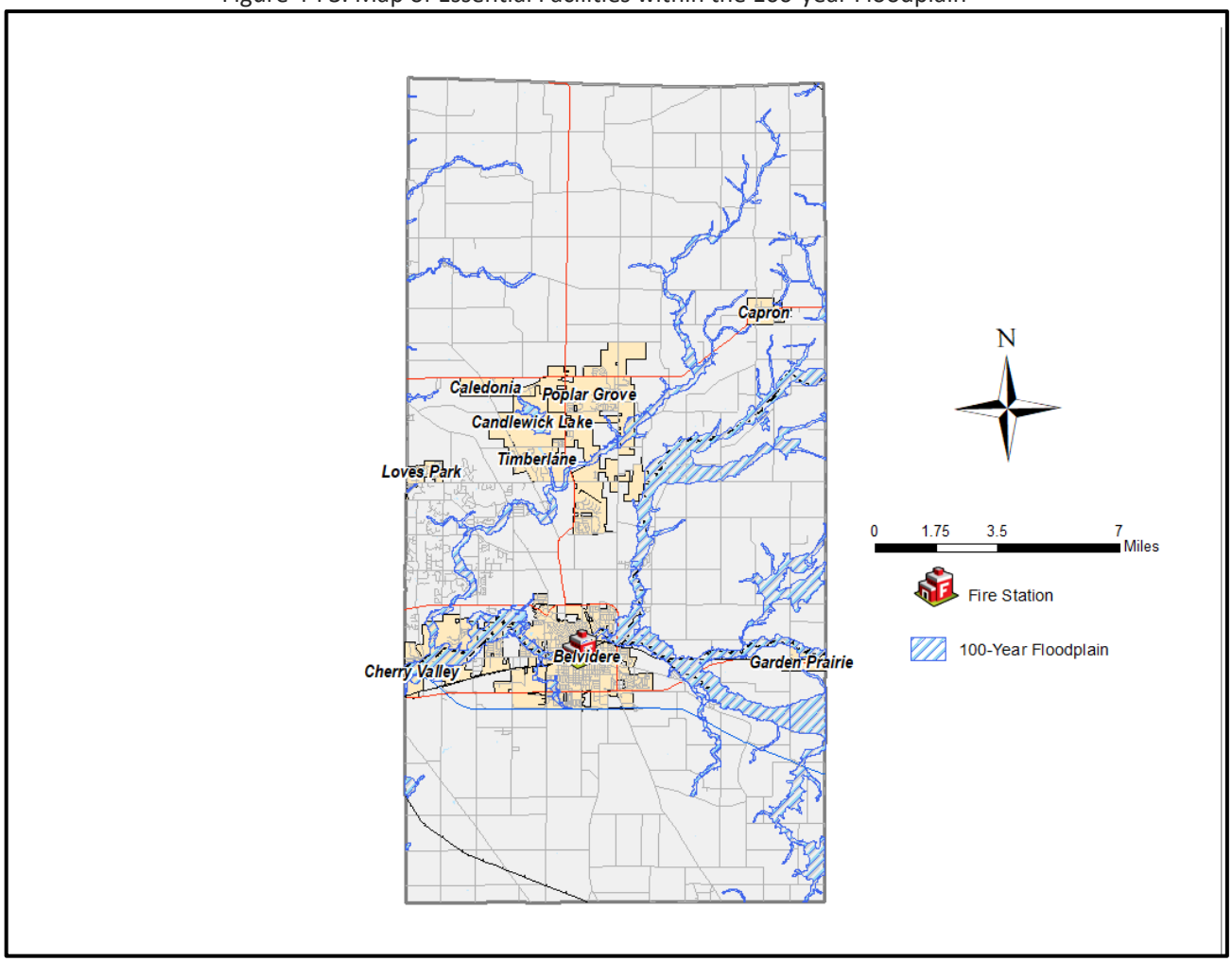
Essential Facilities Damage

The analysis identified one essential facility that is subject to flooding. Table 4-F5 and Figure 4-F3 identified the essential facilities within the 100-year floodplain.

Table 4-F5. Essential Facilities within the 100-year Floodplain

Essential Facility	Facility Name
Fire Departments	Belvidere Fire Department Station 1

Figure 4-F3. Map of Essential Facilities within the 100-year Floodplain



Vulnerability Analysis to Future Assets/Infrastructure

Flooding may affect nearly any location within the county; therefore all buildings and infrastructure are vulnerable. Table 4-8 includes the building exposure for Boone. One essential facility in the county is at risk. Appendix E includes a list of the essential facilities in Boone and Appendix F displays a large format map of the locations of all critical facilities within the county. Currently, new developments comply with the state flood ordinance. Table 5.5 lists local building ordinances. At this time no new construction is planned with the 100-year floodplain.

Suggestions for Community Development Trends

Reducing floodplain development is crucial to reducing flood-related damages. Areas with recent development may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible to drainage issues. Damage to these can cause back-up of water, sewage, and debris

into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions.

4.3.5 Winter Storm Hazard

Hazard Definition of Winter Storm Hazard

Severe winter weather consists of various forms of precipitation and 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, or death and cause property damage and disrupt economic activity.

Ice or sleet, even in small quantities, can result in hazardous driving conditions and can cause property damage. Sleet involves raindrops that freeze completely before reaching the ground. Sleet does not stick to trees and wires. Ice storms, on the other hand, involve liquid rain that falls through subfreezing air and/or onto sub-freezing surfaces, freezing on contact with those surfaces. The ice coats trees, buildings, overhead wires, and roadways, sometimes causing extensive damage.

Ice storms are some of the most damaging winter storms in Illinois. Ice storms occur when moisture-laden Gulf air converges with the northern jet stream causing freezing rain that coats power and communication lines and trees with heavy ice. Strong winds can cause the overburdened limbs and cables to snap, leaving large sectors of the population without power, heat, or communication.

Rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility, characterize significant snowstorms. A blizzard is categorized as a snowstorm with winds of 35 miles per hour or greater and/or visibility of less than one-quarter mile for three or more hours. Strong winds during a blizzard blow falling and fallen snow, creating poor visibility and impassable roadways. Blizzards potentially result in property damage.

Blizzards repeatedly affect Illinois. Blizzard conditions cause power outages, loss of communication, and transportation difficulties. Blizzards can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous if not deadly.

Severe cold involves ambient air temperatures that drop to 0˚F or below. These extreme temperatures can increase the likelihood of frostbite and hypothermia. High winds during severe cold events can enhance the air temperature's effects. Fast winds during cold weather events can lower the wind chill factor (how cold the air feels on your skin). As a result, the time it takes for frostbite and hypothermia to affect a person's body will decrease.

Previous Occurrences of Winter Storm Hazard

The NCDC database reported 52 winter storm and extreme cold events for Boone since 1950. The most recent reported event occurred in February of 2019 when temperatures plummeted across southern Illinois Table 4-WS1 identifies NCDC-recorded winter storm events that caused damage, death, or injury in Boone.

Table 4-WS1. NCDC-Recorded Winter Storms that Caused Damage, Death, or Injury in Boone

Location or County*	Date	Deaths	Injuries	Property Damage
Northern Illinois	12/06/1994	0	0	$10,000
Boone	01/01/1999	1	0	0
Boone	01/23/2003	1	0	0
Boone	02/18/2006	1	0	0
Boone	02/02/1996	3	0	0
Boone	01/15/1997	5	0	0
	Total:	**11**	**0**	**$10,000**

Geographic Location of Winter Storm Hazard

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

Hazard Extent of Winter Storm Hazard

The extent of the historical winter storms varies in terms of storm location, temperature, and ice or snowfall. A severe winter storm can occur anywhere in the county.

Risk Identification of Winter Storm Hazard

Based on historical information, the probability of future winter storms in Boone is likely. The county should expect winter storms with varying magnitudes to occur in the future. Winter storms ranked as the number four hazard according to the Boone Planning Team's risk assessment.

Risk Priority Index

Probability	x	Magnitude	=	RPI
3.25	x	1.5	=	4.875

Vulnerability Analysis of Winter Storm Hazard

Winter storm impacts are equally likely across the entire county; therefore, the entire county is vulnerable to a winter storm and can expect impacts within the affected area. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Boone.

Critical Facilities

All critical facilities are vulnerable to winter storms. A critical facility will encounter many of the same impacts as other buildings within the county. These impacts 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. Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. 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.

Infrastructure

During a winter storm, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that a winter storm could impact any structure. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads and railways, and broken water pipes.

Potential Dollar Losses from Winter Storm Hazard

According to the NCDC, Boone has incurred approximately $10,000 in damages relating to winter storms since 1950. NCDC 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. As a result, the potential dollar losses for a future event cannot be reliably constrained; however, based on average property damage in the past decade, SIU estimates that Boone incurs no property damage per year related to winter storms, including sleet/ice and heavy snow.

Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

Any new development within the county will remain vulnerable to these events.

Suggestions for Community Development Trends

Because winter storm events are regional in nature, future development across the county will also face winter storms.

4.3.6 Thunderstorm Hazard

Hazard Definition

Severe thunderstorms are weather events with one or more of the following characteristics: strong winds, large and damaging hail, and frequent lightning. Severe thunderstorms most frequently occur in Illinois during the spring and summer months but can occur at any time. A severe thunderstorm's impacts can be localized or can be widespread in nature. A thunderstorm is classified as severe when it meets one or more of the following criteria:

Hail 0.75 inches or greater in diameter

Hail is a possible product of a strong thunderstorm. Hail usually falls near the center of a storm, but strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in damage in other areas near the storm. Hailstones range from pea-sized to baseball-sized, and some reports note hailstones larger than softballs.

Frequent and dangerous lightning

Lightning is a discharge of electricity from a thunderstorm. Lightning is often perceived as a minor hazard, but lightning damages many structures and kills or severely injures numerous people in the United States each year.

Wind speeds greater than or equal to 58 miles per hour

Straight-line winds from thunderstorms are fairly common in Illinois. Straight-line winds can cause damage to homes, businesses, power lines, and agricultural areas, and may require temporary sheltering of individuals who are without power for extended periods of time.

Previous Occurrences of Thunderstorm Hazards

The National Climatic Data Center (NCDC) database reported 46 hailstorms in Boone since 1950. Hailstorms occur nearly every year in the late spring and early summer months. The most recent reported occurrence was in May of 2018. Table 4-ST1 lists the significant hail storms (such as those that cause death, damage or injury) in Boone County.

Table 4-ST1. Selected NCDC-Recorded Hail that Caused Damage, Death, or Injury in Boone County

Location or County*	Date	Deaths	Injuries	Property Damage
Capron	08/09/2001	1	0	0
Belvidere	07/07/2008	0	0	$5,000
	Total:	**1**	**0**	**$5,000**

*NCDC 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.

The NCDC database reported two lightning events in Boone. The most recent reported event was in July of 2020. Table 4-ST2 identifies NCDC-recorded lightning that caused damage, death, or injury in Boone County.

Table 4-ST2. Selected NCDC-Recorded Lightning that Caused Damage, Death, or Injury in Boone

Location or County*	Date	Deaths	Injuries	Property Damage
Capron	08/09/2001	1	0	0
Belvidere	07/07/2008	0	0	$5,000
	Total:	**1**	**0**	**$5,000**

*NCDC 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.

The NCDC database reported 113 wind storms in Boone. Table 4-ST3 identifies selected NCDC-recorded wind storms that caused major damage (over $100,000), death, or injury in Boone.

Table 4-ST3. Selected NCDC-Recorded Windstorms that Caused Major Damage (over $100,000), Death, or Injury in Boone

Location or County*	Date	Deaths	Injuries	Property Damage
Belvidere	08/25/2006	0	0	$400,000
	Total:	**0**	**0**	**$400,000**

*NCDC 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.

Geographic Location of Thunderstorm Hazard

The entire county has the same risk for occurrence of thunderstorms. They can occur at any location within the county.

Hazard Extent for Thunderstorm Hazard

The extent of the hypothetical thunderstorms depends upon the extent of the storm, the wind speed, and the size of hail stones. Thunderstorms can occur at any location within the county.

Risk Identification for Thunderstorm Hazard

Based on historical information, the occurrence of future high winds, hail, and lightning is highly likely. The County should expect high winds, hail, and lightning of widely varying magnitudes in the future. According to the Boone Planning Team's assessment, severe thunderstorms are ranked as the number five hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
3	x	1.5	=	4.5

Vulnerability Analysis for Thunderstorm Hazard

The entire county's population and all buildings are vulnerable to a severe thunderstorm and can expect the same impacts within the affected area. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Boone.

Critical Facilities

All critical facilities are vulnerable to severe thunderstorms. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include 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 (e.g., a damaged police station cannot serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect impacts similar to those discussed for critical facilities. These impacts include 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 (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

A severe thunderstorm could impact roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that a severe thunderstorm could damage any number of these structures. The impacts to these structures include broken, failed, or impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); or impassable railways. Bridges could become impassable causing risk to motorists.

Potential Dollar Losses from Thunderstorm Hazard

According to the NCDC, Boone has incurred approximately $825,000 in damages relating to thunderstorms, including hail, lightning, and high winds since 1950. NCDC 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. As a result, the potential dollar losses for

a future event cannot be reliably constrained; however, based on average property damage in the past decade, SIU estimates that Boone incurs property damages of approximately $15,000 per year related to severe thunderstorms.

Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

All future development within the county and all communities will remain vulnerable to severe thunderstorm events.

Suggestions for Community Development Trends

Local officials should enhance severe storm preparedness by sponsoring a range of programs and initiatives to address the overall safety of county residents.

4.3.7 Wildfire

Hazard Definition

A wildfire is any fire involving vegetative fuels occurring in the wildland or urban-wildland interface areas. Wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible material present, and the effect of weather on the fire. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and fire breaks. The spread of wildfires varies based on the flammable material present and can be generally characterized by their fuels as follows:

- Ground - subterranean roots, duff and other buried organic matter
- Crawling or surface - low-lying vegetation such as leaf and timber litter, debris, grass, and low-lying shrubbery
- Ladder –low-level vegetation and tree canopies, such as small trees, downed logs, and vines
- Crown, canopy, or aerial –suspended material at the canopy level, such as tall trees, vines, and mosses

According to the United State Department of Agriculture over the last 10 years, nationwide there have been an average of 75,000 fires per year and an average of 7.2 million acres burned. While sometimes caused by lightning, nine out of ten wildfires are human-caused. The Forest Service and its partners suppress more than 98 percent of wildfires on initial attack, keeping unwanted fires small and costs down.

In the Midwest, including Illinois, the tallgrass prairie ecosystem depends on periodic fires to maintain the habitats which make up the ecosystem. Fire in tall grass prairies acts to burn aboveground biomass, killing woody plants, allowing sunlight to reach the soil, and changing the soil pH and nutrient availability. Growth of native species such as big bluestem, little bluestem, and Indian grass all increase significantly following a fire. When fire is removed from a prairie ecosystem, woody shrubs and trees eventually replace grasses and forbs. Controlled burns/prescribed fires are one of the most effective tools in preventing the outbreak and spread of wildfires and doing so safely reduces the amount of fuel for fires.

Previous Occurrences of Wildfire

The NCDC has no records of any wildfires resulting in fatalities or serious injuries in Boone County.

Geographic Location for Wildfire

Wildland Fires can occur in both forested areas and tallgrass prairie ecosystems located in the county. Most wildfires of concern occur in the Wildland-Urban interface where the combination of availability of fuel and exposure to infrastructure makes for the greatest risk.

Hazard Extent for Wildfire

The extent of the fire hazard varies both in terms of the areal extent of the fire and the type of material being ignited.

Risk Identification for Wildfire

Based on historical information of Boone County, the occurrence of future wildfire that is a hazard to homes and infrastructures is possible. According to the Boone Planning Team's assessment, wildfire is ranked as the number six hazard.

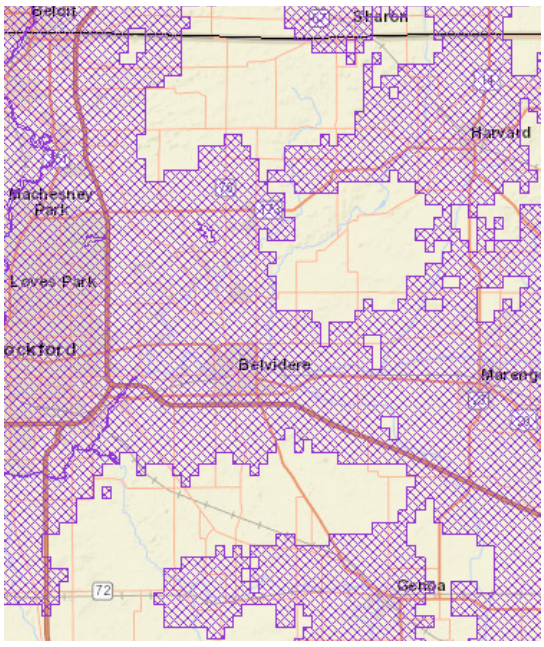
Risk Priority Index

Probability	x	Magnitude	=	RPI
1.75	x	1.75	=	3.0625

Vulnerability Analysis for Wildfire

A wildfire is any fire involving vegetative fuels that occurs in the wildland or urban-wildland interface areas. This study excludes structure fires, vehicle fires, trash or rubbish fires, and outside gas or vapor combustion. Although wildfires have ability to jump gaps such as roads, rivers and fire breaks this plan only considers the wildland-urban interface as vulnerable. Buildings located within the wildland-urban interface portion of the county are considered as vulnerable. Figure 4-WF1 shows the wildland-urban interface in Boone county. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Boone County. Nearly all critical facilities are within the wildland-urban interface.

Figure 4-WF1. Wildland-Urban Interface in Boone County and Surrounding Region



Critical Facilities

Critical facilities and communities within the wildland-urban interface are at risk. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include structural failure due to fire or explosion and loss of function of the facility (e.g., a damaged police station can no longer serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure due to fire or explosion or debris, and loss of function of the building (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

During a wildfire, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that a wildland fire could damage any number of these items. The impacts to these items include: 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 become impassable causing risk to motorists.

Vulnerability to Future Assets/Infrastructure for Wildfire

Boone County has a well-established network of fire departments with equipment capacities that enable an effective response in the event of wildfires. However, for wildland fires, county fire services and private land owners near the National Forest should work with the U.S. Forest Service to reduce fuel loads and develop the necessary wildland urban interface buffers to limit potential property damage from such fires.

Suggestions of Community Development Trends

Any development within the wildland-urban interface potentially increases the risk of property damage due to wildland fire. Planned construction in these areas should be reviewed so proper protective measures are taken to minimize the wildfire risk to these properties.

4.3.8 Drought and Extreme Heat Hazard

Hazard Definition for Drought Hazard

Drought is a normal climatic phenomenon that can occur across the state of Illinois and within Boone. The meteorological condition that creates a drought is below-normal rainfall. However, excessive heat can lead to increased evaporation, which enhances 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 longer).

The severity of a drought depends on location, duration, and geographical extent. Additionally, drought severity depends on the water supply, usage demands by human activities, vegetation, and agricultural

operations. Droughts will affect the quality and quantity of crops, livestock, and other agricultural assets. Droughts can adversely impact forested areas leading to an increased potential for extremely destructive forest and woodland fires that could threaten residential, commercial, and recreational structures.

Drought conditions are often accompanied by extreme heat, which is defined as temperatures that exceed the average high for the area by 10°F or more for the last for several weeks. Such extreme heat can have severe implications for humans. Below are common terms associated with extreme heat:

Heat Wave
Prolonged period of excessive heat often combined with excessive humidity.

Heat Index
A number, in degrees Fahrenheit, which estimates how hot it feels when relative humidity is added to air temperature. Exposure to full sunshine can increase the heat index by 15°F.

Heat Cramps
Muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe, they are often the first signal that the body is having trouble with heat.

Heat Exhaustion
Typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs, resulting in a form of mild shock. If left untreated, the victim's condition will worsen. Body temperature will continue to rise, and the victim may suffer heat stroke.

Heat and Sun Stroke
A life-threatening condition. The victim's temperature control system, which produces sweat to cool the body, stops working. The body's temperature can rise so high that brain damage and death may result if the body is not cooled quickly.

Previous Occurrences for Drought and Extreme Heat

The NCDC database reported 11 drought/heat wave events in Boone County since 1950. The most recent recorded event occurred in July of 2019.

Geographic Location for Drought and Extreme Heat

Droughts are regional in nature. Most areas of the United States are vulnerable to the risk of drought and extreme heat.

Hazard Extent for Drought and Extreme Heat

The extent of droughts or extreme heat varies both depending on the magnitude and duration of the heat and the range of precipitation.

Risk Identification for Drought and/or Extreme Heat

Based on historical information, the occurrence of future droughts and/or prolonged extreme heat is likely. According to the Boone Planning Team's assessment, drought and/or extreme heat are ranked as the number seven hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
1.75	x	1.5	=	2.625

Vulnerability Analysis for Drought and Extreme Heat

Drought and extreme heat are a potential threat across the entire county; therefore, the county is vulnerable to this hazard and can expect impacts within the affected area. According to FEMA, approximately 175 Americans die each year from extreme heat. Young children, elderly, and hospitalized populations have the greatest risk. The entire population is at risk.

Critical Facilities

A critical facility may encounter more acute impacts than other building within the jurisdiction. Potential impacts include water shortages and residents in need of medical care from the heat and dry weather. Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts can include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather.

Infrastructure

During a drought, the risk to structures is primarily associated with fire, which can be exacerbated from hot, dry conditions.

Potential Dollar Losses from Drought and Extreme Heat

According to the NCDC, Boone has not incurred damages relating to drought and extreme heat events storms since 1950.

Vulnerability to Future Assets/Infrastructure from Drought/Extreme Heat Hazard

Future development will remain vulnerable to droughts. Typically, some urban and rural areas are more susceptible than others. For example, urban areas are subject to water shortages during periods of drought. Excessive demands of densely populated areas put a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of heat and drought. Dry conditions can lead to the ignition of wildfires that could threaten residential, commercial, and recreational areas.

Suggestion of Community Development Trends

Because droughts and extreme heat are regional in nature, future development is susceptible to drought. Although urban and rural areas are both 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 drought and extreme heat hazards by educating the public on steps to take before and during the event—for example, temporary window reflectors to direct heat back outside, staying indoors as much as possible, and avoiding strenuous work during the warmest part of the day.

4.3.9 Dam and Levee Failure

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 loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Communities tend to view dams and levees as permanent and infinitely safe structures. This sense of security may be misplaced, 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 design capacity, levees and dams can fail due to structural deficiencies. Both dams and levees require frequent 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 can 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.

Previous Occurrences of Dam and Levee Failure

The U.S. army Corps of Engineers notes no previous occurrences of dam or levee failure in Boone County.

Geographic Location of Dams and Levees in Boone County

The U.S. Army Corps of Engineers maintains the National Inventory of Dams (NID) which identified 2 dams in Boone County. According to NID records, one dam in Boone County is classified as a high hazard and one dam has an Emergency Action Plans (EAP). Table 4-DLF1 list of the dams located in Boone County and their respective classification level.

Table 4-DLF1. Boone Dam Inventory

Dam Name	Stream/River	Hazard Rating	EAP
Candlewick Lake Dam	Candlewick Lake	High	Yes
Belvidere Dam	Kishwaukee River	Low	No

A review of the US Army Corps of Engineers National Levee Database and IDNR records revealed no levee systems present within Boone County.

Hazard Extent for Dam and Levee Failure

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

According to NID records, Candlewick Lake Dam in Boone County is classified as high hazard and has an Emergency Action Plan (EAP). Kishwaukee River Dam is classified as low hazard and does not have an EAP. An EAP is not required by the State of Illinois but is recommended in the 2003 Illinois Dam Safety & Inspection Manual.

Risk Identification for Dam Failure

Based on operation and maintenance requirements and local knowledge of the dams in Boone County, the probability of failure is possible. The warning time and duration of the dam failure event would be very short. Based on input from the Planning Team, future occurrence of dam or levee failure in Boone County is unlikely. According to the Risk Priority Index (RPI) and County input, dam failure is ranked as the number eight hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
1	x	1.75	=	1.75

Vulnerability Analysis for Dam and Levee Failure

An Emergency Action Plan (EAP) is required to assess the effect of dam failure on these communities. In order to be considered creditable 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 probability flood.

Critical Facilities

Critical facilities downstream of the two dams are vulnerable to dam failure. An essential facility will encounter many of the same impacts as other structures with dam failure. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., a damaged police station cannot serve the community). One critical facility is vulnerable to Candlewick Lake Dam failure, the Aqua Illinois Water Treatment plant. Replacement costs for the treatment plant are $3,277,916. The Kishawaukee dam is in Belvidere. Figure 4-DL1 shows the vulnerable area due to a failure of that dam. No critical facilities are in the risk zone.

Building Inventory

All buildings within the floodplain downstream of the dams are vulnerable to floods as a result of dam failure. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., damaged home will no longer be habitable, causing residents to seek shelter). This plan considers all buildings located downstream of the dams and within 100-year flood plain as vulnerable.

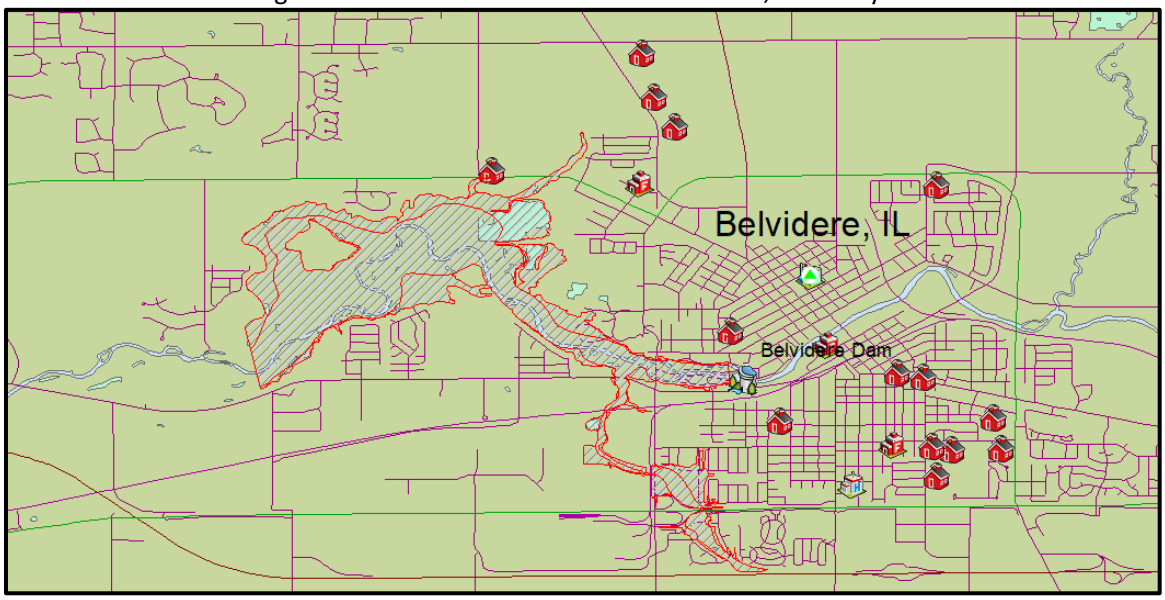
Infrastructure

The types of infrastructure potentially impacted by a flood include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available for this plan, it is important to emphasize that a flood could damage any number of these items. 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); or railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

Flooding as a result of dam or levee failure will affect the downstream floodplain. Any development in the dam downstream floodplain is vulnerable.

Figure 4-DL1. Kishawaukee River Dam failure, GIS analysis



Suggestions for Community Development Trends

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

4.3.10 Earthquake Hazard

Hazard Definition

An earthquake is the shaking of the earth caused by the energy released when large blocks of rock slip past each other in the earth's crust. While most earthquakes occur at tectonic plate boundaries, earthquakes can occur anywhere within a tectonic plate.

Strong earthquakes can collapse buildings and infrastructure, disrupt utilities, and trigger landslides, avalanches, flash floods, fires, and tsunamis. When an earthquake occurs in a populated area, it may cause death, injury, and extensive property damage. An earthquake might damage essential facilities, such as fire departments, police departments, and hospitals, disrupting emergency response services in the affected area. Strong earthquakes may also require mass relocation; however, relocation may be impossible in the short-term aftermath of a significant event due to damaged transportation infrastructure and public communication systems.

Earthquakes are typically measured by two criteria: intensity and magnitude (M). Earthquake intensity qualitatively measures the strength of shaking produced by an earthquake at a certain location and is determined from effects on people, structures, and the natural environment. Earthquake magnitude quantitatively measures the energy released at the earthquake's subsurface source in the crust, or epicenter. Magnitude in the earthquake hazard analysis. Table 4-EQ1 provides a comparison of magnitude and intensity, and Table 4-EQ2 provides qualitative descriptions of intensity, for a sense of what a given magnitude might feel like.

Table 4-EQ1. Comparison of Earthquake Magnitude and Intensity

Magnitude (M)	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

Table 4-EQ2. Abbreviated Modified Mercalli Intensity Scale

Mercalli 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 motorcars 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 motorcars 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.

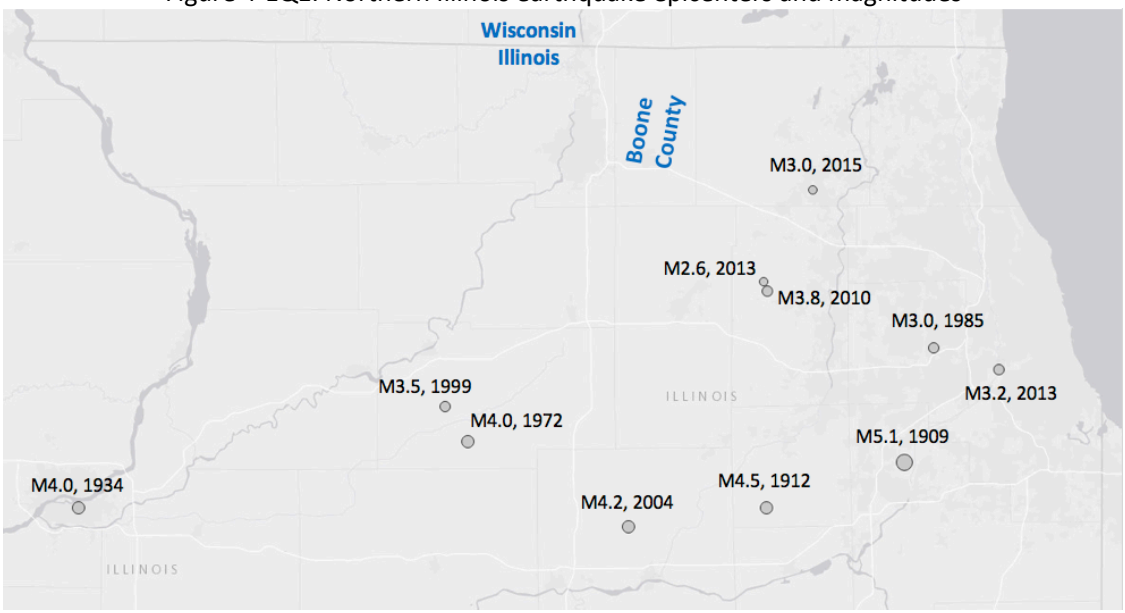
Mercalli Intensity	Description
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and 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.

Previous Occurrences for Earthquakes

Historically, the most significant seismic activity in Illinois is associated with New Madrid Seismic Zone near the southern end of the state. The New Madrid Seismic Zone produced three large earthquakes with magnitudes estimated between 7.0 and 7.7 on December 16, 1811, January 23, 1812, and February 7, 1812. These earthquakes caused violent ground cracking and geyser-like eruptions of sediment (sand blows) over an area >10,500 km^2, and uplifted a 50 km by 23 km zone (the Lake County uplift). The shaking was felt over a total area of over 10 million km^2. Thousands of aftershocks were felt in the succeeding months. The United States Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis estimate the probability of a repeat of the 1811-1812 type earthquakes (M7.5-8.0) is 7%-10% over the next 50 years (USGS Fact Sheet 2006-3125).

Over the past hundred years, earthquakes in Illinois vary from frequent, but largely unnoticed events of M1-3 events up to a M5.3 event occurring in southeastern Illinois in 1968. The most recent earthquake in Illinois greater than Magnitude 3 —as of the date of this report—was a M3.8 event in September 2017, approximately 8 miles west of Mt. Carmel in Wabash County. The last earthquake in Illinois to cause reported damage occurred on April 18, 2008 near Mt. Carmel, IL and measured 5.2 in magnitude. Earthquakes resulting in more serious damage have occurred about every 70 to 90 years and are historically concentrated in southern Illinois. While less frequent, northern Illinois has had a number of earthquakes larger than M3 with the largest being a M5.1 occurring in 1909 (Figure 4-EQ1).

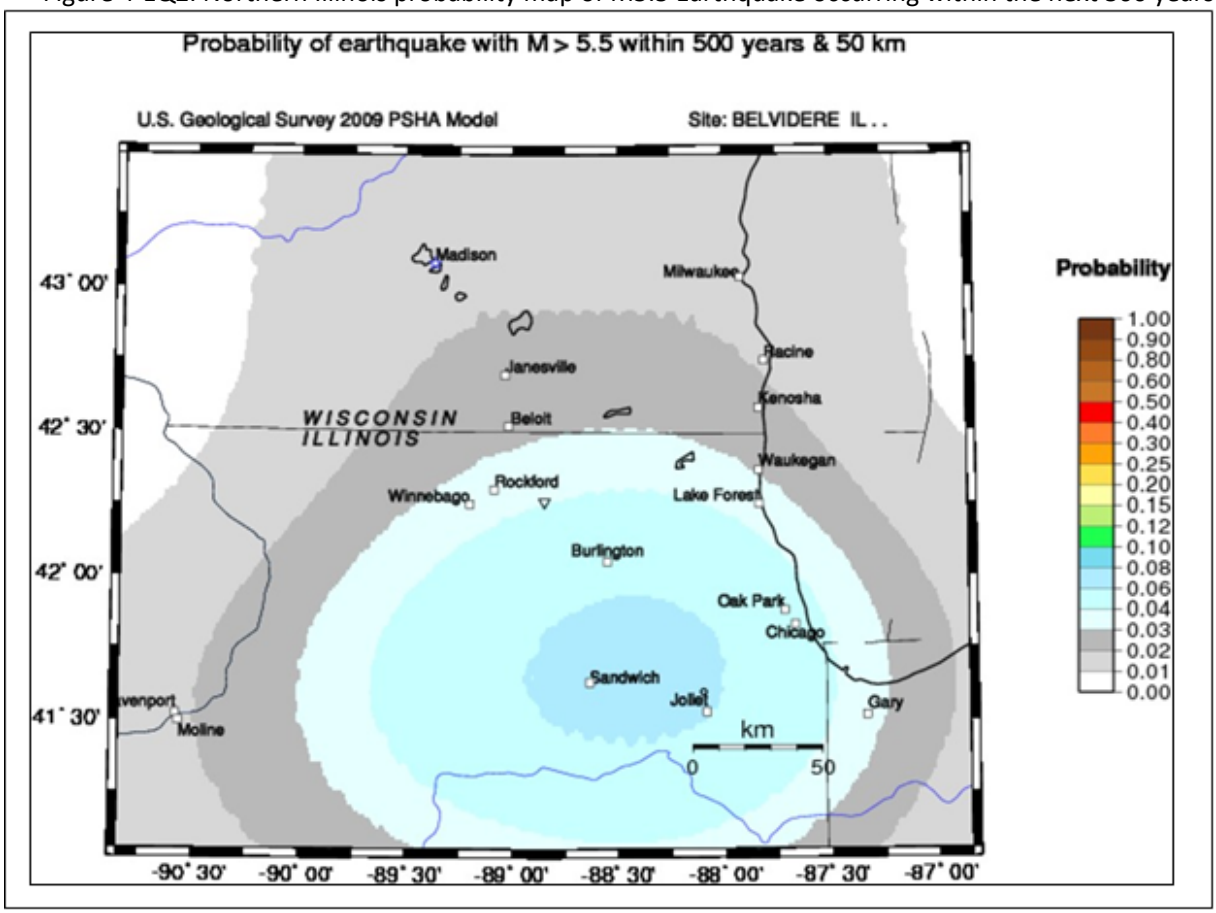
Figure 4-EQ1. Northern Illinois earthquake epicenters and magnitudes



Geographic Location for Earthquake Hazard

The two most significant zones of seismic activity in Illinois are the New Madrid Seismic Zone and the Wabash Valley Fault System along the southern Illinois-Indiana border. There are no recorded earthquakes with epicenters within the boundaries of Boone County, but nearby counties have experienced moderate magnitude earthquakes over the past century with several in the past decade (Figure 4-EQ1). While large earthquakes (>M7.0) like those experienced during the New Madrid Events of 1811 and 1812 are unlikely in Boone County, moderate earthquakes (≤ 6.0M) in or in the vicinity of Boone County are not out of the question. The USGS estimates the probability of a moderate M5.5 earthquake occurring in Boone County within the next 500- years at approximately 3%, but somewhat more likely in counties just to the south (Figure 4-EQ2).

Figure 4-EQ2. Northern Illinois probability map of M5.5 Earthquake occurring within the next 500 years



Hazard Extent for Earthquake Hazard

Earthquake effects are possible anywhere in Boone County. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. SIU used a National Earthquake Hazards Reduction Program (NEHRP) compliant soils map provided by FEMA for the analysis. The map identifies the soils most susceptible to failure.

Risk Identification for Earthquake Hazard

Based on historical information and current USGS and SIU research and studies, future earthquakes in Boone are possible, but large (>M7.0) earthquakes causing catastrophic damage are unlikely. According to the Boone Planning Team's assessment, earthquakes are ranked as the number nine hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
0.5	x	1.25	=	0.625

Vulnerability Analysis for Earthquake Hazard

Earthquakes could impact the entire county equally; therefore, the entire county's population and all buildings are vulnerable to an earthquake. To accommodate this risk, this plan considers all buildings located within the county as vulnerable.

Critical Facilities

All critical facilities are vulnerable to earthquakes. Critical facilities are susceptible to many of the same impacts as any other building within the jurisdiction. These impacts include structural failure and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure and loss of building function which could result in indirect impacts (e.g., damaged homes will no longer be habitable causing residents to seek shelter).

Infrastructure

During an earthquake, the types of infrastructure that shaking could impact include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure was not available for use in the earthquake models, it is important to emphasize that any number of these items could become damaged in the event of an earthquake. 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 also fail or become impassable, causing risk to motorists.

Hazus-MH Earthquake Analyses

Existing geological information was reviewed prior to the Planning Team selection of earthquake scenarios. A Magnitude 5.5 arbitrary earthquake scenario was performed to provide a reasonable basis for earthquake planning in Boone. The other two scenarios included a Magnitude of 7.7 with the epicenter located on the New Madrid Fault Zone and a 500-year probabilistic event.

The earthquake-loss analysis for the probabilistic scenario was based on ground-shaking parameters derived from U.S. Geological Survey probabilistic seismic hazard curves for the earthquake with the 500-year return period. This scenario evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude typical of that expected for a 500-year return period. The New Madrid Fault Zone runs along the Mississippi River through Arkansas, Tennessee, Missouri, Kentucky and Southern Illinois. he Wabash Valley Fault Zone runs through Southeastern Illinois, Western Kentucky and Southwest Indiana. This represents a realistic scenario for planning purposes.

The earthquake hazard modeling scenarios performed:

- Magnitude 5.0 500-Year Probabilistic Earthquake
- Magnitude 7.7 event along the New Madrid Fault Zone
- Magnitude 5.5 arbitrary earthquake epicenter in Boone County

This report presents two types of building losses: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building

and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

Results for the 500-Year Probabilistic M 5.0 Earthquake Scenario

The results of the M 5.0 500-year probabilistic earthquake scenario are depicted in Tables 4-EQ3, 4-EQ4, and Figure 4-EQ3. Hazus-MH estimates that approximately 81 buildings will be at least moderately damaged. This is less than 0.5% of the total number of buildings in Boone. It is estimated that 1 building would be damaged beyond repair.

The building related economic losses are approximately $5.14 million dollars. It is estimated that 29% of the losses are related to the business interruption of the region. By far, the largest loss is sustained by the residential occupancies which make up 66% of the total loss.

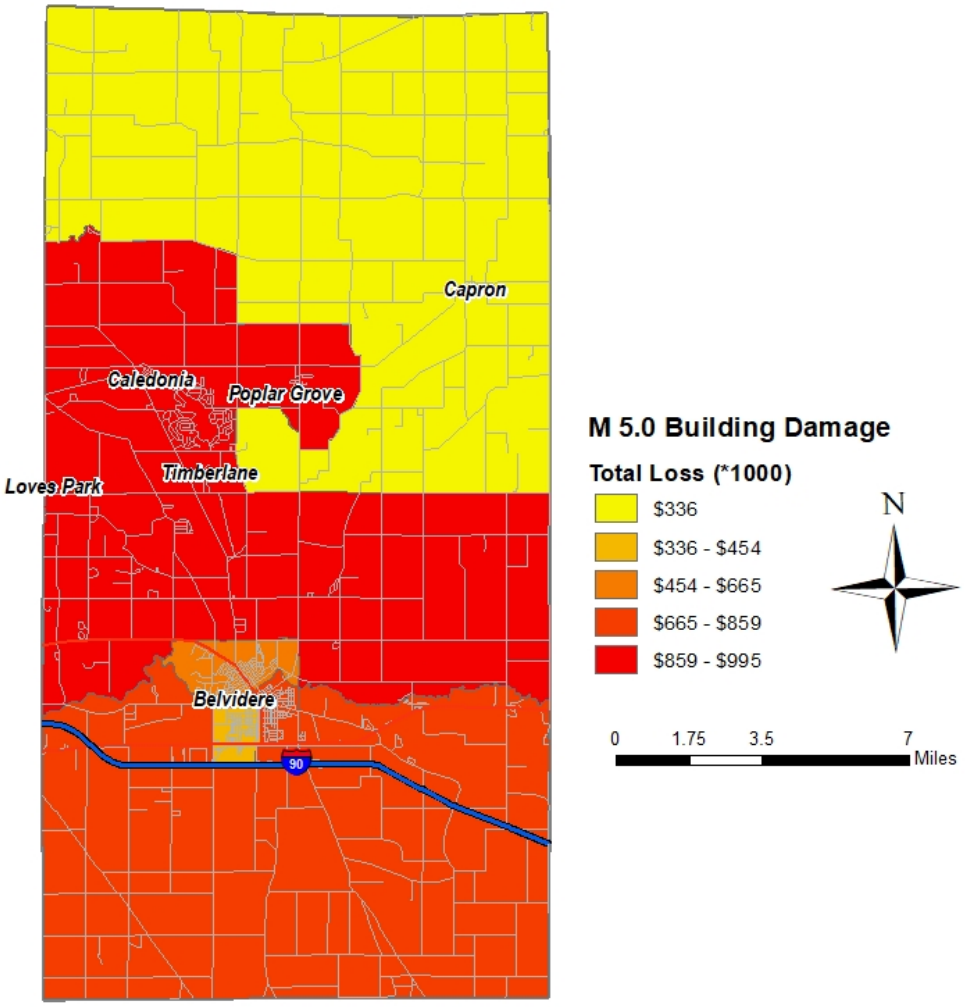
Table 4-EQ3. M5.0 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	148.04	0.77	3.58	1.37	1.22	1.67	0.15	2.1	0.01	1.21
Commercial	753.76	3.92	17.22	6.58	5.34	7.31	0.65	9.04	0.03	6.13
Educational	21.3	0.11	0.51	0.19	0.17	0.23	0.02	0.28	0	0.3
Government	25.36	0.13	0.48	0.18	0.15	0.2	0.02	0.23	0	0.24
Industrial	362.92	1.89	8.15	3.11	2.61	3.57	0.31	4.3	0.01	2
Other Residential	1848.03	9.61	57.71	22.04	16.75	22.91	0.5	6.94	0.02	3.44
Religion	57.28	0.3	1.24	0.47	0.42	0.58	0.05	0.73	0	0.67
Single Family	16017.65	83.28	172.98	66.06	46.46	63.54	5.46	76.4	0.46	86.01
Total:		**19,234**		**262**		**73**		**7**		**1**

Table 4-EQ4. M5.0 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0	0.0026	0.1361	0.0341	0.0154	0.1882
	Capital-Related	0	0.0011	0.1195	0.0204	0.0033	0.1443
	Rental	0.1039	0.0316	0.0902	0.0106	0.0042	0.2405
	Relocation	0.3633	0.0426	0.1231	0.0409	0.0422	0.6121
	Subtotal:	**0.4672**	**0.0779**	**0.4689**	**0.106**	**0.0651**	**1.1851**
Capital Stock Losses	Structural	0.9301	0.0878	0.2091	0.1783	0.0888	1.4941
	Non-Structural	1.4741	0.1705	0.2159	0.1561	0.0705	2.0871
	Content	0.1924	0.0174	0.0542	0.0753	0.0186	0.3579
	Inventory	0	0	0.0013	0.0146	0.0005	0.0164
	Subtotal:	**2.5966**	**0.2757**	**0.4805**	**0.4243**	**0.1784**	**3.9555**
	Total:	**3.06**	**0.35**	**0.95**	**0.53**	**0.24**	**5.14**

Figure 4-EQ3 Boone 500-Year Probabilistic M 5.0 Earthquake Building Economic Losses



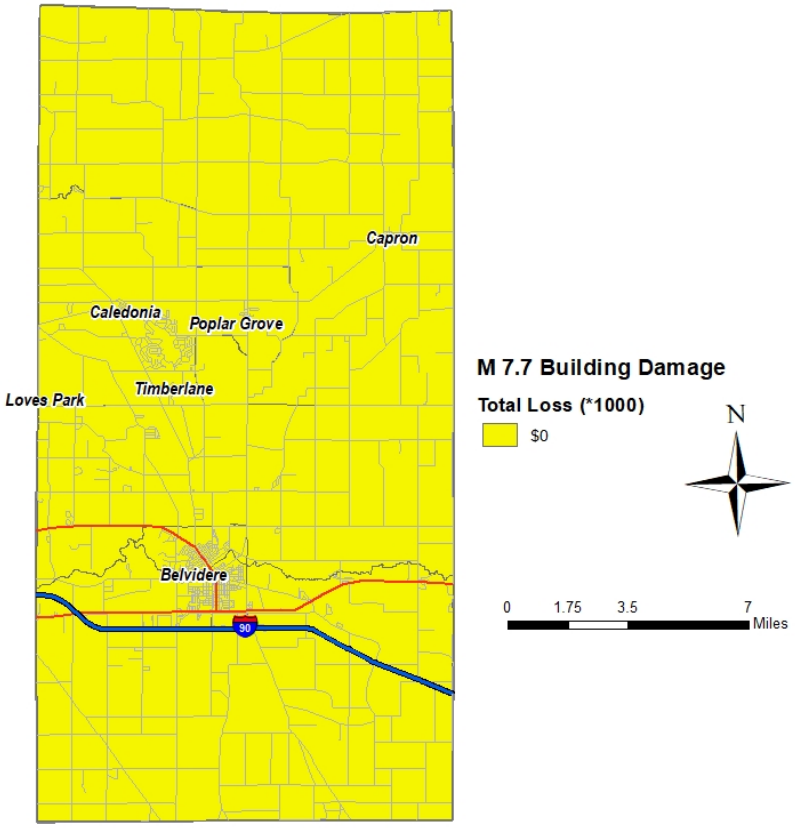
Results for M7.7 New Madrid Earthquake

The results of the M7.7 New Madrid earthquake scenario are depicted in Table 4-EQ5 and Figure 4-EQ4. Because of the distance, Mercalli Intensities throughout the county remain lower than III. Hazus-MH estimates that no buildings will be damaged to any significant extent.

Table 4-EQ5. New Madrid M7.7 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	153	0.78	0	0	0	0	0	0	0	0
Commercial	777	3.97	0	0	0	0	0	0	0	0
Educational	22	0.11	0	0	0	0	0	0	0	0
Government	26	0.13	0	0	0	0	0	0	0	0
Industrial	374	1.91	0	0	0	0	0	0	0	0
Other Residential	1923	9.82	0	0	0	0	0	0	0	0
Religion	59	0.3	0	0	0	0	0	0	0	0
Single Family	16243	82.97	0	0	0	0	0	0	0	0
Total:	**19,577**		**0**		**0**		**0**		**0**	

Figure 4-EQ4. New Madrid M7.7 Earthquake Building Economic Losses



Results M 5.5 Arbitrary Earthquake – General Building Stock

The results of the Arbitrary M 5.5 earthquake scenario are depicted in Tables 4-EQ7, 4-EQ8, and Figure 4-EQ5. Hazus-MH estimates that approximately 3,022 buildings will be at least moderately damaged. This is 15% of the total number of buildings in Boone. It is estimated that 121 building would be damaged beyond repair.

The building related economic are approximately $539.63 million dollars. It is estimated that over 29% of the losses are related to the business interruption of the region. The largest loss is sustained by the residential occupancies which make up 67% of the total loss.

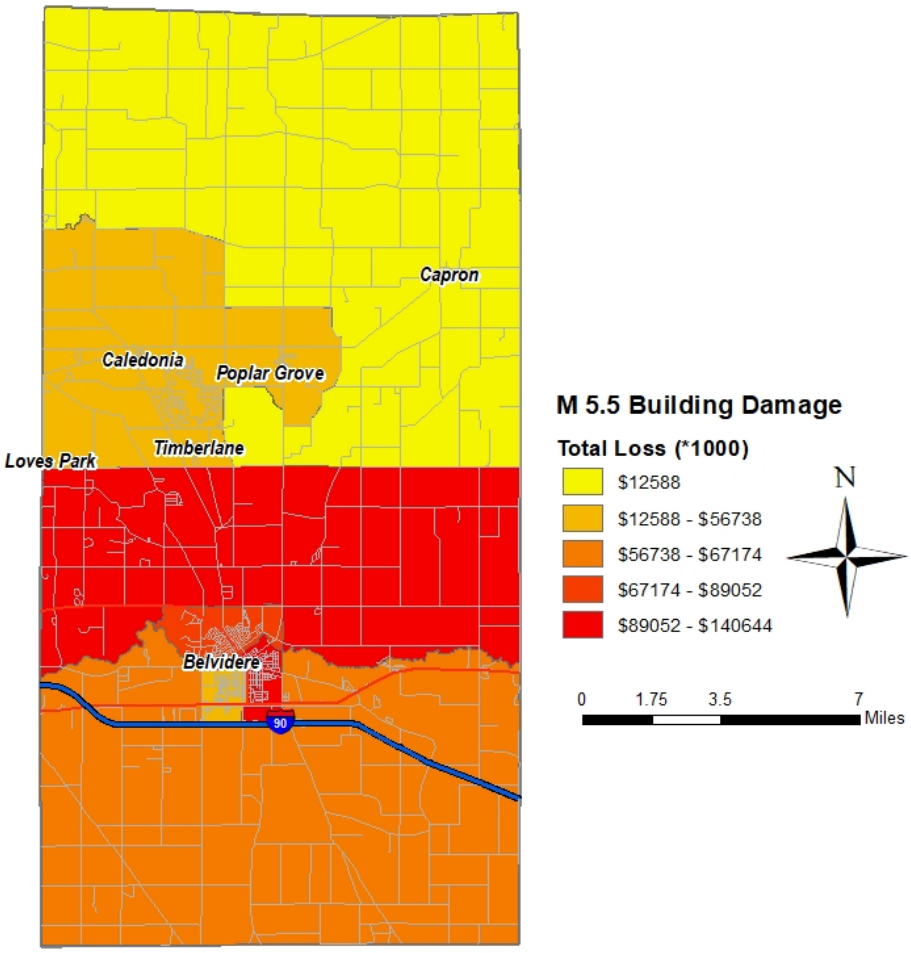
Table 4-EQ7. Arbitrary M 5.5 Magnitude Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	140.47	1.27	30.77	1.54	21.45	2.35	5.76	3.68	0.55	2.72
Commercial	528.69	4.79	110.22	5.51	63.03	6.92	15.38	9.83	1.68	8.26
Educational	26.03	0.24	5.07	0.25	3.07	0.34	0.71	0.46	0.12	0.58
Government	44.29	0.4	7.52	0.38	4.22	0.46	0.84	0.54	0.13	0.65
Industrial	127.12	1.15	25.25	1.26	15.5	1.7	3.79	2.42	0.34	1.67
Other Residential	1630.25	14.78	459.46	22.95	335.22	36.78	36.98	23.65	2.09	10.28
Religion	72.46	0.66	14.5	0.72	8.52	0.93	2.21	1.41	0.31	1.52
Single Family	8457.86	76.7	1348.9	67.39	460.42	50.52	90.73	58.01	15.09	74.32
Total:	**11,027**		**2,002**		**911**		**156**		**20**	

Table 4-EQ8. Arbitrary M 5.5 Magnitude Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0	0.1266	6.7683	1.8434	0.531	9.2693
	Capital-Related	0	0.054	5.853	1.1081	0.1174	7.1325
	Rental	4.9394	1.7071	3.5936	0.5026	0.1883	10.931
	Relocation	17.4345	1.9882	5.8964	1.9365	1.8094	29.065
	Subtotal:	**22.3739**	**3.8759**	**22.1113**	**5.3906**	**2.6461**	**56.3978**
Capital Stock Losses	Structural	41.8798	4.0961	9.9598	8.9573	3.2684	68.1614
	Non-Structural	177.1186	25.3205	29.1294	32.8601	8.1778	272.6064
	Content	77.9675	8.4023	19.0916	25.6864	5.6039	136.7517
	Inventory	0	0	0.4726	5.1104	0.125	5.708
	Subtotal:	**296.9659**	**37.8189**	**58.6534**	**72.6142**	**17.1751**	**483.2275**
	Total:	**319.34**	**41.69**	**80.76**	**78**	**19.82**	**539.63**

Figure 4-EQ5. Arbitrary M 5.5 Scenario Building Economic Losses



Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

New construction, especially critical facilities, should accommodate earthquake mitigation design standards.

Suggestions for Community Development Trends

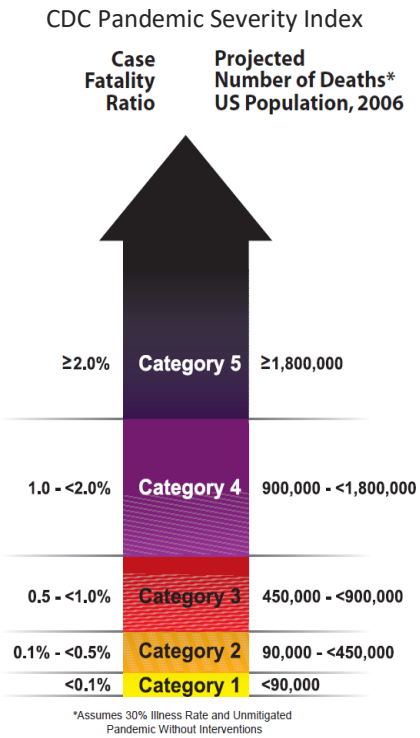
Community development should occur outside of the low-lying areas in floodplains with a water table within five feet of grade that is susceptible to liquefaction. It is important to harden and protect future and existing structures against the possible termination of public services and systems including power lines, water and sanitary lines, and public communication.

4.3.11 Disease Outbreaks, Epidemics, and Pandemics

Hazard Definition

Disease outbreaks, epidemics, and pandemics can have devastating consequences on people and the community at large. These types of hazards have the potential of affecting a large number of people and posing significant harm with their ability to seriously diminish people's health and cause death. Dependent upon the situation, these public health hazards can last from days to years. Disease Outbreaks occur when there is a sudden rise in a disease experienced by a community, region or during a season, despite measures to deter disease spread. Outbreaks could be a single case of a contagious disease, particularly if it is a novel disease or new to a community or remerges after a long absence. An outbreak may be isolated to a single community or cover several countries.

Epidemics occur when an infectious disease spreads rapidly affecting people in several countries. Disease outbreaks have the potential of becoming epidemics. Epidemics are common occurrences in the world of the 21st century. According to the World Health Organization (WHO), every country on earth as experienced at least one epidemic since the year 2000. The 2003 Severe Acute Respiratory Syndrome (SARS) in Asia and the 2014-15 Ebola Virus Disease (EVD) both started out as outbreaks, but became epidemics. SARS ended up spreading to two dozen counties, infecting 8,098 people in which 774 people died. Some public health incidents start out as epidemics, such as Swine Flu (H1N1) and Avian Flu (H5N1) but result in global exposure (see Pandemic, below). Far more often, however, epidemics strike at lesser geographic levels.



Pandemics are disease outbreaks/epidemics that spread worldwide. HIV/Aids is an example of one of the most destructive global pandemics in history. The number of people affected by a pandemic depends upon how severe the pandemic is. Pandemics are generally classified by severity level: mild, moderate, or severe. Pandemics can impact segments of the population not usually affected by seasonal flu, for instance, healthy adults between the ages of 20 – 50, (see more information on difference between pandemic and seasonal flu later in this section). By infecting and causing death in large numbers of people, pandemics can also cause significant economic disruption and loss.

The Center of Disease Control and Prevention (CDC) has developed a Pandemic Severity Index, with categories of increasing severity (Category 1 to Category 5). The Pandemic Severity Index uses a ratio to estimate the number of expected deaths. This index helps communities with pandemic preparedness and planning.

Previous Occurrences of Disease Outbreaks, Epidemics, and Pandemics

The 2014 outbreak of the Ebola virus disease in several West African counties prompted changes in the way the public health industry mitigates and responds to epidemics and pandemics. It is important to note that only two imported cases, including one death, and two locally acquired cases in healthcare workers occurred in the United States. Common epidemic and pandemic threats include (but not limited to) HIV/Aids, smallpox, tuberculosis, influenza, non-polio enteroviruses, and foodborne outbreaks. This plan will only highlight the most recent non-polio enteroviruses and influenza illness records.

Non-Polio Enteroviruses are very common viruses that cause about 10 to 15 million infections in the United States each year. All populations are susceptible to non-polio enteroviruses, however there is an increased risk for infants, children, and teenagers due to a lack of immunity from previous exposures to the viruses. The infection is spread via close contact or touching surfaces with the infection. Those who become infected with the viruses do not get sick or come down with mild illnesses. Severe cases have the potential to infect the heart, brain, or even paralyze.

One of the most recent non-polio enteroviruses cases occurred from mid-August to December 11th, 2014. The CDC confirmed a total of 1,149 people in 48 states and the District of Columbia with respiratory illness caused by Enterovirus D68 (EV-D68). This virus was first identified in California in 1962 and is one of the more than 100 non-polio enteroviruses. EV-D68 has been the most common type of enterovirus identified in 2014, leading to increases in illnesses among children and affecting those with asthma most severely.

Influenza Pandemics (pandemic flu) occurs when a new type of influenza (flu) virus emerges, affecting the health and lives of many people. As a serious respiratory illness, pandemic flu spreads quickly from person to person because people have not been exposed to the new flu strain. Once exposed, individuals may have little or no bodily resistance for fighting off the new, contagious type of flu. During the 20th century, there were three major influenza pandemics.

The 1918 Spanish flu was the deadliest flu pandemic, infecting 20% to 40% of the world's population. An estimated 50 million died from the Spanish flu, 675,000 of which were from the United States. This was a viral pandemic in which people could die quite suddenly. Instances occurred in which people reported being well in the morning, felt sick during the day and had died by evening. Many individuals fighting this virus succumbed to complications, such as pneumonia. Those most affected were adults between the ages of 20-50, healthy individuals that typically are not the hardest hit by influenza.

"Asian flu" of 1957 and "Hong Kong flu" of 1968 caused approximately 1 - 4 million deaths. The 1957 pandemic originated in China and was a category 2 on the pandemic severity index. Eventually, the Asian flu strain evolved, shifting initiating a milder 1968-69 Hong Kong flu pandemic infecting 500,000 people

The most recent pandemic is the currently ongoing COVID-19 Pandemic with nearly 400,000 deaths worldwide at the time of writing, more than 110,000 of which are in the U.S., nearly 6000 in Illinois and 18 COVID related deaths in Boone County. Table 4-EP1 displays the influenza pandemics since 1918.

Table 4-EP1. Influenza Pandemics since 1918

Date	Name	Subtype	Deaths in United States
1918-1919	Spanish Flu	H1N1	675,000
1957-1958	Asian Flu	H2N2	69,800
1986-1969	Hong Kong Flu	H3N2	33,800
2009-2010	2009 Flu Pandemic / Swine Flu	H1N1/09	12,500

Date	Name	Subtype	Deaths in United States
2020-	Novel Coronavirus	SARS-CoV2	112,000*
		Total:	**903,100**

Source: U.S. Department of Health & Human Services
*as of June 8, 2020

Seasonal Flu and Pandemic Flu are both influenza viruses that affect the upper respiratory system of people. Seasonal flu is the more common type of flu, emerging each year during the fall, winter, and spring months. Seasonal flu continually circulates among people during each flu season, changing slightly from year to year. Because of seasonal flu's continual presence among people, individuals are more likely to have acquired some bodily resistance, allowing them to fight off this flu strain better. Despite having acquired some immunity, the CDC estimates that from the 1976-77 season to the 2006-07 flu season, flu-associated deaths ranged from a low of about 3,000 to a high of about 49,000. Health organizations offer seasonal flu vaccinations annually to protect people from this changing virus. Pandemic flu is a new type of virus, which means that people have little or no immunity to it. Pandemic flu spreads quickly from person to person and can produce serious illness, potentially more severe than seasonal flu.

Geographic Location for Disease Outbreak, Epidemics, and Pandemic Hazard

Because of the nature of pandemic disease, the entire country, continent, or whole world is at risk. An epidemic can occur over a short period of time and strike at lesser geographic levels. The entire county is at risk of disease outbreak, epidemic, or pandemic hazard.

Hazard Extent for Disease Outbreak, Epidemics, and Pandemic Hazard

The extent of the hazard varies in terms of the physical characteristics of the disease outbreak, epidemic or the pandemic (e.g., the number of people infected and strength of the virus). For instance, the COVID-19 Pandemic has proven to have a greater risk to elderly and minority populations.

Risk Identification for Disease Outbreak, Epidemics, and Pandemic Hazard

Disease outbreaks, epidemics, and pandemics can occur within any area in the county; therefore, the entire county population is vulnerable. This plan includes a section devoted to disease outbreak, epidemic, and pandemic but it should be noted that it is not included in the ranked list of hazards, but was included with the spread of the current COVID-19 pandemic.

Vulnerability Analysis

A less severe pandemic and/or more severe epidemic would likely result in dramatic increases in the number of hospitalizations and deaths. A severe pandemic can overwhelm the nation's critical healthcare services and impose significant stress on our nation's critical infrastructure (including but not limited to the airline and travel industry). Epidemic and pandemics can create a shortage of staff, facilities, equipment, hospital beds, and other supplies needed to cope with the number of people who get the pandemic flu. Alternative sites, such as schools, may serve as medical facilities.

Suggestions for Community Development Trends

The U.S. Department of Health & Human Services and the State of Illinois Department of Public Health provides guidance to communities, individuals, health professionals, businesses and schools on epidemic and pandemic mitigation. Planning and preparedness information is disseminated via Flu.gov. Various Fact sheets, tool kits, check lists and pre-pandemic planning guides are available. It is important that all

entities in the county are prepared because the federal government cannot prepare for or respond to the challenge of a pandemic alone.

The Centers of Disease Control and Prevention (CDC) developed the 2007 Interim Pre-pandemic Planning Guide for local communities to mitigate against pandemic influenza. The goals are to limit the spread of a pandemic; mitigate disease, suffering, and death; and sustain infrastructure and lessen the impact on the economy and the functioning of society. A pandemic influenza mitigation framework was created and includes four mitigation interventions to help offset the effect on communities. Implementing these interventions require advance planning. As such, the CDC warns of second- and third-order consequence of the interventions which may require additional planning. Interventions include, but are not limited to:

1. Isolation and treatment (as appropriate) with influenza antiviral medications of all persons with confirmed or probable pandemic influenza. Isolation may occur in the home or healthcare setting, depending on the severity of an individual's illness and /or the current capacity of the healthcare infrastructure.
2. Voluntary home quarantine of members of households with confirmed or probable influenza case(s) and consideration of combining this intervention with the prophylactic use of antiviral medications, providing sufficient quantities of effective medications exist and that a feasible means of distributing them is in place.
3. Dismissal of students from school (including public and private schools as well as colleges and universities) and school-based activities and closure of childcare programs, coupled with protecting children and teenagers through social distancing in the community to achieve reductions of out-of-school social contacts and community mixing.
4. Use of social distancing measures to reduce contact between adults in the community and workplace, including, for example, cancellation of large public gatherings and alteration of workplace environments and schedules to decrease social density and preserve a healthy workplace to the greatest extent possible without disrupting essential services.
5. Additionally, one of the best and most effective mitigation strategies available to everyone is simply utilizing good hygiene practices, e.g., effectively washing hands frequently, effectively covering coughs and sneezes, and wiping down surfaces frequently shared by people, e.g., door knobs, counter surfaces, bathroom/kitchen faucet sink handles and bathroom toilet handles, etc.

Section 5. Mitigation Strategies

The goal of mitigation is to reduce the future impacts of a hazard, including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist with recovery. Throughout the planning process, the Boone Planning Team worked to identify existing hazard mitigation policies, develop mitigation goals, and create a comprehensive range of mitigation strategies specific to each jurisdiction. This work provides a blueprint for reducing the potential losses identified in the risk assessment (section 4).

5.1 Existing Hazard Mitigation Policies, Programs and Resources

This section documents each jurisdiction's existing authorities, policies, programs and resources related to hazard mitigation and the ability to improve these existing policies and programs. It is important to highlight the work that has been completed in Boone that pertains to hazard mitigation. In addition, the following information also provides an evaluation of these abilities to determine whether they can be improved in order to more effectively reduce the impact of future hazards.

5.1.1 Successful Mitigation Projects

To be successful, mitigation must be a recurrent process that is continually striving to lessen the impact of natural hazards within the county. The following are projects have had progress or were successfully completed after Boone County 2014 Multi-Hazard Mitigation Plan was formally adopted.

- Automatic Aid agreements have been signed by all four fire departments in the county.
- Training of Emergency Agency members have been ongoing. Joint training between police and fire departments for school shootings have been enacted. Firefighters have been trained in Rescue Task Force operations. Firefighters are now trained and equipped to enter the "warm zone" to rescue and treat victims.
- The county has purchased a Mobile Command Vehicle for more coordinated operations at major incidents. This vehicle is available to any jurisdiction or agency in the county.
- Boone County has recently adopted a storm water ordinance
- All jurisdictions have been working toward full county tornado siren coverage. To date, the southern half of the county is nearing 100% coverage.
- Vulnerability of chemical spill has been reduced by lessening commercial inventory in the county.
- The county has updated the response procedures for a reduction of loss of life from tornadoes. The county has an ongoing program to identify places of refuge for those that do not have basements or other shelters.
- 911 Special Needs list for the county has been compiled and is currently up-to-date.
- The Dam in Belvidere receives routine safety and operational maintenance
- The county publicizes cooling room locations in times of extreme heat.

Unrealized or unfinished strategies from the 2014 plan are continued in this plan with the exception of hardening infrastructure via retrofitting. Hardening of current infrastructure is deemed too expensive for the level of risk to mitigate against. It is deemed more cost effective to enforce building codes moving forward.

5.1.2 National Flood Insurance Program

In 1968, Congress created the National Flood Insurance Program (NFIP) to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding. This section covers the County's NFIP status, flood insurance policy and claim statistics, repetitive loss structures, and Community Rating System status.

NFIP Status

Including the county, six out of the seven incorporated communities in Boone County participate in the NFIP. Table 5-1 includes a summary of information for Boone participation in the NFIP. Boone will continue to provide information to its non-participating jurisdiction regarding the benefits of the National Flood Insurance Program. While Timberlane has a FIRM, they do not participate in the NFIP as the area of 100-year flood plain within the jurisdiction is minimal with little building exposure (Figure 4-F2).

Table 5-1. Information on Boone Participation in the NFIP

Community	Participate in the NFIP	Initial Flood Hazard Boundary Map Identified	Initial FIRM Identified	Current Effective FIRM Date
BELVIDERE, CITY OF	YES	3/15/1974	1/6/1982	2/18/2011
BOONE COUNTY *	YES	4/29/1977	11/17/1982	2/18/2011
CAPRON, VILLAGE OF	YES		2/18/2011	02/18/11(M)
CHERRY VALLEY, VILLAGE OF	YES	3/1/1974	3/16/1981	2/17/2016
LOVES PARK, CITY OF	YES	6/28/1974	10/17/1978	2/17/2016
POPLAR GROVE, VILLAGE OF	YES		2/18/2011	2/18/2011
TIMBERLANE, VILLAGE OF	NO		2/18/2011	2/18/2011

NFIP status and information are documented in the Community Status Book Report updated on 06/08/2020.
(M) – No Elevation Determined

Flood Insurance Policy and Claim Statistics

As of September 2019, 164 households paid flood insurance, insuring $33,844,300 in property value. The total premiums collected for the policies amounted to $173,046. Since the establishment of the NFIP in 1978, 158 flood insurance claims were filed in Boone, totaling in $1,525,644 in payments. Table 5-2 summarizes the claims since 1978.

Table 5-2. Flood Insurance Claim Statistics for Boone

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Payments
BOONE COUNTY *	23	15	1	7	$199,942.25
BELVIDERE, CITY OF	30	24	1	5	$159,620.12
CHERRY VALLEY, VILLAGE OF	5	3	0	2	$22,547.22
LOVES PARK, CITY OF	100	68	0	32	$1,143,535.27

NFIP policy and claim statistics since 1978 until the most recently updated date of 09/2019. Closed Losses refer to losses that are paid; open losses are losses that are not paid in full; CWOP losses are losses that are closed without payment; and total losses refers to all losses submitted regardless of status. Lastly, total payments refer to the total amount paid on losses.

Repetitive Loss Structures

There are several structures in Boone County that have experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more occasions during a 10-year period

that ends on the date of the second loss, in which the cost to repair the flood damage is ≥ 25% of the market value of the structure at the time of each flood loss. Currently there are over 122,000 Repetitive Loss properties nationwide.

The Federal Emergency Management Agency was contacted to determine the location of repetitive loss structures in Boone County. Once the data are forthcoming Table 5-3 will describe the repetitive loss structures for each jurisdiction.

Table 5-3. Repetitive Loss Structures for each Jurisdiction in Boone County

Jurisdiction	Occupancy Type	Number of Properties	Number of Losses	Total Paid
Boone County				
Total:				

Community Rating System Status

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. In Illinois, 69 communities participate in the CRS. Although joining the CRS is free, completing CRS activities and maintaining a CRS rating requires a degree of commitment from the community, including dedicating staff.

The CRS uses a Class rating system that is similar to fire insurance rating to determine flood insurance premium reductions for residents. CRS Classes are rated from 9 to 1. Most communities enter the program at a CRS Class 9 or Class 8 rating, which entitles residents in Special Flood Hazard Areas (SFHAs) to a 5% to 10% discount on flood insurance premiums. Each CRS Class improvement produces a 5 percent greater discount on flood insurance premiums. Currently, Boone County and its incorporated areas do not participate in the NFIP'S Community Rating System (CRS). Joining the CRS could be one way the County or its incorporated communities improve their existing floodplain management policies and further reduce the flood hazard risk.

5.1.3 Jurisdiction Ordinances

Hazard Mitigation related ordinances, such as zoning, burning, or building codes, have the potential to reduce the risk from known hazards. These types of regulations provide many effective ways to address resiliency to known hazards. Table 5-4 lists Boone County's current ordinances that directly pertain, or can pertain, to hazard mitigation.

The adoption of new ordinances, including the adoption of new development standards or the creation of hazard-specific overlay zones tied to existing zoning regulations, present opportunities to discourage hazardous construction and manage the type and density of land uses in areas of known natural hazards. Adopting and enforcing higher regulatory standards for floodplain management (i.e., those that go beyond the minimum standards of the NFIP) is another effective method for minimizing future flood losses, particularly if a community is experiencing growth and development patterns that influence flood hazards in ways that are not accounted for on existing regulatory floodplain maps. Revisions to existing building codes also present the opportunity to address safe growth. Many state and local codes are based off national or industry standard codes which undergo routine evaluations and updates. The adoption of

revised code requirements and optional hazard-specific standards may help increase community resilience.

Table 5-4: Boone County's Jurisdiction Ordinances

Community	Zoning	Storm water Mgmt	Flood	Subdivision Control	Burning	Seismic	Erosion Mgmt	Land Use Plan	Building Codes
Boone County	Y	Y	Y	Y	Y	N	Y	Y	IBC
Belvidere	Y	Y	Y	Y	N	N	Y	Y	IBC/IRC
Capron	Y	N	N	Y	N	N	N	N	IBC
Poplar Grove	Y	N	Y	Y	Y	N	Y	N	IBC
Timberlane	Y	N	N	Y	N	N	N	N	N

5.1.4 Fire Insurance Ratings

By classifying communities' ability to suppress fires, the Insurance Service Office (ISO) Public Protection Classification Program helps communities evaluate their public fire-protection services. The program provides a countrywide standard that helps fire departments in planning and budgeting for facilities, equipment, and training. Information is collected on municipal fire-protection efforts in communities throughout the United States. In each of those communities, ISO analyzes the relevant data using a Fire Suppression Rating Schedule. Ratings are assigned from 1 to 10 where Class 1 generally represents superior property fire protection, and Class 10 indicates that the area's fire-suppression program doesn't meet ISO's minimum criteria. Table 5-6 displays each Fire Department's insurance rating and total number of employees.

Table 5-6. Boone Fire Departments, Insurance Ratings, and Number of Employees/Volunteers

Fire Department	Fire Insurance Rating	Number of Employees
Belvidere Fire Department	3	30
Boone County Fire Protection District #1	5	21 (all volunteer)
Boone County Fire Protection District #2	5	43 (5 part-time, 38 volunteer)
Boone County Fire Protection District #3	4/5	42 (7 full time)

Mitigation Goals

In Section 4 of this plan, the risk assessment identified Boone as prone to several hazards. The Planning Team members understand that although they cannot eliminate hazards altogether, Boone can work towards building disaster-resistant communities. Below is a generalized list of goals, objectives, and actions. The goals 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: Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.

Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards.

Objective: Minimize the amount of infrastructure exposed to hazards.

Objective: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.

Objective: Improve emergency sheltering in Boone County.

Goal 2: Create new or revise existing plans/maps for Boone County

Objective: Support compliance with the NFIP for each jurisdiction in Boone County.

Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.

Objective: Conduct new studies/research to profile hazards and follow up with mitigation strategies.

Goal 3: Develop long-term strategies to educate Boone County residents on the hazards

Objective: Raise public awareness on hazard mitigation.

Objective: Improve education and training of emergency personnel and public officials.

5.2 Multi-Jurisdictional Mitigation Strategies

After reviewing the Risk Assessment, the Mitigation Planning Team was presented with the task of individually listing potential mitigation activities using the FEMA STAPLEE evaluation criteria (see table 5-7). FEMA uses their evaluation criteria STAPLEE (stands for social, technical, administrative, political, legal, economic and environmental) to assess the developed mitigation strategies. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. The Planning Team brought their mitigation ideas to Meeting 3.

Table 5-7. FEMA's STAPLEE Evaluation Criteria

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.
Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
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.
Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
Economic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
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.

Table 5-8 contains a comprehensive range of specific mitigation actions and projects for each jurisdiction, with an emphasis on new and existing buildings and infrastructure. At least two identifiable mitigation action items have been addressed for each hazard listed in the risk assessment. Each of the incorporated communities within and including Boone County was invited to participate in brainstorming sessions in which goals, objectives, and strategies were discussed and prioritized. Each participant in these sessions was armed with possible mitigation goals and strategies provided by FEMA, as well as information about mitigation projects discussed in neighboring communities and counties.

All potential strategies and goals that arose through this process are included in Table 5-8. The mitigation strategies are arranged by hazard they directly address. In some cases, certain mitigation strategies can address all hazards. If provided by the jurisdiction, each mitigation strategy contains specific details pertaining to the implementation, responsible and/or organizing agency, and potential funding source. Potential funding sources are identified by Federal, State, Local, or Private. A code is assigned to each mitigations strategy for ease of reference when reviewing the prioritization of each mitigations strategies in Section 5.4.

Table 5-8. Boone Multi-Jurisdictional Mitigation Strategies

Code	Mitigation Item	Jurisdictions	Status	Hazards Addressed	Priority	Comments
A1	Public Education/Awareness	Boone County	Ongoing	All Hazards	Medium	Boone County recognizes that public education is important and expensive. The county plans to obtain external funding to raise public awareness of hazards.
A2	Firefighting training facility	All	Proposed	All Hazards	High	To further enhance ongoing county-wide fire department cooperation, the county would like to update and strengthen their training abilities with a multi-functional training facility.
A3	Back-up Generators	Boone County	Ongoing	All Hazards	High	The county plans to obtain back-up generators for each critical facility and county government building (local law enforcement, fire departments, hospitals, city and county buildings, schools, etc).
A4	Enhanced Communication Systems/Emergency Operations Center (EOC)	Boone County	Ongoing	All Hazards	High	Boone County is currently in the process of updating all communications systems to improve communications between emergency operators and the public.
A5	Dedicated Emergency Operations Center	Boone County	Proposed	All Hazards	High	The current EOC is a classroom with a few laptop computers and a few phone lines. This is not a functional EOC. The Coronavirus pandemic exposed how inefficient this operation is.
A6	Local Emergency Planning Committee support	Boone County	Ongoing	All Hazards	Medium	Boone County has a robust Local Emergency Planning Committee. This cooperation is continuing, but has no financial support.

A7	County-wide Rescue Squad	All (joint effort)	Proposed	All Hazards	High	Having one rescue squad for the entire county alleviates duplication of effort and improves inter-operability of the four existing departments. For instance, each department would not have to buy the same type of vehicle.
A8	Procure a Back-up Water Supply	Boone County	Proposed	All Hazards	Low	Boone County wishes to establish an emergency fund to obtain water from an outside source in the event a disaster disrupts the current potable water supply
A9	Obtain Tents/Shelter and Cots	Boone County	Proposed	All Hazards	High	Boone County would like to obtain funding for tents and shelters to better address the sheltering needs in the event of a major hazard. The COVID-19 crisis demonstrated a need of cots for relocated people.
A10	Data Center Redundancy	Boone County	Proposed	All Hazards	High	If the building the Information Technology Center is in is damaged, the entire City of Belvidere and County is without computer and phone access.
F1	Stormwater Management and Floodplain Ordinance	Boone County	Ongoing	Flood	High	Boone County has recently adopted a Storm Water Ordinance and will continue to monitor its floodplain ordinance.
A11	Updated Starcom Portable Radios	Boone County	Proposed	All Hazards	High	The Boone County Emergency Management is currently using outdated portable radios. These radios do not allow communications with all the entities necessary.
F2	Installation of Pumping Stations	Boone County	Ongoing	Flood	High	Boone County is in the process of installing pumping stations but with external funding, additional work could be completed to the infrastructure.

F3	Elevate Low-Lying Roads	Boone County	Ongoing	Flood	High	Boone County is interested in elevating low-lying roads and plans to seek funding. Studies need to be done to research the effects.
TS1	Provide and Publicize Locations of Safe Rooms and/or Shelters	Boone County	Ongoing	Tornado/ Severe Storms	High	Boone County is currently working on identifying all shelters in the county to provide this information to the public. The County will work with different associations on getting private shelters installed and advertised.
TS2	Tree Management	Boone County	Ongoing	Tornado/ Severe Storms	High	Boone County already has a tree-trimming and management program and will continue to maintain it.
ET1	Cooling/Water Shelters	Boone County, Belvidere	Ongoing	Extreme Temperatures	High	Boone County would like to obtain funding for cooling and warming centers. The local law enforcements, fire and emergency management will oversee the project.
A12	Badge Reader/Asset Tracker	Boone County, Belvidere	Proposed	All Hazards	High	Disasters bring a lot of responders and equipment to a scene. These asset trackers allow much greater accountability of people and equipment by using a bar code system. People are scanned in quickly and their location is known.
CU1	Assault vehicle for Police	Boone County	Proposed	Civil Unrest	High	There was a reported school shooting in the county in Spring 2020. It turned out to be a distraction for a bank robbery. If it had been real, there was no safe rescue vehicle available.
EQ1	Earthquake Response Plan	Boone County	Ongoing	Earthquake	Medium	Boone County Emergency Management has an earthquake response plan in place and will continue to monitor and update it in the future.

HM1	Emergency Plan/Protocol for HAZMAT	Boone County, Belvidere	Ongoing	Hazmat	High	Boone County, along with Belvidere Fire departments, Boone County EMA, and Boone County LEPC currently maintains and emergency plan for HAZMAT incidents
HM2	Conduct a Commodity Flow Study	All (joint effort)	Ongoing	Hazmat	Medium	Boone County EMA will oversee this project. Funding will be sought from ILDOT, IEMA, and FEMA.

5.3 Prioritization of Multi-Jurisdictional Mitigation Strategies

Implementation of the mitigation strategies is critical to the overall success of the mitigation plan. It is important 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 vital. It is important to note that 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. It is also critical to take into account the amount of time it will take the community to complete the mitigation project.

For each participating jurisdiction a rating (high, medium, or low) was assessed for each mitigation item. The ranking is the result of the STAPLEE evaluation and the timeframe the community is interested in completing the strategy: H - High 1-3 years; M - Medium 3-5 years; and L - Low 5+years. Overall, hazard mitigation priorities are similar to those detailed in the 2014 plan but with the improvements listed in section 5.1.1.

Section 6. Plan Implementation and Maintenance

6.1 Implementation through Existing Programs

Throughout the planning process, the Boone Planning Team worked to identify existing hazard mitigation policies, develop mitigation goals, and a create a comprehensive range of mitigation strategies specific to each jurisdiction. This work provides a blueprint for reducing the potential losses identified in the Risk Assessment (Section 4). The ultimate goal of this plan is to incorporate the mitigation strategies proposed into ongoing planning efforts within the County. The Boone Emergency Management Agency will be the local champion for the mitigation actions. The Boone Board and the city and village councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified action.

The actions and goals represented in this plan will be integrated into the Comprehensive Economic Development Strategy (CEDS) for Northern Illinois developed by the Region 1 Planning Council in 2021 for the U.S. Dept. of Commerce and applicable to Boone, McHenry, and Winnebago counties. The counties are physically and economically connected through the Chicago to Rockford corridor along routes 173, 20/176, and I-90 as well as all having portions with rural identities. This presents shared infrastructure, land-use, and environmental concerns including water resources and hazard mitigation. Hazard mitigation as a topic is largely excluded in the current CEDS, but is important to many outlined concerns such as water quality, land use, and flooding as well as resiliency and health concerns. The hazards and mitigation strategies described in this plan are to be considered during the next updates of the CEDS, building codes, and zoning ordinances.

Most of the strategies will require, at least in part, material and/or financial support from the county EMA and participating jurisdictions as is noted in table 5-8. Identifying additional funding to carry out the various actions is frequently the limiting factor in implementation. The FEMA Region V Mitigation Resource Funding Guide provides an extensive list of federal and state resources from multiple agencies

that may be drawn on to further mitigation efforts. For example, federal programs identified applicable to the strategies in table 5-8 include FEMA Emergency Management and Performance grants (A2, A, A4, A5, A10), FEMA Pre-Disaster Mitigation grants (A1, A5, A9, A10), HUD Community Challenge Planning grant (A3, TS1, ET1), and the Department of Homeland Security Local Emergency Planning Committee program (HM2). State programs with grants applicable to enabling the carry out of the strategies include the Illinois Division of Natural Resources Flood Hazard Mitigation Hazard (F2, F3). A few strategies are likely to leverage some private funds or other resources (e.g., donated time or space) from vested members of the community (e.g., TS1).

Continued public involvement is also critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by the Boone Emergency Management Agency and forwarded to the Planning Team for discussion. Education efforts for hazard mitigation will be an ongoing effort of Boone. The public will be notified of periodic planning meetings through notices in the local newspaper. Once adopted, a copy of the MHMP will be maintained in each jurisdiction and in the Boone Emergency Management Agency.

6.2 Monitoring, Evaluation, and Updating the MHMP

Throughout the five-year planning cycle, the Boone Emergency Management Agency will reconvene the Planning Team to monitor, evaluate, and update the plan on an annual basis. Additionally, a meeting will be held in 2024 to address the five-year update of this plan. Members of the planning committee are readily available to engage in email correspondence between annual meetings. If the need for a special meeting, due to new developments or the occurrence of a declared disaster in the county, the team will meet to update mitigation strategies. Depending on grant opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

As part of the update process, the Planning Team will review the county goals and objectives to determine their relevance to changing situations in the county. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The team will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The plan revision will also reflect changes in local development and its relation to each hazard. The parties responsible for the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

Updates or modifications to the MHMP during the five-year planning process will require a public notice and a meeting prior to submitting revisions to the individual jurisdictions for approval. The plan will be updated via written changes, submissions as the committee deems appropriate and necessary, and as approved by the Boone Board.

The GIS data used to prepare the plan was obtained from existing county GIS data as well as data collected as part of the planning process. This updated Hazus-MH GIS data has been returned to the county for use and maintenance in the county's system. As newer data becomes available, these updated data will be used for future risk assessments and vulnerability analyses.

Definitions

100-year Floodplain	Areas subject to inundation by the 1-percent-annual-chance flood event.
Critical Facility	A structure, because of its function, size, service area, or uniqueness, that has the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. This includes, but are not limited to, water and wastewater treatment facilities, municipal buildings, educations facilities, and non-emergency healthcare facilities.
Community Rating System (CRS)	A voluntary program for National Flood Insurance Program (NFIP) participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management.
Comprehensive Plan	A document, also known as a "general plan," covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all the physical elements that will determine the community's future developments.
Disaster Mitigation Act of 2000 (DMA 2000)	The largest legislation to improve the planning process. It was signed into law on October 30, 2000. This legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.
Essential Facility	A subset of critical facilities that represent a substantial hazard to human life in the event of failure. This includes (but not limited to) hospital and fire, rescue, ambulance, emergency operations centers, and police stations.
Federal Emergency Management Agency	An independent agency created in 1979 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery.
Hazard	A source of potential danger or adverse condition.
Hazard Mitigation	Any sustained action to reduce or eliminate long-term risk to human life and property from hazards.

Hazard Mitigation Grant Program (HMPG)	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration.
Hazus-MH	A geographic information system (GIS)-based disaster risk assessment tool.
Multi-Hazard Mitigation Planning	Identify policies and actions that can be implemented over the long term to reduce risk and future losses from various hazardous events.
National Flood Insurance Program	Administered by the Federal Emergency Management Agency, which works closely with nearly 90 private insurance companies to offer flood insurance to property owners and renters. In order to qualify for flood insurance, a community must join the NFIP and agree to enforce sound floodplain management standards.
Planning Team	A group composed of government, private sector, and individuals with a variety of skills and areas of expertise, usually appointed by a city or town manager, or chief elected official. The group finds solutions to community mitigation needs and seeks community acceptance of those solutions.
Risk Priority Index	Quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards.
Risk Assessment	Quantifies the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.
Strategy	A collection of actions to achieve goals and objectives.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions.

Acronyms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

AEGL – Acute Exposure Guideline Levels
ALOHA – Areal Locations of Hazardous Atmospheres

C

CERI – Center for Earthquake Research and Information
CRS – Community Rating System

D

DEM – Digital Elevation Model
DFIRM – Digital Flood Insurance Rate Map
DMA – Disaster Mitigation Act of 2000

E

EAP – Emergency Action Plan
EMA – Emergency Management Agency
EPA – Environmental Protection Agency

F

FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map

G

GIS – Geographic Information System

H

Hazus-MH – Hazards USA Multi-Hazard
HMGP – Hazard Mitigation Grant Program
HUC – Hydrologic Unit Code

I

IA – Individual Assistance
IDNR – Illinois Department of Natural Resources
IDOT – Illinois Department of Transportation
IEMA – Illinois Emergency Management Agency
ISO – Insurance Service Office
ISGS – Illinois State Geological Survey
ISWS– Illinois State Water Survey

M MHMP – Multi-Hazard Mitigation Plan

N NCDC – National Climatic Data Center
NEHRP – National Earthquake Hazards Reduction Program
NFIP – National Flood Insurance Program
NID – National Inventory of Dams
NOAA – National Oceanic and Atmospheric Administration
NSFHA – Non-Special Flood Hazard Area

P PA – Public Assistance
PHMSA– Pipeline and Hazardous Materials Safety Administration
PPM – Parts Per Million

R RPI – Risk Priority Index

S SIU – Southern Illinois University Carbondale
SPC – Storm Prediction Center
STAPLEE – Social, Technical, Administrative, Political, Legal, Economic, and Environmental

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U USGS – United States Geological Survey

Appendices

Appendices

Appendix A. Meeting Minutes

Formal Mitigation Planning Meetings

Meeting 1 – Dec 9th, 2019

Meeting 2 – April 6th, 2020

Meeting 3 – May 19th, 2020

Meeting 4 – June 10th, 2020

Outside Meetings

See Attached Outside Meeting Minutes and Sign-in Sheets

Meeting 1 – December 9th, 2019

Attendance Roster For

The First Planning

Meeting For

EMPG Grant

Name	Organization	Position
Dave Ernest	Boone County Sheriff's Office	Sheriff
Perry Gay	Boone County Sheriff's Office	Chief Deputy
Pat Molloy	Boone County Sheriff's Office	Lieutenant
Dan Zaccard	Boone County EMA	Director
Shane Woody	Belvidere Police	Chief
Pat Gardner	Belvidere Police	Deputy Chief
Mat Wallace	Belvidere Police	Deputy Chief
Al Hyser	Belvidere Fire Department	Chief
Joel Shadden	Boone County Information Tech	Manager
Sherry Giesecky	Boone County Board Member	Board Member
Steve Kirshbaum	Swedish American Hospital	Paramedic Educator
Brent Anderson	City of Belvidere	Public Works Director
Austin Edmonson	Boone County Administration	Interim Director
Dan Streed	Boone County Administration	Assistant Director
Becky Wigget	Boone County Coroner's Office	Coroner
Ellen Genrich	Boone County Health Department	Disaster Coordinator

Meeting 2 – April 6th, 2020

COIVD-19 response cancelled scheduled formal assembly of planning team. In lieu of cancelled meeting, a phone meeting and email communication between SIU (James Conder) and Boone County EMA (Dan Zaccard) took place on April 6, 2020 with the following outcomes:

Reviewed County Risk Assessments

County EMA will contact jurisdictions individually for jurisdictional risk assessments.

SIU delivered Mitigation Strategy information, including printed materials to County EMA.

County EMA to distribute the materials to the various jurisdictional representatives.

Reviewed Mitigation Strategies from previous plan.

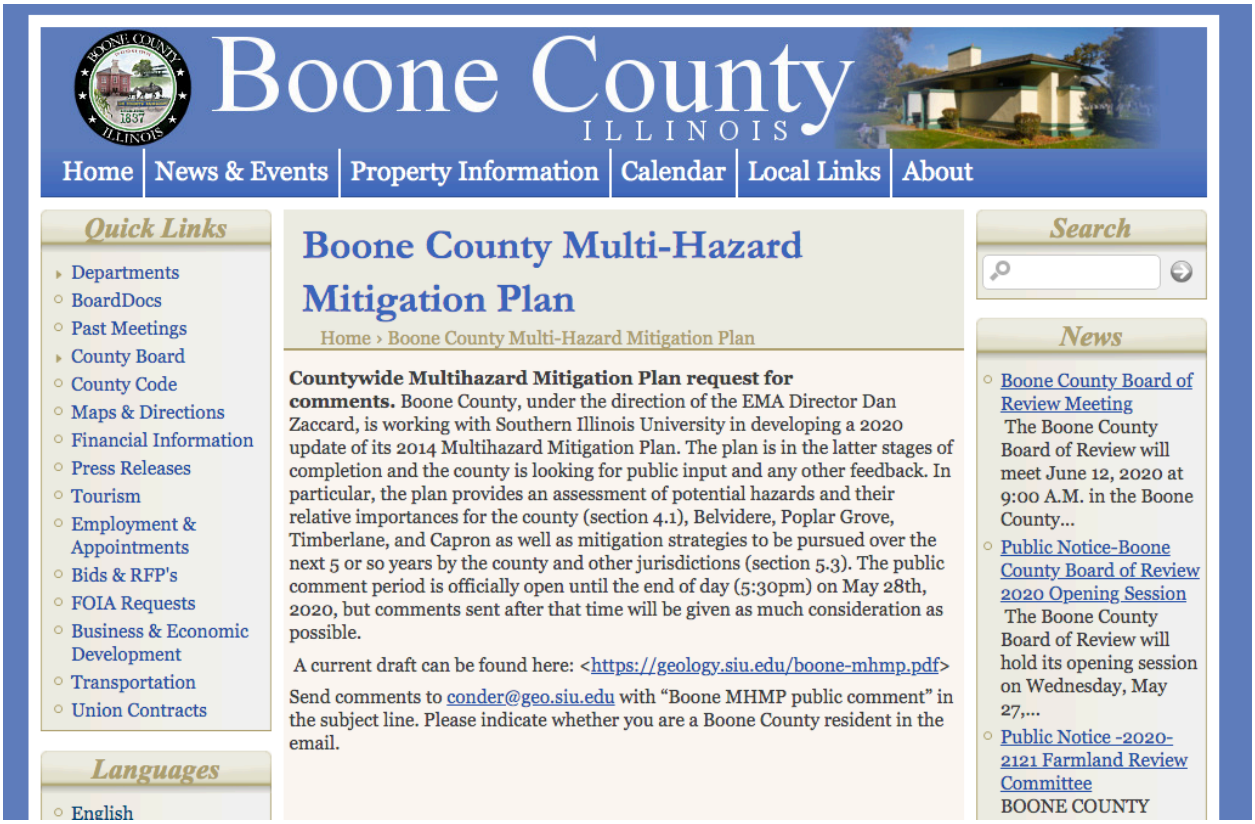
Over the course of the weeks of April 6th and April 13th, the County EMA had individual phone meetings with representatives from the Health Department, Belvidere, Capron, Poplar Grove, and Timberlane covering the above points.

On or about July 10, the County EMA had additional follow-up phone meetings with Capron, Poplar Grove, and Timberlane refining mitigation strategy priorities.

Meeting 3 – May 19th, 2020

Public meeting. COIVD-19 precluded a formal assembly. In lieu of physical assembly, a call for public comments was issued on the County's website with a downloadable version of the plan. In addition to being advertised on the county's website, the comment period was advertised in printed publications of the Rockford Register and the Boone County Shopper as well as the Boone County Shopper's Facebook page and the SIU Geology page. The formal comment period lasted from May 19th to May 28th.

Appendix B. Local Press Release and Newspaper Articles



Boone County
ILLINOIS

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Quick Links

- Departments
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- FOIA Requests
- Business & Economic Development
- Transportation
- Union Contracts

Languages

- English

Boone County Multi-Hazard Mitigation Plan

Home › Boone County Multi-Hazard Mitigation Plan

Countywide Multihazard Mitigation Plan request for comments. Boone County, under the direction of the EMA Director Dan Zaccard, is working with Southern Illinois University in developing a 2020 update of its 2014 Multihazard Mitigation Plan. The plan is in the latter stages of completion and the county is looking for public input and any other feedback. In particular, the plan provides an assessment of potential hazards and their relative importances for the county (section 4.1), Belvidere, Poplar Grove, Timberlane, and Capron as well as mitigation strategies to be pursued over the next 5 or so years by the county and other jurisdictions (section 5.3). The public comment period is officially open until the end of day (5:30pm) on May 28th, 2020, but comments sent after that time will be given as much consideration as possible.

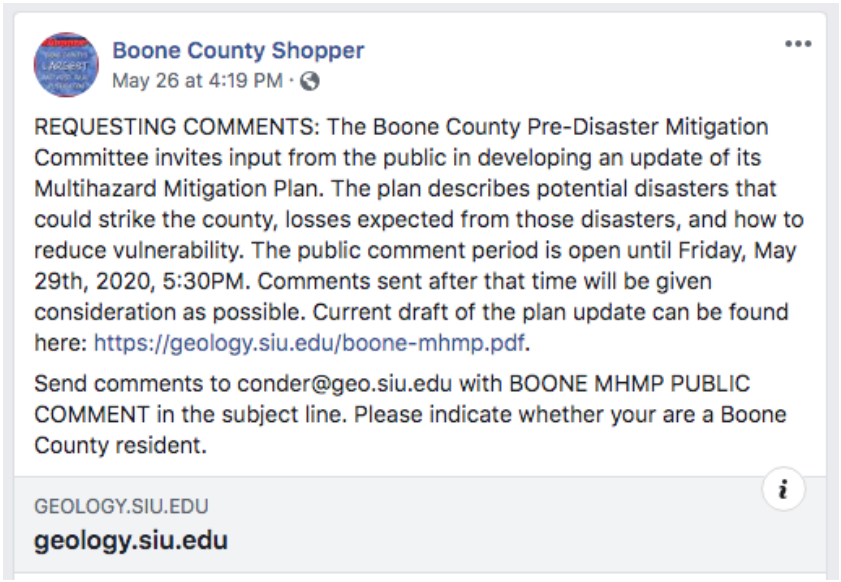
A current draft can be found here: <https://geology.siu.edu/boone-mhmp.pdf>

Send comments to conder@geo.siu.edu with "Boone MHMP public comment" in the subject line. Please indicate whether you are a Boone County resident in the email.

Search

News

- Boone County Board of Review Meeting
  The Boone County Board of Review will meet June 12, 2020 at 9:00 A.M. in the Boone County...
- Public Notice-Boone County Board of Review 2020 Opening Session
  The Boone County Board of Review will hold its opening session on Wednesday, May 27,...
- Public Notice -2020-2121 Farmland Review Committee
  BOONE COUNTY



Page 8 Boone County Shopper - Belvidere, Illinois - May 28, 2020

REQUESTING COMMENTS: The Boone County Pre-Disaster Mitigation Committee invites input from the public in developing an update of its Multihazard Mitigation Plan. The plan describes potential disasters that could strike the county, losses expected from those disasters, and how to reduce vulnerability. The public comment period is open until May 29th, 2020, 5:30PM. Comments sent after that time will be given consideration as possible. Current draft of the plan update can be found here: https://geology.siu.edu/boone-mhmp.pdf Send comments to conder@geo.siu.edu with BOONE MHMP PUBLIC COMMENT in the subject line. Please indicate whether your are a Boone County resident.

Appendix C. Adopting Resolutions

See Attached Adopting Resolutions

Appendix D. Historical Hazards

See Attached Newspaper Clippings and Map

Emergency crews work almost 12 hours to contain Belvidere ammonia leak

May 28, 2019 11:30 am Breane Lyga

TOP STORIES

UPDATE: Belvidere firefighters say 13 emergency agencies worked almost 12 hours Tuesday to clear an ammonia leak from a Belvidere business.

Belvidere Fire Chief Al Hyser says fire crews were called to Dean Foods for a possible ammonia leak around 7:30 in the morning.

The leak happened after a piece of equipment had an "accidental catastrophic failure."

Fire crews say two people were injured, a worker and a bystander.

The leak was cleaned up by 6 p.m. Tuesday night.

BELVIDERE (WREX) — All Boone County area fire stations are responding to a potential ammonia leak at Dean Foods in Belvidere, according to North Boone Fire District 3.

When an April 21, 1967, Belvidere Tornado cut a 10-mile swath through Belvidere, scenes of destruction such as this were commonplace, with utility trucks arriving in caravans. RRSTAR.COM FILE PHOTO

A tornado cut a 10-mile path of destruction through Belvidere on April 21, 1967, and killed 24 people and injured 500. RRSTAR.COM FILE PHOTO

Appendix E. List of Essential Facilities

Not all data is available for every facility. Other facility specifics may be available upon request.

Emergency Operations Center Facilities

Facility Name	Address	City
Emergency Management Agency	615 N Main Street	Belvidere

Fire Station Facilities

Facility Name	Address	City
Belvidere Fire Department	615 N Main St	Belvidere
Belvidere Fire Department	123 S State St	Belvidere
Boone County Fire District 2	353 E 6th St	Belvidere
Boone County Fire District 2	1777 Henry Luckow Ln	Belvidere
Boone County Fire Protection District 1	130 W Ogden St	Capron
North Boone Fire District 3	305 W Grove	Poplar Grove
North Boone Fire District 3	2409 Main St	Caledonia

Police Station Facilities

Facility Name	Address	City
Boone County Sheriff's Office	615 N Main St.	Belvidere
Belvidere Police Department	615 N Main St.	Belvidere

School Facilities

Facility Name	Address	City
Belvidere Central Middle School	8787 Beloit Rd	Belvidere
Belvidere High School	1500 East Ave	Belvidere
Belvidere North High School	9393 Beloit Rd	Belvidere
Belvidere South Middle School	919 E 6th St.	Belvidere
Boone County Center	1320 E Avenue	Belvidere
Caledonia Elementary School	2311 Randolph	Caledonia
Camelot School	7133 Garden Prairie	Garden Prairie
Capron Elementary School	200 N Wooster St.	Capron
Immanuel Lutheran School	1045 Belvidere Rd	Belvidere
Lincoln Elementary School	1011 Bonus Ave	Belvidere
Manchester Elementary School	3501 Blaine Rd	Poplar Grove
Meehan Elementary School	1401 E 6th St.	Belvidere
North Boone High School	17823 Poplar Grove	Poplar Grove
North Boone Middle School	17641 Poplar Grove	Poplar Grove
North Boone Upper Elementary School	6200 N Boone School Rd	Poplar Grove
Perry Elementary School	633 W Perry St.	Belvidere
Poplar Grove Elementary School	208 N State St.	Poplar Grove
Regional Learning Center	1320 East Avenue	Belvidere
Seth Whitman Elementary School	8989 Beloit Rd	Belvidere
St. James Catholic School	320 Logan Avenue	Belvidere
Washington Academy School	1031 5th Ave	Belvidere

Medical Care and Long Term Care Facilities

Facility Name	Address	City	Comments
Crusader Community Health Belvidere	1050 Logan Ave.	Belvidere	Family Practice, Pediatrics, Dental, Podiatry, Medication Resource Center
OSF Medical Group	143 Kishwaukee Street	Belvidere	Family Medicine
OSF Medical Group Poplar Grove	13539 Illinois Route 76	Poplar Grove	Family Medicine – Geriatric Medicine
Physicians Immediate Care	1663 Belvidere Rd	Belvidere	Walk-in Injury and Illness Center
Rockford Health Physicians	1669 Belvidere Road	Belvidere	Primary care services
Shappert Health Center	2170 Pearl Street	Belvidere	Acute and chronic care for all ages
SwedishAmerican Medical Center of Belvidere	1625 S. State St.	Belvidere	SwedishAmerican Medical Hospital System; 24-Hour Emergency Physicians, inpatient unit
SwedishAmerican Medical Group	1700 Henry Luckow Lane	Belvidere	Clinic (primary care services, specialty care services and ancillary services)

Appendix F. Critical Facilities Map

See Attached Large Format Maps of Critical Facilities.