Jackson County, Illinois

Multi-Hazard Mitigation Plan

A 5-year Update to the Countywide MHMP originally adopted in 2009

Jackson County, Illinois

Multi-Hazard Mitigation Plan

County Adoption Date – April 18, 2023

Written and prepared by Greater Egypt Regional Planning and Development Commission

Kelsey Bowe, Environmental Planner
Tyler Carpenter, GIS & Environmental Planning Director
Gabrielle Reed, Environmental Planner
Noah Scalero, Environmental Planner

Primary Contact

Sheriff Robert Burns
Coordinator
Jackson County Emergency
Management Agency
618.684.3137
jacksoncountyema@gmail.com

Secondary Contact

Orval Rowe
Deputy Coordinator
Jackson County Emergency
Management Agency
618.684.3137
jacksoncountyema@gmail.com

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Acronyms

ASCE	American Society of Civil Engineers	**HMGP**	Hazard Mitigation Grant Program
ASDSO	Association of Dam Safety Officials	**IBC**	International Building Code
BRIC	Building Resilient Infrastructure and Communities	**IDPH**	Illinois Department of Public Health
CARES	Coronavirus Aid, Relief, and Economic Security Act	**IEMA**	Illinois Emergency Management Agency
CDC	Centers for Disease Control	**IEPA**	Illinois Environmental Protection Agency
CDMS	Comprehensive Data Management System	**INDR**	Illinois Department of Natural Resources
CISA	Cybersecurity & Infrastructure Security Agency	**IPCC**	Intergovernmental Panel on Climate Change
CNEOS	Center for NEO Studies	**ISGS**	Illinois State Geological Survey
COVID-19	Coronavirus Disease-19	**ITTF**	Illinois Terrorism Task Force
CRS	Community Rating System	**MCS**	Mesoscale Convection System
CUSEC	The Central U.S. Earthquake Consortium	**MHMP**	Multi-Hazard Mitigation Plan
DI	Damage Indicators	**NASA**	National Aeronautics and Space Administration
DMA	Disaster Mitigation Act of 2000	**NEO**	Near Earth Object
DOD	Degrees of Damage	**NFIP**	National Flood Insurance Program
DRA	Delta Regional Authority	**NMSZ**	New Madrid Seismic Zone
EAP	Emergency Action Plan	**NOAA**	National Oceanic and Atmospheric Administration
EF	Enhanced Fujita (Tornado Scale)	**NORS**	National Outbreak Reporting System
EPCRA	Federal Emergency Planning and Community Right to Know Act of 1986	**NPDP**	National Performance of Dams Program
FAST	Fixing America's Surface Transportation Act of 2015	**NRCS**	National Resources Conservation Service
FEMA	Federal Emergency Management Agency	**NWS**	National Weather Service
FERC	Federal Energy Regulatory Commission	**PDM**	Pre-Disaster Mitigation Grant Program
		SFHA	Special Flood Hazard Areas
FMAG	Fire Management Assistance Grant Program	**US EPA**	United States Environmental Protection Agency
GERPDC	Greater Egypt Regional Planning and Development Commission	**USACE**	United States Army Corps of Engineers
GIS	Geographic Information System	**USDA**	United States Department of Agriculture
HAB	Harmful Algal Bloom	**USFWS**	United States Fish and Wildlife Service
Hazus-MH	Hazus Multi Hazard (modeling software)	**USGS**	United States Geological Survey
HHPD	Rehabilitation of High Hazard Potential Dam Grant Program	**WVSZ**	Wabash Valley Seismic Zone

1. Introduction

The purpose of mitigation planning is for State, local, and Indian tribal governments to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources. (Stafford Act Title 44, Chapter 1, Part 201).

Hazard mitigation planning is required by the Disaster Mitigation Act of 2000 (DMA), which replaced the Stafford Act. Local, tribal, territorial, and state governments must adopt hazard mitigation plans and update them every five years to be eligible for the following Federal Emergency Management Agency (FEMA) grant and insurance programs:

- Hazard Mitigation Grant Program (HMGP)
- Building Resilient Infrastructure and Communities (BRIC)
- Fire Management Assistance Grant Program (FMAG)
- Public Assistance Grant Program (PA)
- Pre-Disaster Mitigation Grant Program (PDM)
- Rehabilitation of High Hazard Potential Dam Grant Program (HHPD)
- National Flood Insurance Program (NFIP)

While this planning process is required for natural hazards, planning partners were encouraged to include any hazards in this plan that pose potential threats to their communities. In addition to FEMA funding, having Multi Hazard Mitigation Plans (MHMP) in place can streamline the process of applying for other federal, state, and local disaster mitigation and relief funding opportunities.

In order to help communities plan for natural hazards, FEMA developed Hazus Multi Hazard (MH), a geographic information system (GIS) based software that models earthquakes, floods, and other natural hazards. This software can estimate physical and economic losses and social impacts, help communities identify high risk areas, and provide the necessary information to create mitigation strategies for these natural hazards. Hazus-MH uses data from the US Census Bureau and allows for manual editing and additions of data. This ensures accuracy and relevancy to the county.

This Multi-Hazard Mitigation Plan (MHMP), adopted by Jackson County and all jurisdictions within, fulfills the requirement of the DMA, which amended section 322 of the Stafford Act, 42 U.S.C. 5165. The First MHMP for Jackson County was adopted in 2009. This will be the second update to the original plan.

2. Planning Process

Hazard Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from a natural hazardous event. Hazard Mitigation Planning involves communities in a four-step process to identify risks and vulnerabilities to natural hazards and develop long-lasting strategies that lead to the development of a comprehensive approach to risk reduction and an effective mitigation plan[1].

- Organize resources
- Assess risks
- Develop a mitigation plan
- Implement the plan and monitor progress

Planning Timeline

The planning process was be completed by Greater Egypt Regional Planning and Development Commission (Greater Egypt) and the Franklin County Planning Team. The planning team consists of at least 1 member representing each jurisdiction within the county. The planning timeline involved partner and public meetings, the writing and review of the plan, finalization of plan and adoption by the county and all jurisdictions, and state and federal review and approval.

Figure 2.1: MHMP planning timeline for 2021-2022

Mitigation Planning Timeline	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
	1	2	3	4	5	6	7	8	9	10	11	12	13
Meetings: Goals and Objectives													
Meetings: Public involvement													
Meetings: Mitigation Activities													
Write Plan													
Review Plan													
Finalize Plan													
Print Plan													
State/ Federal Review													

[1] Illinois Emergency Management Agency, "Mitigation Planning".

Meeting 1: Goals and Objectives

- *Greater Egypt presented the planning process and review the responsibilities of planning partners*
- *Greater Egypt presented historical, current, and possible hazards that are a threat to the county. Maps of risk areas within the county and southern Illinois were included in presentation.*
- *Greater Egypt reviewed the Hazus-MH hazard modeling process and reviewed essential and critical facilities data.*
  - *Planning partners were given the option to review and edit these datasets to provide the most accurate flood and earthquake models.*
- *Planning partners participated in a hazard ranking exercise to determine which hazards have the highest severity and probability of occurring.*
  - *The top ranked hazards from this exercise were modeled using Hazus-MH and other GIS based software to estimate physical damage, economic loss, and social impacts if the hazard occurred.*

Meeting 2: Public Involvement

- *Meeting 2 consisted of a review of hazard rankings, preliminary hazard models, and an introduction to the mitigation strategies exercise.*
  - *The public was notified of this meeting through a series of newspaper press releases (see Appendix 6 for full list of press releases).*
- *The public was encouraged to provide their input in the planning process, including providing suggestions of any additional hazards to include in the plan and any mitigation strategies*
  - *No public comments were received for this plan*

Meeting 3: Mitigation Strategies

- *Greater Egypt reviewed the finalized hazard ranking list and summarized the mitigation strategies that were provided by planning partners.*
- *Planning partners provided final comments and ideas for mitigation strategies.*
- *This will be the final opportunity to provide mitigation strategies and update the Hazus essential facilities list*

Meeting 4 (optional): Plan Review

- *If requested by the planning team, Greater Egypt hosted a 4th meeting to review the final MHMP before each jurisdiction adopts the plan.*
  - *This will be the final opportunity for planning partners to request any edits and additions to the MHMP.*

2.1. Responsibilities of Planning Partners

The planning partners are vital to completion of the MHMP, knowledge and expertise of local leaders is necessary to identify hazards and develop mitigation strategies. FEMA also requires the participation of partners for the plan to be approved and adopted.

There are 31 participating jurisdictions and stakeholders in Jackson County. At least 1 member representing each jurisdiction is required to participate in the planning process. Planning partners were actively involved in the following activities (* indicates required participation):

Attend at least two meetings during the planning process
Complete a hazard ranking exercise for your jurisdiction
Propose mitigation strategies for each hazard*
Assist with meeting match requirements
Review and provide comments on drafts of the full plan
Assist in coordinating public involvement
Review and update the county datasets
Integrate the MHMP into other planning and development initiatives as appropriate
Submit photographs, GIS files, and any other data relating to natural hazards, the county, or jurisdictions to improve the detail of the MHMP
Formally adopt the Jackson County MHMP as an official Plan* (Required for County and participating municipalities, optional for other organizations)

The full list of Planning Team members can be found in Appendix 1.

2.2. Neighboring Communities

Greater Egypt organized Planning Teams and wrote Multi-Hazard Mitigation Plans for the 5 Counties of its planning district: Franklin, Jackson, Jefferson, Perry, and Williamson. The EMA coordinators of these counties were in contact with each other and Greater Egypt throughout the planning process. EMA Coordinators, other County staff, and other jurisdictions attended meetings and assisted in planning for multiple counties. Meeting attendance can be found in appendix 4; other planning activities are recorded in county match documents and can be available upon request.

2.3. Review of Technical Documents

The planning process included review of local, state, federal, and academic resources. The 2015 Jackson County Multi-Hazard Mitigation Plan was reviewed and incorporated into this updated version. Hazard background information is cited in footnotes throughout this Plan. GIS data sources are provided on every map. Data tables have sources listed below each table. Detailed GIS data can also be requested from Greater Egypt at any time from https://greateregypt.org/gis-services/

3. Jackson County Profile

3.1. County Background

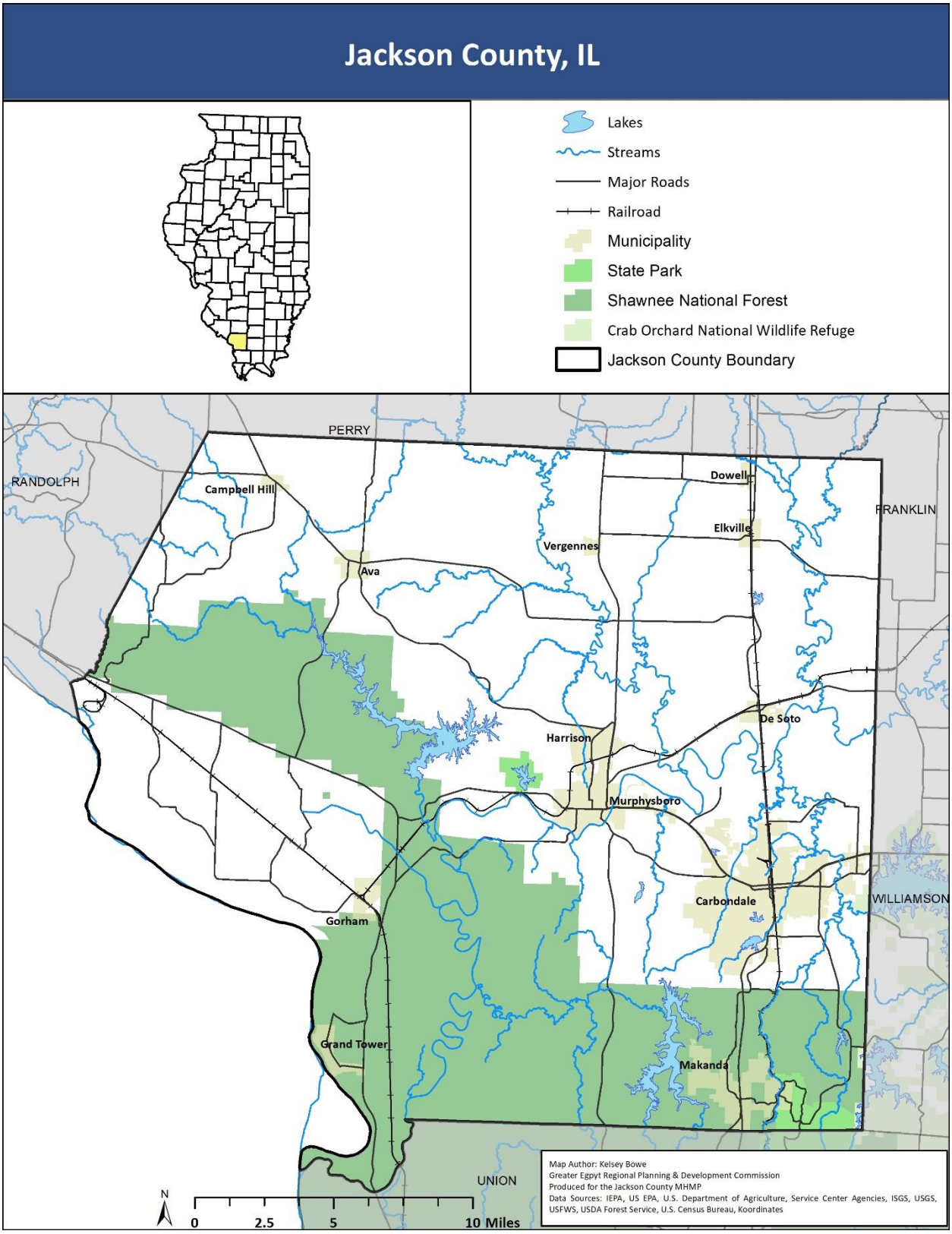
Jackson County is located in southern Illinois and is one of the more populous counties in the region. Its western edge borders the Mississippi River and the state of Missouri. It is bounded to the north by Randolph and Perry counties. Franklin and Williamson counties border Jackson to the east, while Union County borders to the south. It lies approximately 75 miles southeast of St. Louis, MO and 170 miles south of Springfield, IL.

The county was named after former president Andrew Jackson. Jackson County's boundaries were claimed in 1816 from parts of both Randolph and Johnson Counties. However, in 1827, its boundaries were reduced when Perry County subsumed some of Jackson County's northern territory. Jackson County's political boundaries remain the same to this day. The county seat was located in Brownsville until it burned down in 1843. It was then moved to Murphysboro, where it resides to this day.

Jackson County's primary economic drivers are educational institutions, health care, social services, and retail trade. Southern Illinois University and SIH are major institutions in Jackson County. The region also boasts many tourist amenities including two state parks, the Shawnee National Forest, wineries, orchards, entertainment venues, restaurants, and hotels.

Jackson County, IL is part of the Delta Regional Authority (DRA) and is listed as a distressed county. The DRA is a federal-state partnership that encompasses 252 counties and parishes in the Mississippi River Delta and Alabama Black Belt regions. This organization is led by two president appointed chairpersons and the governors of the 8 participating states (Alabama, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, Tennessee). The goal of the DRA is to improve the economic opportunities for the counties involved, which are considered the most distressed in the U.S.; Federal funds are allocated to the DRA every year, where they are invested into local communities based on applications. The DRA's total funding allocation budget in 2021 was $14,847,923.00.

Figure 3.1


Jackson County, IL
Lakes
Streams
Major Roads
Railroad
Municipality
State Park
Shawnee National Forest
Crab Orchard National Wildlife Refuge
Jackson County Boundary
PERRY
RANDOLPH
Campbell Hill
Dowell
FRANKLIN
Elkville
Vergennes
Ava
De Soto
Harrison
Murphysboro
Carbondale
WILLIAMSON
Gorham
Grand Tower
Makanda
UNION
N
0
2.5
5
10 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: IEPA, US EPA, U.S. Department of Agriculture, Service Center Agencies, ISGS, USGS, USFWS, USDA Forest Service, U.S. Census Bureau, Koordinates

3.2. Demographics

Based on the 2020 Decennial Census, Jackson County has 52,974 residents. This is a 12% decrease in population from 2010 figures. Jackson County is divided into sixteen townships: Bradley, Carbondale, Degognia, De Soto, Elk, Fountain Bluff, Grand Tower, Kinkaid, Levan, Makanda, Murphysboro, Ora, Pomona, Sand Ridge, Somerset, and Vergennes. The population by township within Jackson County can be seen in Table 3.1. According to the U.S. Census Bureau, 72.1% of residents in Jackson County are white, 5.4% are Hispanic or Latino, and 14.3% are Black or African American. A full breakdown of race and Hispanic origins for Jackson County is displayed in Table 3.2.

Table 3.1 - Jackson County 2020 Population Estimates by Township

Township	2020 Population
Carbondale	24,686
Murphysboro	9,434
Makanda	4,034
Somerset	3,934
De Soto	2,319
Bradley	1,908
Elk	1,746
Levan	816
Pomona	794
Sand Ridge	722
Vergennes	717
Grand Tower	567
Ora	492
Kinkaid	447
Fountain Bluff	204
Degognia	154

Source: U.S. Census Bureau

Table 3.2 - Race and Hispanic Origin of Population in Jackson County

Race and Hispanic Origins	Percentage of Population
American Indian and Alaska Native alone	0.40%
Asian alone	3.90%
Black or African American alone	14.30%
Two or more races	6.60%
Hispanic or Latino	5.40%
White alone, not Hispanic or Latino	70.80%
White alone	72.10%
Native Hawaiian and Pacific Islander	0.05%
Some other race	2.70%

Source: U.S. Census Bureau

3.3. Economy and Industry

Major economic activity in Jackson County is located around Carbondale and Murphysboro, which are linked by Route 13 - a major thoroughfare in the region. Primary industries in the region are educational services and healthcare. Southern Illinois University, Carbondale School Districts, and Murphysboro Unit School Districts are the largest educational employers. Memorial Hospital of Carbondale, Neuro Restorative, and St. Joseph Memorial Hospital are the largest healthcare employers in the county. Other industries include retail trade, service industry, and manufacturing. Walmart, Lowes, Kroger, and Schnucks are some of the larger retail employers, while Penn Aluminum International and Com-Pac International are some of the larger manufacturing employers.

According to the U.S. Census Bureau, Jackson County has a median household income of $37, 241 and a per capita income of $24,804. Roughly 25.4% of the population is below the poverty line – the national poverty rate is 10.5%.

Table 3.3 - Number of People Employed by Major Industries in Jackson County

Industry	Estimated Number of Employees
Educational Services	5,490
Health Care & Social Assistance	4,022
Retail Trade	3,233
Accommodation & Food Services	2,137
Manufacturing	1,746
Agriculture, Forestry, Fishing & Hunting	502

Source: Data from the Census Bureau ACS 5-year Estimate

3.4. Land Use and Development Trends

Before European settlement, Jackson County was largely deciduous forest with small areas of prairie as well. Over recent centuries, the land cover has been transformed by agriculture, mining, and urban development. Agriculture and deciduous forest currently dominate the land cover of Jackson County. Shawnee National Forest, Giant City State Park, and Lake Murphysboro State Park comprise large portions of the county's public land. Southern Illinois University - Carbondale, Touch of Nature, Carbondale and Murphysboro Park Districts, Crab Orchard National Wildlife Refuge, and Southern Illinois Airport are other major public land use spaces in the county.

The coal mining industry was a driving economic force in Jackson County during the 20th century. Ramifications of historic mining, such as mine spoil piles and acid mine drainage, are still present today. There are small portions of Jackson County that have been left unsuitable for development or agriculture as a result of un-reclaimed mining sites.

Significant portions of the agricultural land are used for hay or pasture as seen in Figure 3.3. There are pockets of highly productive agricultural land, major crops in the region are corn, soy, winter wheat, and hay. On the western border of the county, which resides in the fertile Mississippi River floodplain, corn and soybeans are grown. While this area has prime soil for growing crops, it is also subject to heavy losses during years of high flooding. South of Carbondale, vineyards and orchards abound in the microclimates of the Shawnee hills.

Urban development in the county has been focused along the Route 13 corridor which runs east to west from Carbondale to Murphysboro before turning to the north. Southern Illinois University Carbondale has been a major economic driver in the region for many decades - though enrollment has declined in recent years. Economic growth in the region tends around

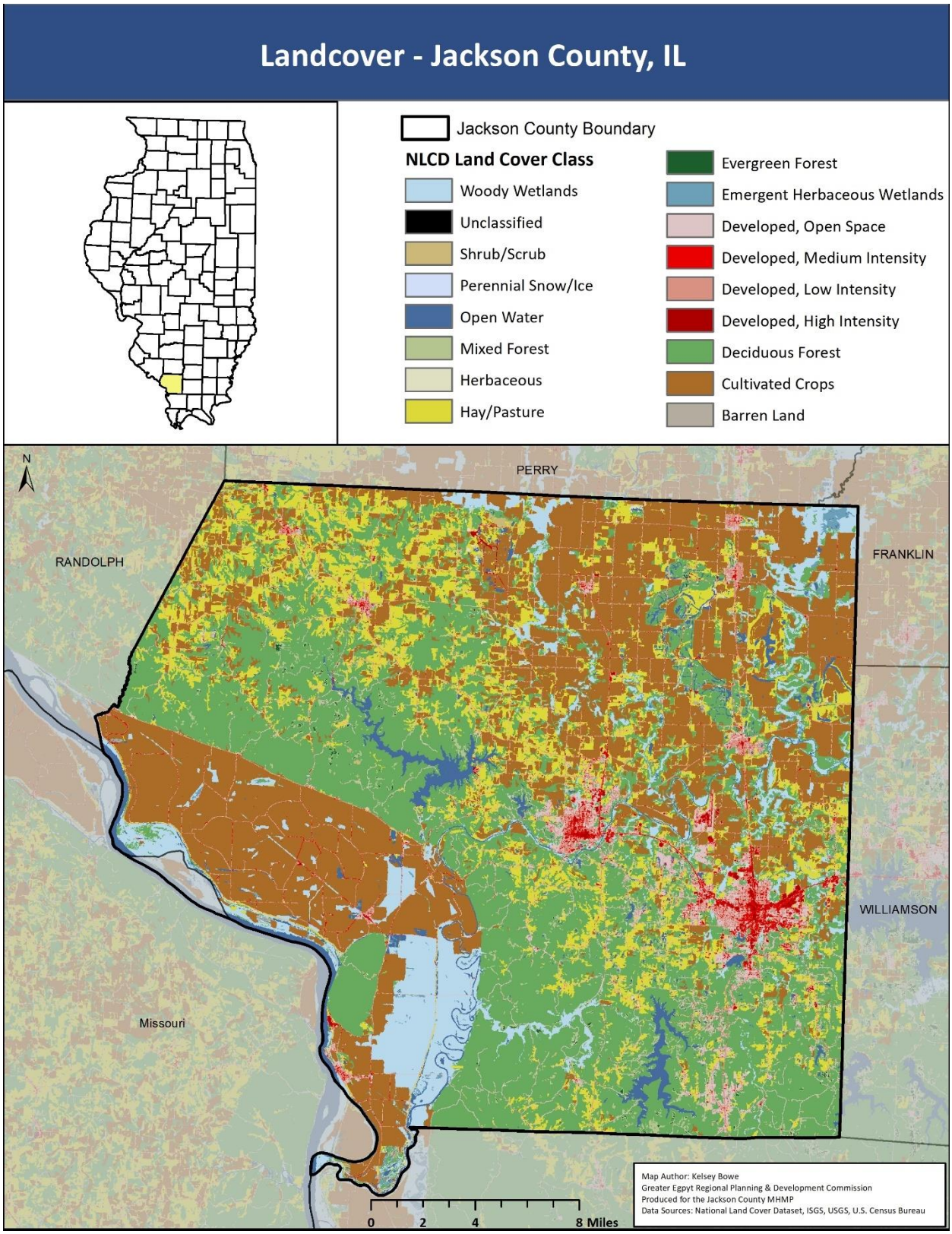
Southern Illinois University, Carbondale Memorial Hospital, the retail centers along Route 13, and numerous housing developments. Both the City of Carbondale Comprehensive Plan, adopted in 2011, and the Downtown Master Plan, adopted in 2016, depict plans for growth and urban improvements in the Carbondale area. Table 3.4 reflects recent changes in development for Jackson County.

Table 3.4 – Summary of Commercial/Industrial Permits Issued for the Jackson County Enterprise Zone

Year	Total Permits Issued	New Construction
2016	24	8
2017	3	2
2018	14	4
2019	19	9
2020	16	3
2021	17	not listed
2022	15	not listed

Source: City of Carbondale Economic Development Director

Figure 3.2


Landcover - Jackson County, IL
Jackson County Boundary
NLCD Land Cover Class
Woody Wetlands
Unclassified
Shrub/Scrub
Perennial Snow/Ice
Open Water
Mixed Forest
Herbaceous
Hay/Pasture
Evergreen Forest
Emergent Herbaceous Wetlands
Developed, Open Space
Developed, Medium Intensity
Developed, Low Intensity
Developed, High Intensity
Deciduous Forest
Cultivated Crops
Barren Land
N
PERRY
RANDOLPH
FRANKLIN
WILLIAMSON
Missouri
0
2
4
8 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: National Land Cover Dataset, ISGS, USGS, U.S. Census Bureau

3.5. Climate

Jackson County encompasses two Köppen-Geiger climate zones: Dfa (hot-summer humid continental) and Cfa (humid subtropical). Summers are humid and warm, while winters are cool and wet. The warmest months are June – September with average highs reaching 89°F and lows in the mid to high 60's. Average highs in the winter are well above freezing: the average high in January is 40°F and the low is 24°F. However, this region is subject to wildly variable weather, often leading to weeks of stifling heat in the summer and very cold conditions in the winter. Average annual precipitation is 43.18 inches. Though daytime highs in the winter are often above freezing, cold spells with significant snowfall and ice buildup are not uncommon in the winter. Jackson County's climate may become more variable in the future as suggested by recent Intergovernmental Panel on Climate Change (IPCC) reports and other climate studies. More detailed information regarding climate change can be found in section 4.1

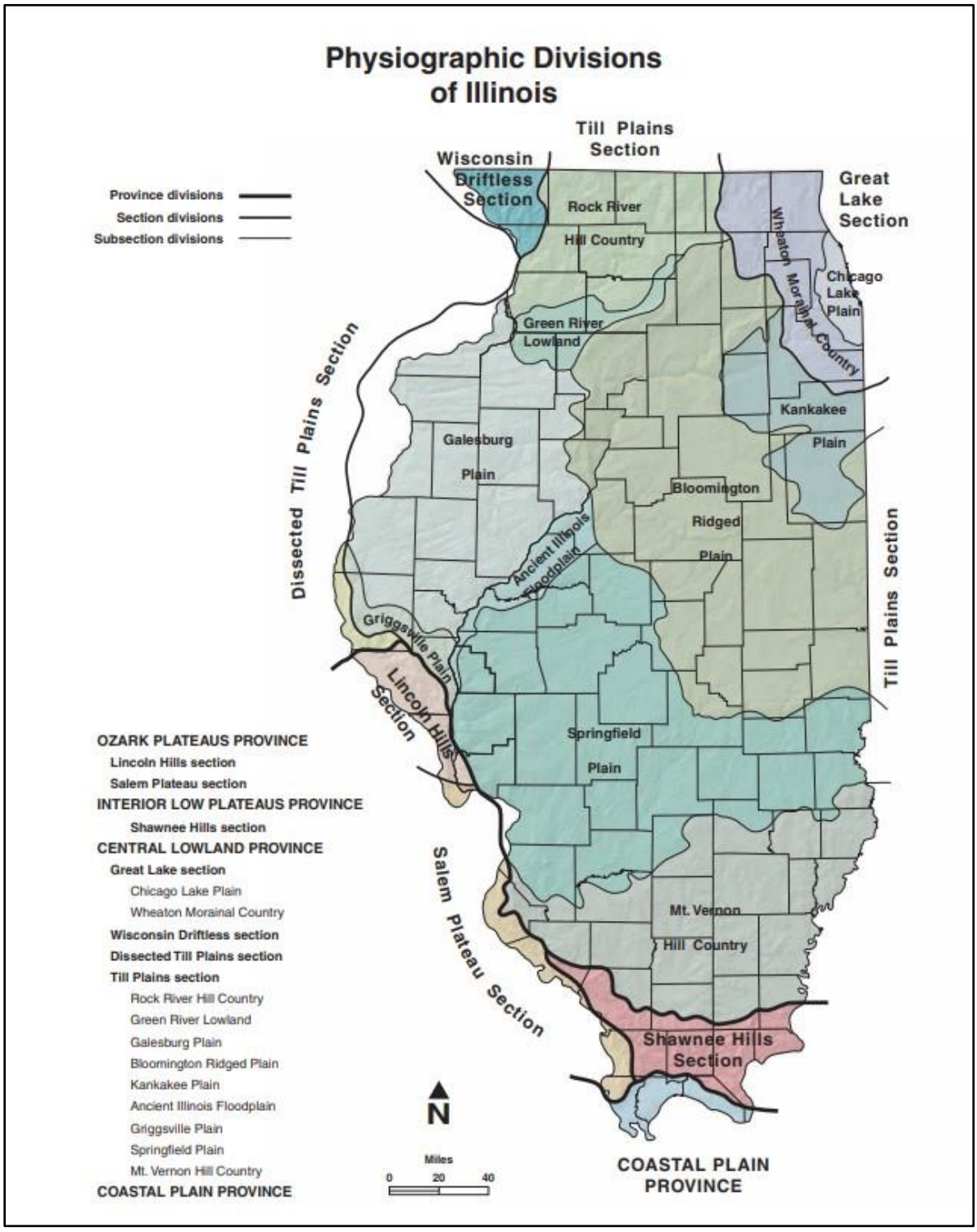
3.6. Topography & Hydrology

Illinois is divided into four physiographic provinces with seven sections and 11 subsections (figure 3.3), Jackson County is located within three physiographic divisions: The Mt Vernon Hill Country portion of the Till Plains, Shawnee Hill Section, and the Salem Plateau Section of Illinois. The Till Plains topography resulted from the deposition of unsorted glacial sediments during the final stages of the Wisconsin glaciation. However, this region is predominantly controlled by bedrock and not deep sediment deposits. The Shawnee hills physiographic division was untouched by glaciers, because of this the topography in the southwest portion of Jackson County is characterized by larger, rolling hills and steeper stream valleys which often contain bluffs of exposed sandstone and limestone bedrock. The Salem Plateau division covers small portions of the western part of Jackson County near the Mississippi River. This region is characterized by large, flat plains.

Jackson county contains both coal bearing and karst bedrocks, see section 4.13 for detailed information.

The highest elevation in Jackson County is 811ft (247m) above sea level at Grassy Knob, the lowest point in the county is 340ft (103m) above seas level near the confluence of the Big Muddy and Mississippi rivers.

Figure 3.3 - Physiographic Divisions of Illinois



Source: Illinois State Geological Survey (ISGS)

Jackson County is drained by the Big Muddy watershed (HUC ID: 07140106) and the Upper Mississippi – Cape Girardeau watershed (HUC ID: 07140105) (figure 3.4). The county is bordered to the west by the Mississippi River. The major lakes in the county are Campbell Lake, Holliday Lake, Lake Kinkaid, New Thompson Lake, Lake Chautauqua, Lake Murphysboro, Campus Lake, Carbondale City Lake, Cedar Lake, Grand Tower Chute, Midland Hills Lake, and Spring Arbor Lake.

The Big Muddy watershed covers large portions of Franklin, Jackson, Jefferson, Perry, Washington, and Williamson Counties. It also drains small portions of Hamilton, Johnson, and Union Counties. The main tributaries to the Big Muddy River in Jackson County are Beaucoup creek, Little Muddy River, Cedar creek and Crab Orchard creek. The Big Muddy River converges with the Mississippi River south of Grand Tower, IL. The western portion of the county drains directly to the Mississippi River. See figure 3.5 for elevation, watershed boundaries, and major water bodies of Jackson County.

Figure 3.4

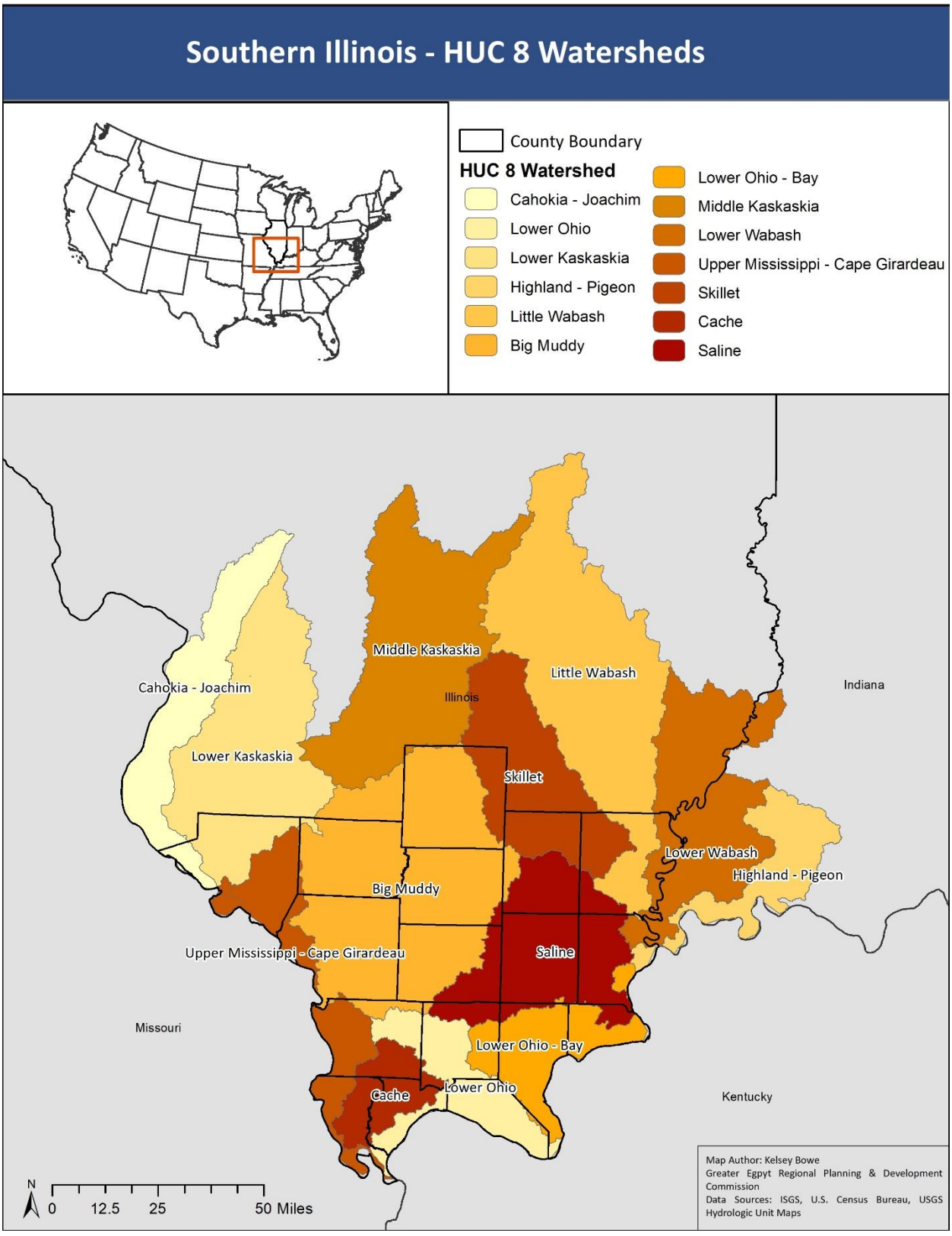
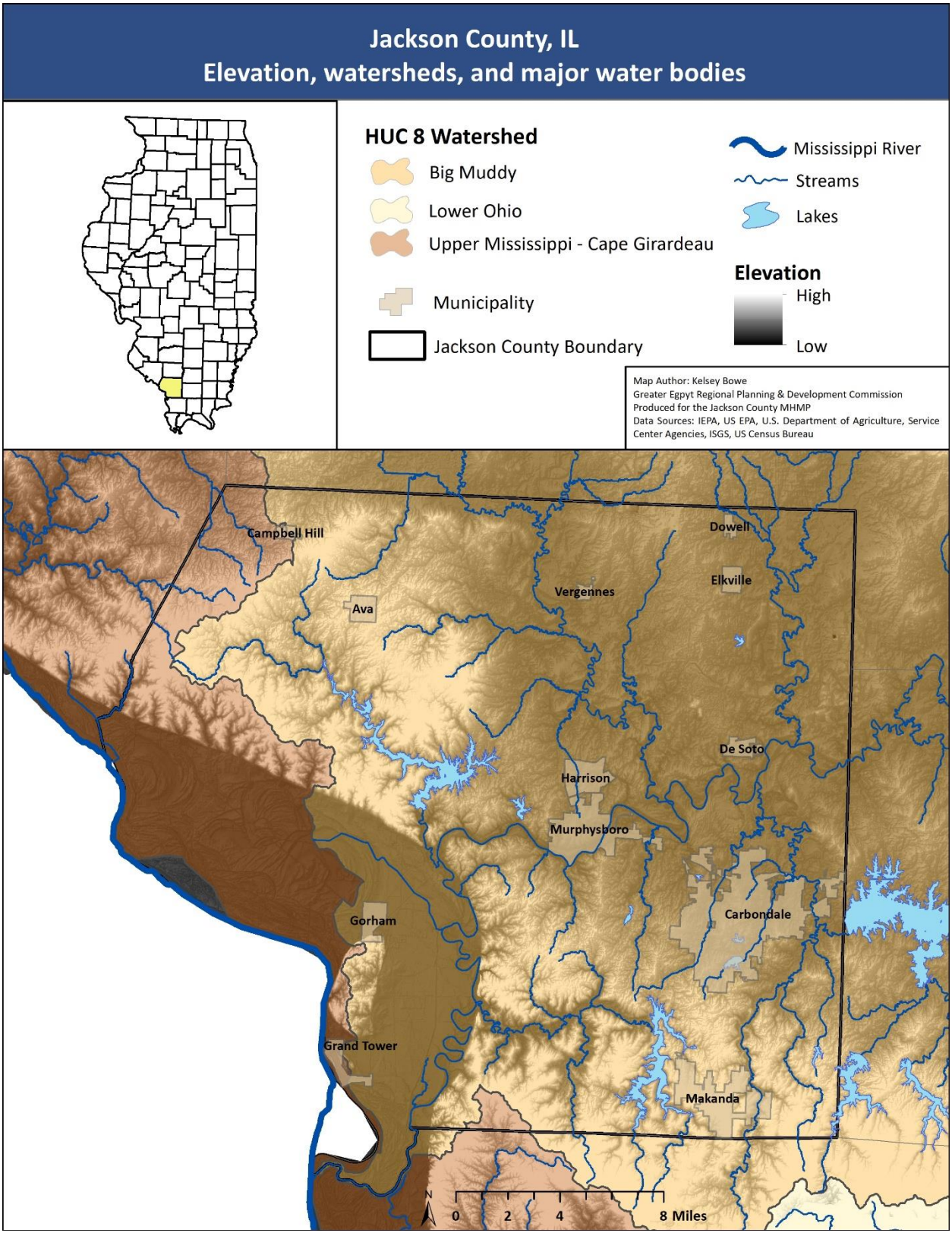

Southern Illinois - HUC 8 Watersheds
County Boundary
HUC 8 Watershed
Cahokia - Joachim
Lower Ohio
Lower Kaskaskia
Highland - Pigeon
Little Wabash
Big Muddy
Lower Ohio - Bay
Middle Kaskaskia
Lower Wabash
Upper Mississippi - Cape Girardeau
Skillet
Cache
Saline
Middle Kaskaskia
Little Wabash
Cahokia - Joachim
Illinois
Indiana
Lower Kaskaskia
Skillet
Lower Wabash
Highland - Pigeon
Big Muddy
Upper Mississippi - Cape Girardeau
Saline
Missouri
Lower Ohio - Bay
Cache
Lower Ohio
Kentucky
N
0
12.5
25
50 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Data Sources: ISGS, U.S. Census Bureau, USGS Hydrologic Unit Maps

Figure 3.5


Jackson County, IL
Elevation, watersheds, and major water bodies
HUC 8 Watershed
Big Muddy
Lower Ohio
Upper Mississippi - Cape Girardeau
Municipality
Jackson County Boundary
Mississippi River
Streams
Lakes
Elevation
High
Low
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: IEPA, US EPA, U.S. Department of Agriculture, Service Center Agencies, ISGS, US Census Bureau
Campbell Hill
Dowell
Elkville
Vergennes
Ava
De Soto
Harrison
Murphysboro
Carbondale
Gorham
Grand Tower
Makanda
N
0
2
4
8 Miles

4. Hazard Descriptions and Risk Assessments

4.1. Introduction

The following section will contain hazard definitions, examples of potential extent and impacts that may occur, details on historic occurrences within Jackson County, and relevant maps and figures. When possible, all historic occurrences encompass hazard events from 1950-2021, but some databases may be missing records.

4.1.1. Relevant FEMA definitions:

Hazard Extent: Strength or magnitude of hazard. Can be measured on scientific scales (Tornado EF Scale, Palmer drought severity index, etc.), measurements of the hazard (flood height, snow depth, etc.), or other factors such as duration and speed of onset.
Hazard Impacts: Consequences/effects of the hazard on a community and its assets. Examples include number of injuries/deaths, dollar amount of property/crop damage, number of days without power, etc.

Essential and Critical Facilities: The FEMA Hazus Software designates important facilities and infrastructure into two categories, which will be used throughout the plan:

- **Essential:**
  - Emergency Operations Centers
  - Police stations
  - Fire stations
  - Schools
  - Hospitals
- **Critical:**
  - Transportation – Airports, highways, railways, and bridges
  - Utilities – wastewater treatment, potable water storage, water/sewer lines, gas pipelines, power plants
  - Communication - TV & Radio Stations
  - Dams*
  - Military Facilities*
  - User Defined**

  *While Hazus has designated space for dams and military spaces, they are not currently part of the default datasets provided and were therefore not included in the hazard models.

  **The user defined category is space for a community to input their own structures into Hazus, the Jackson County Planning Team included ambulance stations in this category.

A complete list of Jackson County's essential and critical facility data can be found in Appendix 2.

4.1.2. Emerging Hazard – Climate Change

Global average temperature has increased by 1.8°F from 1901 to 2016. Evidence consistently points to human related activities, mainly greenhouse gas emissions, as the cause[2]. Climate change is no longer a future problem as effects are being felt in the present time around the world, and events and trends associated with climate change are only expected to continue to increase in number of events and in severity[3] .

Our planet is a complex system of natural ecosystems and human infrastructure, and climate change can drive many different outcomes within a small area. In the Midwest, climate change is driving more dramatic shifts in seasonal hydrologic regimes. Areas are experiencing severe storms, floods, and extreme heat waves within generally short time periods. All of these factors can decrease infrastructure stability, agriculture productivity, water and air quality, and general community resiliency to natural hazards. Southern Illinois currently encompasses regions within Köppen-Geiger climate types Dfa (hot-summer humid continental) and Cfa (humid subtropical), but future models suggest most of the state will be classified as Cfa by 2071[4]. Figures 4.1 and 4.2 show the Köppen-Geiger climate classifications of Illinois and surrounding areas for present day (based on data from 1980-2016) and projected climate types for the future (based on 32 different climate models for years 2071-2100).

Illinois joined the U.S. Climate Alliance in January 2019. This is a bipartisan coalition of 24 governors with commitment to implementing policies that advance the goals the Paris Agreement, track and report progress of each state to the global community, and advance new and existing policies to promote clean energy and reduce carbon pollution.[5]

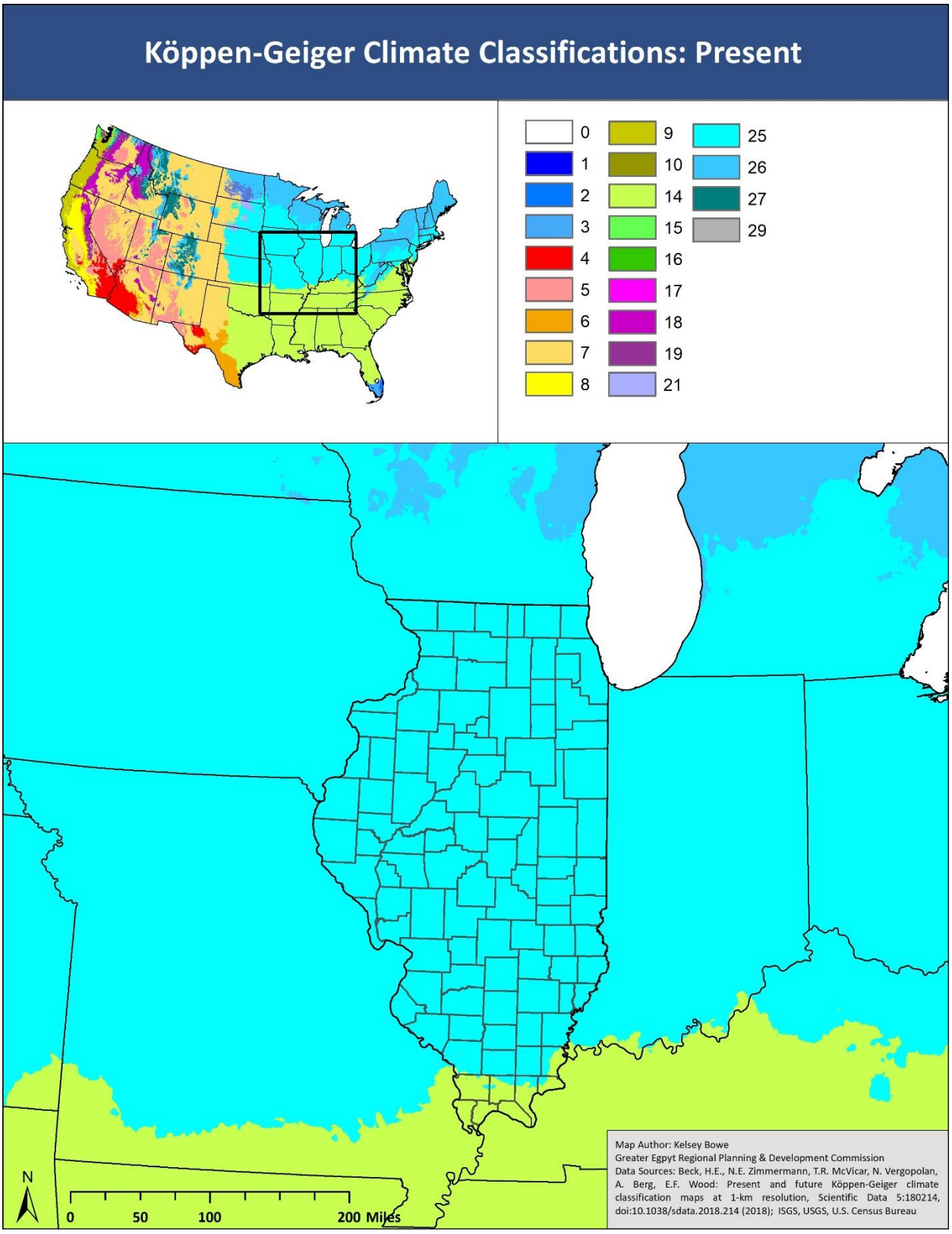
This Multi-Hazard Mitigation Plan will contain a sub section within each chapter, when relevant, to discuss the risks associated with climate change related increases of the specific hazard.

[2] Hayhoe, K. et al., 2018: Our Changing Climate. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II U.S. Global Change Research Program, Washington, DC, USA, pp. 72–144.
[3] Gray, E. and Merzdorf J. "Earth's Freshwater Future: Extreme Floods and Drought", NASA Global Climate Change, 2019.
[4] Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood: Present and future Köppen-Geiger climate classification maps at 1-km resolution, Scientific Data 5:180214, doi:10.1038/sdata.2018.214 (2018).
[5] Igusky, K., "Illinois Governor J. B. Pritzker Joins U.S. Climate Alliance", United States Climate Alliance, 2019.

Table 4.1: Key to the Köppen-Geiger climate classifications

	1: Af Tropical, rainforest
	2: Am Tropical, monsoon
	3: Aw Tropical, savannah
	4: BWh Arid, desert, hot
	5: BWk Arid, desert, cold
	6: BSh Arid, steppe, hot
	7: BSk Arid, steppe, cold
	8: Csa Temperate, dry summer, hot summer
	9: Csb Temperate, dry summer, warm summer
	10: Csc Temperate, dry summer, cold summer
	11: Cwa Temperate, dry winter, hot summer
	12: Cwb Temperate, dry winter, warm summer
	13: Cwc Temperate, dry winter, cold summer
	14: Cfa Temperate, no dry season, hot summer
	15: Cfb Temperate, no dry season, warm summer
	16: Cfc Temperate, no dry season, cold summer
	17: Dsa Cold, dry summer, hot summer
	18: Dsb Cold, dry summer, warm summer
	19: Dsc Cold, dry summer, cold summer
	20: Dsd Cold, dry summer, very cold winter
	21: Dwa Cold, dry winter, hot summer
	22: Dwb Cold, dry winter, warm summer
	23: Dwc Cold, dry winter, cold summer
	24: Dwd Cold, dry winter, very cold winter
	25: Dfa Cold, no dry season, hot summer
	26: Dfb Cold, no dry season, warm summer
	27: Dfc Cold, no dry season, cold summer
	28: Dfd Cold, no dry season, very cold winter
	29: ET Polar, tundra
	30: EF Polar, frost

Figure 4.1


Köppen-Geiger Climate Classifications: Present
0
1
2
3
4
5
6
7
8
9
10
14
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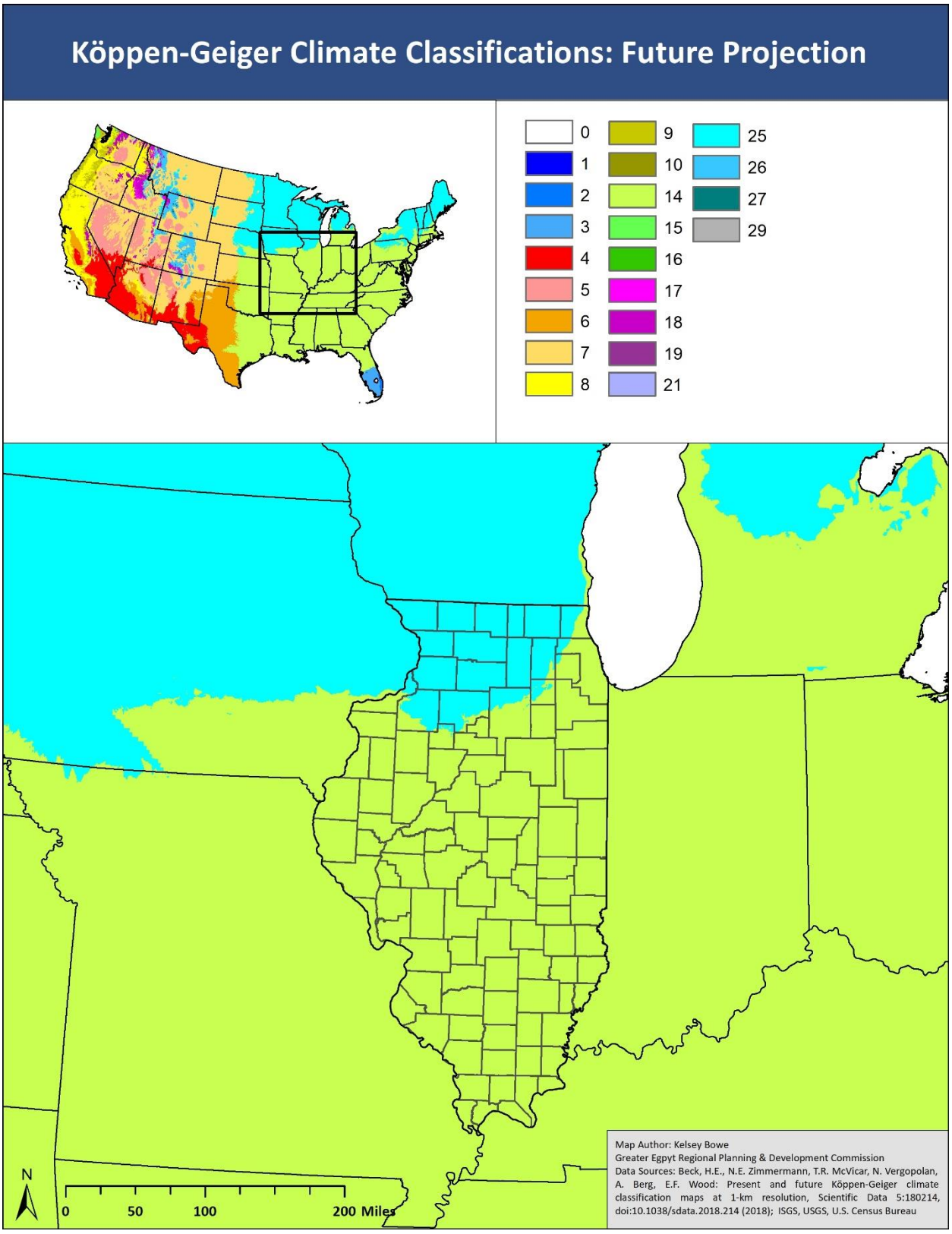
17
18
19
21
25
26
27
29
N
0
50
100
200 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Data Sources: Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood: Present and future Köppen-Geiger climate classification maps at 1-km resolution, Scientific Data 5:180214, doi:10.1038/sdata.2018.214 (2018); ISGS, USGS, U.S. Census Bureau

Figure 4.2


Köppen-Geiger Climate Classifications: Future Projection
0
1
2
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200 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Data Sources: Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood: Present and future Köppen-Geiger climate classification maps at 1-km resolution, Scientific Data 5:180214, doi:10.1038/sdata.2018.214 (2018); ISGS, USGS, U.S. Census Bureau

4.1.3. Jackson County Hazard Rankings

Hazards were ranked using the risk priority index equation:

$$\boldsymbol{Risk\ Index = probability * severity}$$

Where probability is how likely a hazard event will occur on a scale of 1-4:

Table 4.2

Probability	Characteristics
4 – Highly Likely	Event is probable within the next calendar year. These events have occurred, on average, once every 1-2 years in the past.
3 – Likely	Event is probable within the next 10 years. Event has a 10-15% chance of occurring in any given year. These events have 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. These events have 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. These events have occurred, on average, once every 50-200 years in the past.

Severity is the degree to which a hazard will cause injuries/deaths, affect functionality of essential and critical facilities, and cause property damage and/or utility disruptions on a scale of 2-8:

Table 4.3

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 in 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 Jackson County Planning Team members completed a hazard ranking exercise. The County hazard list is as follows:

1. Tornados & Derechos
2. Disease Outbreak, Epidemics, & Pandemics
3. Earthquakes
4. Severe Winter Weather
5. Severe Thunderstorms
6. Flooding
7. Hazardous Materials release
8. Drought & Excessive Heat
9. Dam & Levee Failure
10. Cyberattacks
11. Terrorism
12. Ground Failure
13. Utility Disruptions & Power Outages
14. Near Earth Object impact (asteroid, comet, meteoroid)
15. Wildland Fires
16. Landslides
17. Invasive Species & Infestations

Hazard rankings by jurisdiction can be found in appendix 3.

4.1.4. Disaster Declarations

There have been 2 disaster declarations for Jackson County from 2015-2022:

2019: DR-4461-IL Illinois Severe Storms and Flooding

- Jackson County was one of 28 counties along the Illinois and Mississippi Rivers that experienced the most severe floods since 1993.

2020: DR4489-IL Illinois COVID-19 Pandemic

- COVID-19 was declared a nationwide emergency on March 13, 2020 by President Trump, pursuant to section 501(b) of the Stafford Act, this declaration removed the need for individual governors to apply. All 50 states and five territories were covered under this initial declaration, on February 2, 2021 and March 29, 2021, the Navajo nation and Poarch Band of Creek Indians were also approved for Coronavirus Disease-19 (COVID-19) disaster declarations under President Biden.

4.2. Tornados and Derechos

4.2.1. Hazard Description

Tornados are violently rotating columns attached to the base of a cloud and extend to the ground. Tornados are most often produced at the trailing end of strong supercell thunderstorm systems; though the process of tornado formation is not fully understood[6]. Tornadoes can be brutally destructive when they move through densely populated areas. Severe tornados can reach winds speeds in excess of 300mph and cause paths of destruction 1 mile wide and more than 50 miles long. Due to the power of the rotating winds, buildings and human life are at great risk during a strong tornado.

Tornado intensity is measured on the Enhanced Fujita (EF) Scale (adopted by the National Weather Service (NWS) in 2007). EF rating is determined by the 3-second wind gust speed (table 4.4). It is important to note these speeds are estimates based on observations from the point of damage after the tornado has passed and are not direct measurements of wind speed. The NWS service uses 28 Damage Indicators (DI) (Table 4.5) on a scale of Degrees of Damage (DOD) to estimate expected, lower, and upper bounds of wind gusts that occurred[7]. The NWS has specific DOD scales for each type of DI and is the only agency with authority to give official EF ratings of tornado events. The scale ranges from EF0, characterized by wind gusts of up to 85 mph with light damage to buildings, to EF5 which is characterized by catastrophic damage and wind gusts over 200 mph.

Derechos are long-lived wind storms continuing in one direction, usually over large areas. To be classified as a derecho, the storm must extend for over 240 miles and reach wind gusts of 58mph[8]. Derechos are a unique weather phenomenon that almost exclusively occur in the eastern United States. They are also seasonal storms, with 70% occurring between May and August[6]. Both tornados and derechos develop from, and are associated with thunderstorms.

[6] "Severe weather 101," The National Severe Storms Laboratory, nssl.noaa.gov.
[7] "A Recommendation for an Enhanced Fujita Scale (EF-scale) Submitted to the National Weather Service and Other Interested Users," WIND SCIENCE AND ENGINEERING CENTER, Texas Tech University, 2004.
[8] "Derecho" National Weather Service

Table 4.4 - Enhanced Fujita Tornado Rating

Enhanced Fujita Number	3-Second Gust Speed (mph)	Selected Degrees of Damage Descriptions
0 Gale	65-85	Loss of <20% roofing material, loss of siding. Loss of rooftop HVAC.
1 Moderate	86-110	Broken glass, loss of >20% roofing material. Manufactured homes overturn but remain intact. Collapse of exterior walls of many types of building. Broken wood electrical poles. Trees uprooted or snapped.
2 Significant	111-135	Houses shift off foundations, collapse of roofs. Manufactured homes destroyed. Collapse of exterior walls of many types of building. Complete destruction of some isolated buildings. Bent or broken steel and concrete electrical poles. Trees snapped and debarked.
3 Severe	136-165	Top floor exterior and interior walls may collapse. Collapse of rigid frames in metal buildings. Damage to wall cladding and roof slabs of institutional buildings (hospitals, courthouses).
4 Devastating	166-200	Collapse of most walls, total destruction of residential houses. Destruction of large buildings such as shopping malls. Significant damage to institutional buildings.
5 Incredible	Over 200	Total destruction of residential houses, destruction of large buildings such as shopping malls. Significant damage to institutional buildings.

Source: National Weather Service/National Oceanic and Atmospheric Administration

Table 4.5 - Damage Indicators used to determine EF tornado rating

DI Number	Damage Indicator
1	Small Barns or Farm Outbuildings (SBO)
2	One- or Two-Family Residences (FR12)
3	Manufactured Home – Single Wide (MHSW)
4	Manufactured Home – Double Wide (MHDW)
5	Apartments, Condos, Townhouses [3 stories or less] (ACT)
6	Motel (M)
7	Masonry Apartment or Motel Building (MAM)
8	Small Retail Building [Fast Food Restaurants] (SRB)
9	Small Professional Building [Doctor's Office, Branch Banks] (SPB)
10	Strip Mall (SM)
11	Large Shopping Mall (LSM)
12	Large, Isolated Retail Building [K-Mart, Wal-Mart] (LIRB)
13	Automobile Showroom (ASR)
14	Automobile Service Building (ASB)
15	Elementary School [Single Story; Interior or Exterior Hallways] (ES)
16	Junior or Senior High School (JHSH)
17	Low-Rise Building [1-4 Stories] (LRB)
18	Mid-Rise Building [5-20 Stories] (MRB)
19	High-Rise Building [More than 20 Stories] (HRB)
20	Institutional Building [Hospital, Government or University Building] (IB)
21	Metal Building System (MBS)
22	Service Station Canopy (SSC)
23	Warehouse Building [Tilt-up Walls or Heavy-Timber Construction](WHB)
24	Transmission Line Towers (TLT)
25	Free-Standing Towers (FST)
26	Free-Standing Light Poles, Luminary Poles, Flag Poles (FSP)
27	Trees: Hardwood (TH)
28	Trees: Softwood (TS)

Source: National Weather Service/National Oceanic and Atmospheric Administration

Table 4.6 Average path size of tornados, based on all tornados reported in the United States from 2007-2013[9]

Enhanced Fujita Number	Average Path Length (miles)	Average Patch Width (feet)
0	1.41	180.12
1	4.41	537.40
2	8.88	1128.94
3	18.08	2415.68
4	32.65	3273.95
5	44.71	5366.79

4.2.2. Geographic Location and Historical Occurrences

Southern Illinois is sometimes included in definitions of "Tornado Alley" and "Dixie Alley", although the terms have no official boundaries and generally refer to the Southcentral and Southeast portions of the U.S. respectively. Both geographic areas have the highest frequency of tornados in the U.S. The infamous Tri-State Tornado of 1925 was one of the worst recorded tornados in the history of the Midwest. It went through Jackson County and others in Illinois on its path from Missouri to Indiana. A rare weather event, the Tri-State Tornado had a path length of 219 miles and a width of ¾ mile. It continued for an estimated 3 ½ hours, and was an F5 on the Fujita scale. This event was the most destructive single tornado in United States history: 695 lives were lost, 2,027 were injured, and 15,000 homes were destroyed.

On May 29, 1982 an F3 tornado travelled through Perry County in southern Illinois, injuring 6 and destroying 9 homes in Conant[10]. An F4 tornado went through Williamson County, IL the same day- killing 10, injuring 181, and damaging 500 homes and 82 businesses[11]. The path in Williamson County was 17 miles long and nearly ¼ mile wide[12].

On December 11-12, 2021, a supercell thunderstorm travelled over 350 miles through Arkansas, Missouri, Tennessee, and Kentucky. 66 Tornados have been confirmed from this storm event, including an EF4 from Craighead County Arkansas to Obion County Tennessee with a path length of 80.3 miles and a max width of 5,249ft, and a second EF4 from Fulton County to Breckenridge County in Kentucky, with a path length of 165.7 miles and a max width of 7,874ft[13]. One EF3 and five EF2 tornados occurred in Illinois from this event; none occurred in Jackson County. 89 deaths and nearly $4 billion in damages occurred across all of the states that were impacted[14].

[9] Elsner, James B et al. "Tornado intensity estimated from damage path dimensions." PloS one vol. 9,9 e107571. 17 Sep. 2014
[10] Koplowitz, H.B., The Southern Illinoisian, "9 of 11 Conant homes ruined" June 1, 1982.
[11] Staff Writers, The Southern Illinoisian, "Marion counts loss, plans future" June 1, 1982.
[12] National Weather Service, "1982 Marion Illinois Tornado".
[13] National Weather Service, "NWS Storm Damage Summaries - Dec 10-11, 2021 Tornado Outbreak".
[14] Wikipedia, "Tornado outbreak of December 10–11, 2021".

There have been two major derechos in Illinois in recent decades; one in May of 2009 in southern Missouri and Illinois, and one in 2020 that went through Nebraska, Iowa, northern Illinois and northern Indiana. The 2009 derecho had recorded wind speeds of 120mph in Murphysboro, IL. Many power outages occurred and there was 1 death from the storm[15]. In 2020 an estimated 850,000 acres of crops were damaged and 2 people were killed in Iowa. In Illinois alone 750,000 homes lost power[16].

There have been 35 records of tornados in Jackson County from 1950-2021, with only 25 causing death, injury, or property damage (table 4.7).

[15] The Southern Illinoisian
[16] Foley and Funk, "Derecho leaves 2 dead, heavy crop damage across Midwest", The Southern Illinoisian, 8.12.2020.

Table 4.7 - Tornados that have caused death, injury, or property damage in Jackson County, IL.

Location	Date	Rank	Deaths	Injuries	Property Damage
	12/18/1957	F4	11	180	2500000
	11/13/1951	F2	0	7	250000
	4/5/1958	F3	0	6	250000
	4/5/1958	F3	0	5	250000
	12/18/1957	F2	0	5	25000
	6/1/1970	F2	0	5	25000
GORHAM	9/22/2006	F2	0	1	800000
	3/25/1970	F2	0	1	250000
CORA	2/28/2017	EF3	0	0	6000000
MAKANDA	2/29/2012	EF2	0	0	100000
SATO	5/8/2009	EF1	0	0	80000
DOWELL	3/23/2012	EF1	0	0	75000
ELKVILLE	4/19/2011	EF0	0	0	70000
MT CARBON	4/24/2014	EF1	0	0	35000
	12/18/1957	F2	0	0	25000
	8/21/1971	F1	0	0	25000
	6/14/1990	F1	0	0	25000
MURPHYSBORO	6/19/2015	EF1	0	0	25000
ELKVILLE	5/8/2009	EF0	0	0	10000
ETHERTON	2/20/2014	EF1	0	0	10000
CRAIN	4/7/2010	EF0	0	0	5000
AVA	12/23/2015	EF0	0	0	5000
DE SOTO	11/10/2002	F0	0	0	4000
	5/8/1988	F1	0	0	2500
ETHERTON	3/1/2017	EF0	0	0	2000

Source: NOAA Storm Events Database

4.2.3. Risk

Tornadoes and derechos can occur at any location in the county. Derechos are a seasonal weather phenomenon and typically occur during May-August. Historical tornadoes generally moved from southwest to northeast across the county, although many other tracks are possible. The extent of the hazard varies in terms of the EF rating of the tornado and location and direction of its path. Based on NOAA data, Jackson County has a 50% chance of a tornado occurring in any given year.

Structures most at risk of damage in the event of tornados include mobile and manufactured homes, unreinforced masonry structures, and facilities without storm window retrofits. Any homes and facilities constructed before building codes were widely enforced (pre-1970s) are more at risk for wind damage. The 2018 International Building Code (IBC) has wind load and impact resistance requirements for window installations specific for geographic area. The State of Illinois has not adopted statewide building code requirements[17]. Jackson County has also not

[17] "Building Codes and Regulations", Capital Development Board, Illinois.gov.

adopted any building codes; some individual municipalities do have building code enforcements, see section 5.2 for all hazard related codes and ordinances.

4.2.4. Climate Change

2021 had an above average number of tornados recorded, with December having a record-breaking number of 193 tornados across the United States[18]. National average tornado frequency has remained relatively constant, but the spatial distribution has been shifting; with positive trends in the Midwest and Southeast, and negative trends in the Great Plains region[19]. The Eastern U.S. is expected to see an increase in days with favorable conditions for severe thunderstorms with the changing climate, which could also lead to an increased risk of tornado occurrence[20].

4.2.5. Hazard Model

ArcGIS was used to simulate an EF4 tornado in Jackson County, IL. A hypothetical path was created with a polyline from the Mississippi River heading northeast through Murphysboro and DeSoto. From the tornado path, four damage zones were created using the multiple ring buffer tool (table 4.8).

Table 4.8 Buffer zones and damage estimates used for the EF4 tornado model

Zone	Buffer (feet)	Bridges & hospital damage	All other building damage
1	500	75%	100%
2	1000	50%	80%
3	2150	25%	50%
4	3300	5%	10%

Essential and critical facilities and infrastructure data comes from the Hazus Illinois State dataset, and from local planning partner knowledge. Residential parcel data is from the Jackson County Assessor's Office. Railroad bridges, highway bridges, and hospitals have lower damage percentages since they are generally designed to withstand severe weather better than other infrastructure and buildings. The residential category includes single family homes, duplexes, mobile homes, and apartment buildings (Occupancy codes 0040 and 0050).

Figure 4.3 shows the tornado path for Jackson County. Figure 4.4 shows the path in detail through Murphysboro and Harrison. Figure 4.5 shows the path in detail through DeSoto. Table 4.8 shows the total damage cost estimates. Tables 4.9-4.12 show the results and damage cost estimates for each buffer zone.

[18] NOAA, "Contiguous U.S. ranked fourth warmest during 2021; 20 billion-dollar disasters identified", January 10, 2022.
[19] Gensini, V.A. and Brooks, H.E., Nature, "Spatial trends in United States tornado frequency", 2018.
[20] NASA - Global Climate Change, "Severe thunderstorms and climate change", April 7, 2013.

Figure 4.3

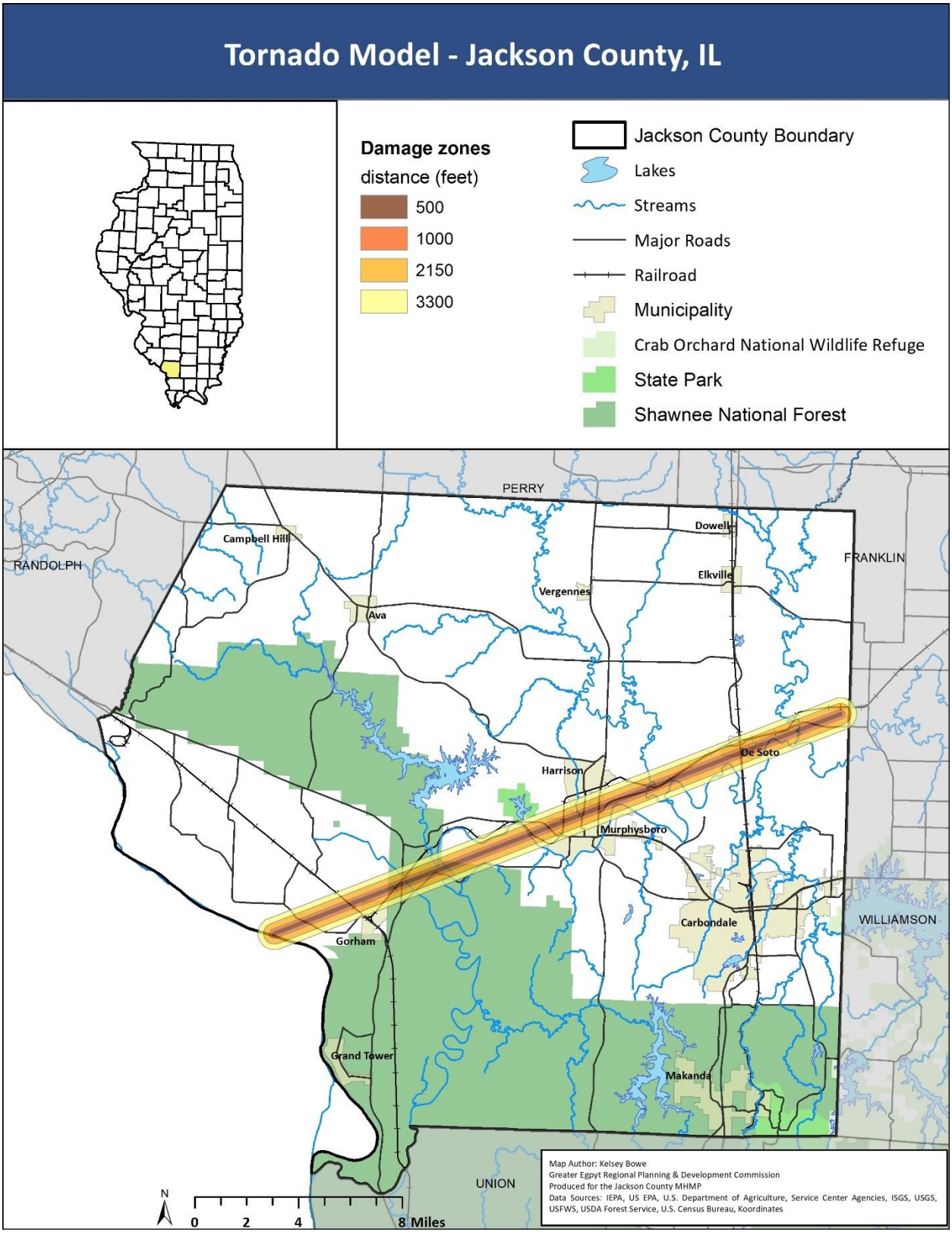

Tornado Model - Jackson County, IL
Damage zones
distance (feet)
500
1000
2150
3300
Jackson County Boundary
Lakes
Streams
Major Roads
Railroad
Municipality
Crab Orchard National Wildlife Refuge
State Park
Shawnee National Forest
PERRY
RANDOLPH
FRANKLIN
WILLIAMSON
UNION
Campbell Hill
Dowell
Elkville
Vergennes
Ava
Harrison
De Soto
Murphysboro
Carbondale
Gorham
Grand Tower
Makanda
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: IEPA, US EPA, U.S. Department of Agriculture, Service Center Agencies, ISGS, USGS, USFWS, USDA Forest Service, U.S. Census Bureau, Koordinates
N
0
2
4
8 Miles

Figure 4.4

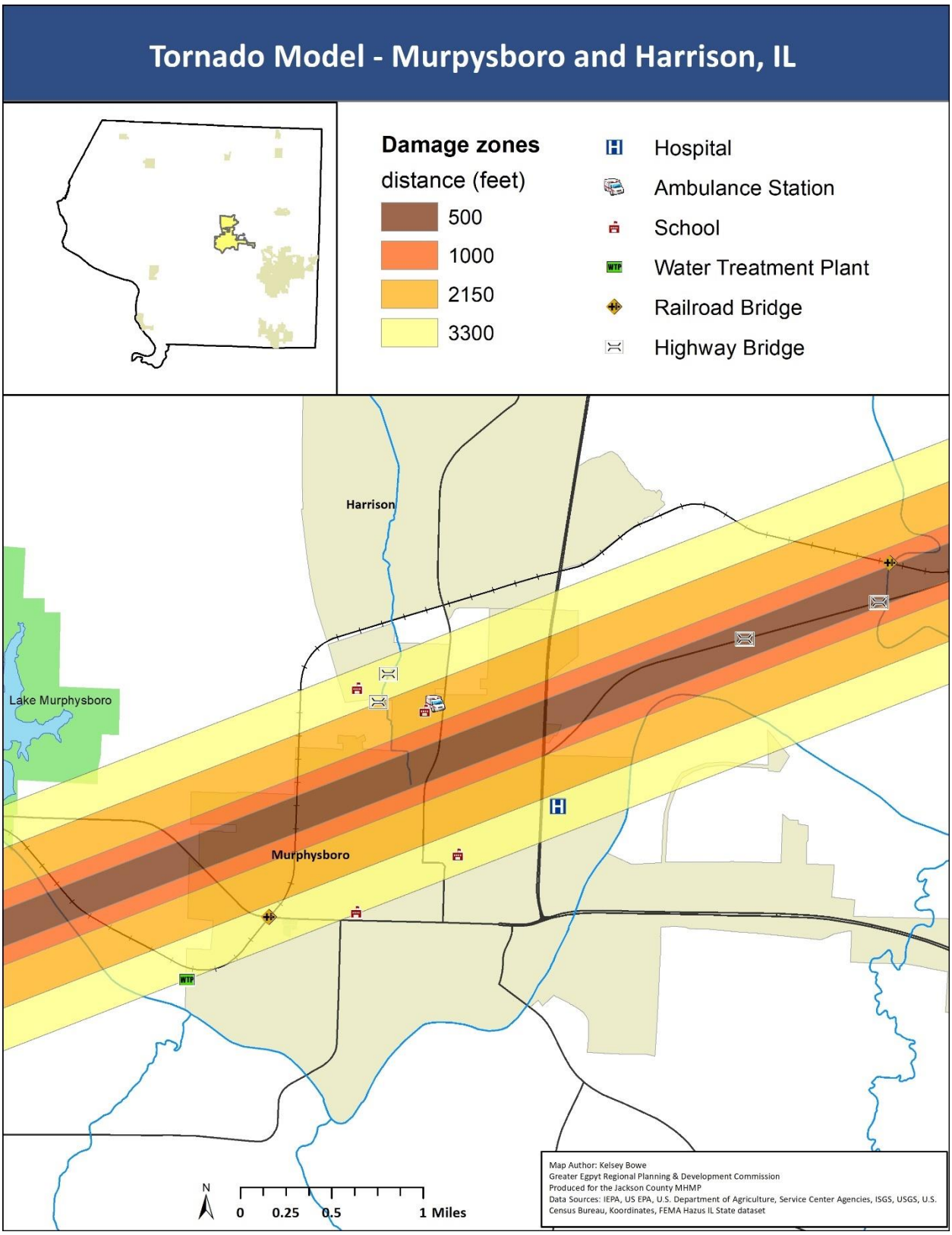

Tornado Model - Murpysboro and Harrison, IL
Damage zones
distance (feet)
500
1000
2150
3300
Hospital
Ambulance Station
School
Water Treatment Plant
Railroad Bridge
Highway Bridge
Harrison
Lake Murphysboro
Murphysboro
WTP
N
0
0.25
0.5
1 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: IEPA, US EPA, U.S. Department of Agriculture, Service Center Agencies, ISGS, USGS, U.S. Census Bureau, Koordinates, FEMA Hazus IL State dataset

Figure 4.5

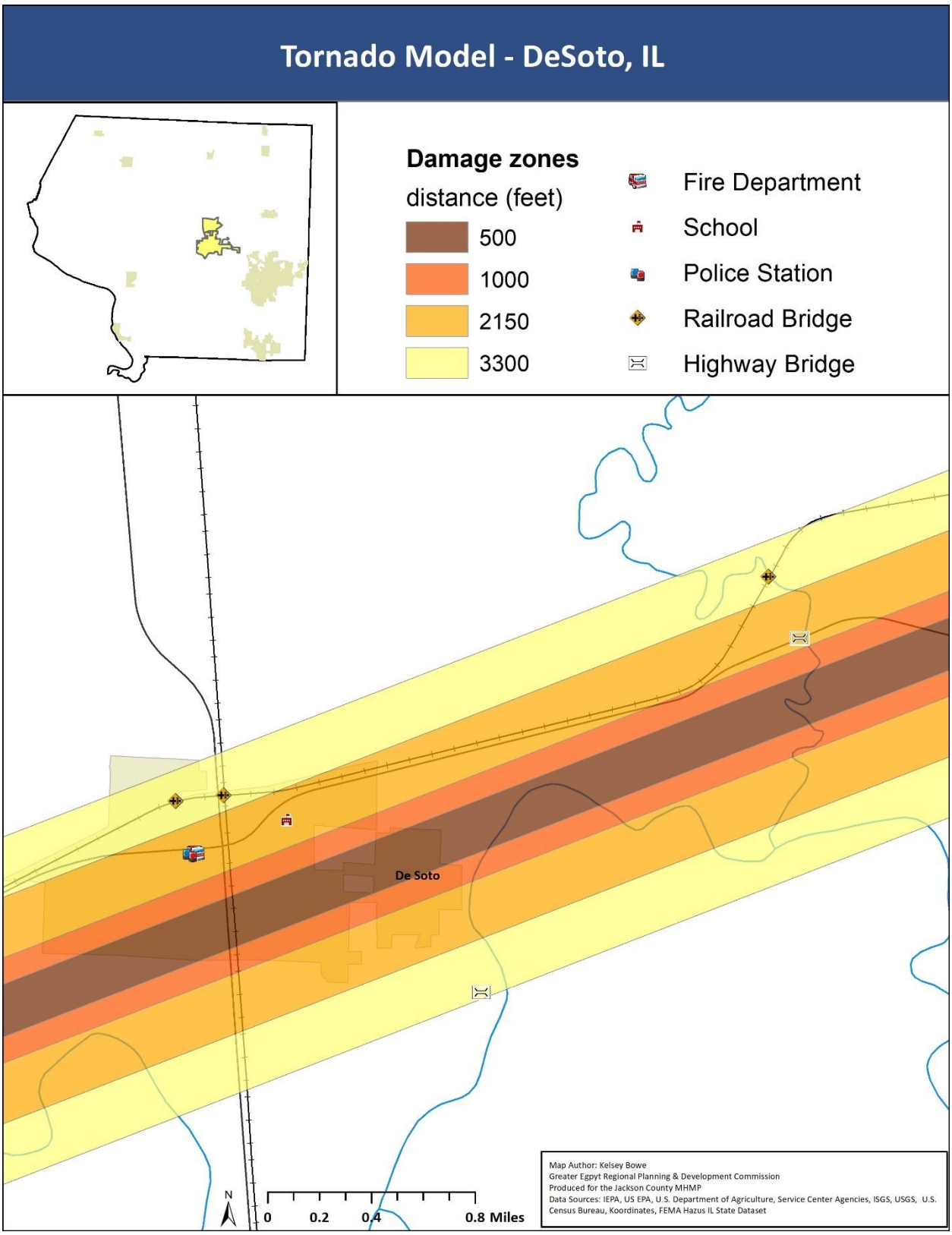

Tornado Model - DeSoto, IL
Damage zones
distance (feet)
500
1000
2150
3300
Fire Department
School
Police Station
Railroad Bridge
Highway Bridge
De Soto
N
0
0.2
0.4
0.8 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: IEPA, US EPA, U.S. Department of Agriculture, Service Center Agencies, ISGS, USGS, U.S. Census Bureau, Koordinates, FEMA Hazus IL State Dataset

Table 4.9

Total Damage			
Category	**# Damaged**	**Total Cost of Damage**	
highway bridges	12	$	10,860,761.18
railroad bridges	7	$	5,228,431.40
essential facilities	8	$	9,106,878.02
critical facilities	2	$	3,000,000.00
residential buildings	2655	NA	
TOTAL		$	$28,196,070.60

Table 4.10

Zone 1			
Category	**# Damaged**	**Total Cost of Damage**	
highway bridges	2	$	8,508,237.53
residential buildings	539	NA	

Table 4.11

Zone 2			
Category	**# Damaged**	**Total Cost of Damage**	
highway bridges	1	$	457,399.70
railroad bridges	1	$	2,614,215.70
residential buildings	481	NA	

Table 4.12

Zone 3		
Category	**# Damaged**	**Total Cost of Damage**
highway bridges	2	990,090.23
railroad bridges	1	1,307,107.85
residential buildings	996	NA
Jackson County Ambulance Service-Station 2		187,997.00
Carruthers Elementary School		3,377,302.49
DeSoto Grade School		1,757,061.53
De Soto Township Fire Protection Dist		1,398,265.00
Desoto Police Department		1,398,265.00

Table 4.13

Zone 4		
Category	**# Damaged**	**Total Cost of Damage**
highway bridges	7	$ 905,033.73
railroad bridges	5	$ 1,307,107.85
residential buildings	639	NA
Gorham Sewer Treatment Plant		$ 1,500,000.00
Murphysboro Sewer Treatment Plant		$ 1,500,000.00
Murphysboro High School		$ 917,416.50
Immanuel Lutheran School		$ 61,929.22
Montessori School of Southern Illinois		$ 8,641.29

4.3. Disease Outbreaks, Epidemics, & Pandemics

4.3.1. Hazard Description

This hazard is the spread of various diseases or other health problems that increase at rapid rates. The term disease outbreak is typically used when disease spread is limited to small communities or regions, such as a school system, city, or county; Although it can also be used when referring to large scale disease spread. Epidemics are disease outbreaks that infect people throughout a nation or several nations. Pandemics are disease outbreak at a global scale. Pandemics are usually the result of highly-infectious, rapidly spreading diseases. Disease outbreaks may last days to years, and the effects on public health and the economy may be long lasting and severe.

While disease outbreaks are often the result of contagious (human to human spread) diseases, such as influenza or measles they can stem from other origins. Other sources of disease outbreak include foodborne pathogens (such as E. coli or salmonella), zoonotic disease spread (Animal to human spread, such as Lyme disease and west Nile virus), and public health trends (such as the rise in obesity rates). Some disease outbreaks also become endemic, in which a disease is consistently present but limited to certain regions; or seasonal outbreaks where the same disease will resurface at high rates during certain times of the year.

Examples of pandemics include Spanish Influenza, HIV/AIDs, and most recently, COVID-19. Detailed information regarding COVID-19 is widely available from the Centers for Disease Control (CDC), Illinois Department of Public Health (IDPH), and County Health Departments. Disease Outbreaks are not considered a natural hazard by FEMA, and rarely qualify for FEMA emergency funding or grant programs. COVID-19 was declared a federal disaster in all 50 states and relief funding has been distributed through the Coronavirus Aid, Relief, and Economic Security (CARES) Act, 2020 [P.L. 116-136]; the Coronavirus Preparedness and Response Supplemental Appropriations Act, 2020, [P.L. 116-123], and the Families First Coronavirus Response Act, 2020 [P.L. 116-127].

4.3.2. Geographical Location and Historical Occurrences

The CDC maintains the National Outbreak Reporting System (NORS) for disease outbreaks in the U.S.

Table 4.14 Disease Outbreaks in Illinois from 2009-2018.

Type of Outbreak	# Outbreaks	# Illnesses	# Hospitalizations	# Deaths
Person to person	1221	34456	876	24
Foodborne	603	19635	2958	74
Waterborne	33	1862	107	21
Animal Contact	58	5065	998	9
Environmental	4	142	5	0
Indeterminate/unknown	23	516	23	1
Total	1942	61676	4967	129

Source: CDC NORS

*The statistics for animal contact does not include diseases from invertebrate vectors such as mosquitos and ticks, nor does it contain diseases spread from animal bites; most cases are salmonella from touching reptiles and poultry.

Table 4.15 Covid-19 cases and deaths in Illinois as of 6/16/2022.

Covid cases	Confirmed deaths	Probable deaths
3,376,596	33,979	4,413

Source: Illinois Department of Public Health

As of Tuesday, May 17, 2022 Johns Hopkins University data estimates over one million people in the United States have died as a result of COVID-19.

4.3.3. Risk

Since the nature of disease outbreaks vary depending on the type of illness, the risk varies as well. In general, the county has equal risk of an outbreak occurring although facilities such as schools or nursing homes have a higher risk due to the close density of people and vulnerability of children and elderly.

4.4. Earthquakes

4.4.1. Hazard Description

Earthquakes occur when seismic energy in the earth's crust is quickly released, often due to large blocks of crust fracturing or slipping past one another. Tectonic earthquakes often occur along major geologic fault lines. However, earthquakes can also occur in the interior of major plates due to weaknesses in the crust or other factors.

Effects of earthquakes can include perceptible ground shaking, surface faulting, and ground failure. In general, ground shaking will be more vigorous as earthquake magnitude increases. Ground shaking can cause massive damage to buildings and infrastructure; though the amount of damage depends also on soil properties, building specifications, distance from the epicenter, and other factors. Surface faulting, classified as strike-slip, normal, or reverse/thrust, causes displacement of the earth's crust at the surface. This usually leads to a long, narrow zone of displacement, which can be catastrophic to buildings and infrastructure. However, these zones are often quite narrow and impact small areas if they do occur. Ground failure can be induced by liquefaction which is a phenomenon where coarse soils, comprised mainly of silts or sands, act as a liquid due to the seismic shear waves produced by the earthquake. Liquefaction can cause lateral spreads, flow failures, loss of bearing strength, and sand boils – all of which can be destructive to the built environment[21].

The impacts of large earthquakes on more densely populated areas can be severe. Buildings and major infrastructure may collapse, roadways may be impassable due to debris or road failure, and essential facilities may be damaged or unreachable. Injury and loss of life are also possible during an earthquake – often the result of building collapse or falling debris. Due to the possible crippling of transportation and essential facilities, pre-hazard contingency planning is crucial for adequate emergency response in the event of an earthquake.

Earthquakes are measured by intensity, magnitude and energy release. Intensity describes the effects of the earthquake at the surface. Intensity is measured by the Modified Mercalli Intensity Scale (figure 4.6) which ranges from I – XII, where "I" describes an earthquake almost imperceptible to people and "XII" describes extreme damage to the built and natural environments at the surface. Magnitude is a measurement of the physical size of the earthquake, calculated by multiplying the length, width, and slip. Slip is the displacement of the fault. Energy release is a measure of all frequencies of shaking produced for the duration of an earthquake and is estimated using a logarithmic conversion of the magnitude. Magnitude is measured by a logarithmic scale - an increase of a whole number on the magnitude scale represents a tenfold increase in amplitude and 32 times more energy release[22].

[21] Hays, W.W., ed., 1981, Facing Geologic and Hydrologic Hazards - Earth Science Considerations: U.S. Geological Survey Professional Paper
[22] "Earthquake Magnitude, Energy Release, and Shaking Intensity", Earthquake Hazards, USGS.

Figure 4.6

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

Source: U.S. Geological Survey (USGS)

4.4.2. Geographic Location and Historical Occurrences

Southern Illinois lies in the northwest region of the New Madrid Seismic Zone (NMSZ). This zone covers areas of Arkansas, Missouri, Mississippi, Tennessee, Kentucky, and Illinois (figure 4.7) and is characterized by a group of faults deeply buried by river sediment. The geology associated with the New Madrid Seismic zone is known as the Mississippi Embayment. This is underlain by Reelfoot Rift, a deep continental rift system formed roughly 600 million years ago, and by Paleozoic sedimentary rock formed around 570 million years ago. The upper layers of the Mississippi Embayment include marine sedimentary rock from 50-100 million years ago, and even more recently river sediments from 5 million to 60,000 years ago[23].

Historic data suggests that magnitude 7-8 earthquakes have occurred in the NMSZ roughly every 500 years since 900 CE. The worst recorded series of earthquakes occurred in 1811-1812. three large earthquakes occurred in December 1811, and January and February of 1812, with hundreds of aftershocks felt throughout the year and into 1813. The epicenter of the third earthquake occurred near and destroyed the town of New Madrid, Missouri. Other damage from the earthquakes and aftershocks included bank failure along the Mississippi River, landsides of surrounding bluffs, uplift and subsidence of large areas, and liquefication of subsurface sediment- resulting in sand blows that covers thousands of square kilometers.

[23] "The New Madrid Seismic Zone", Earthquake Hazards, USGS.

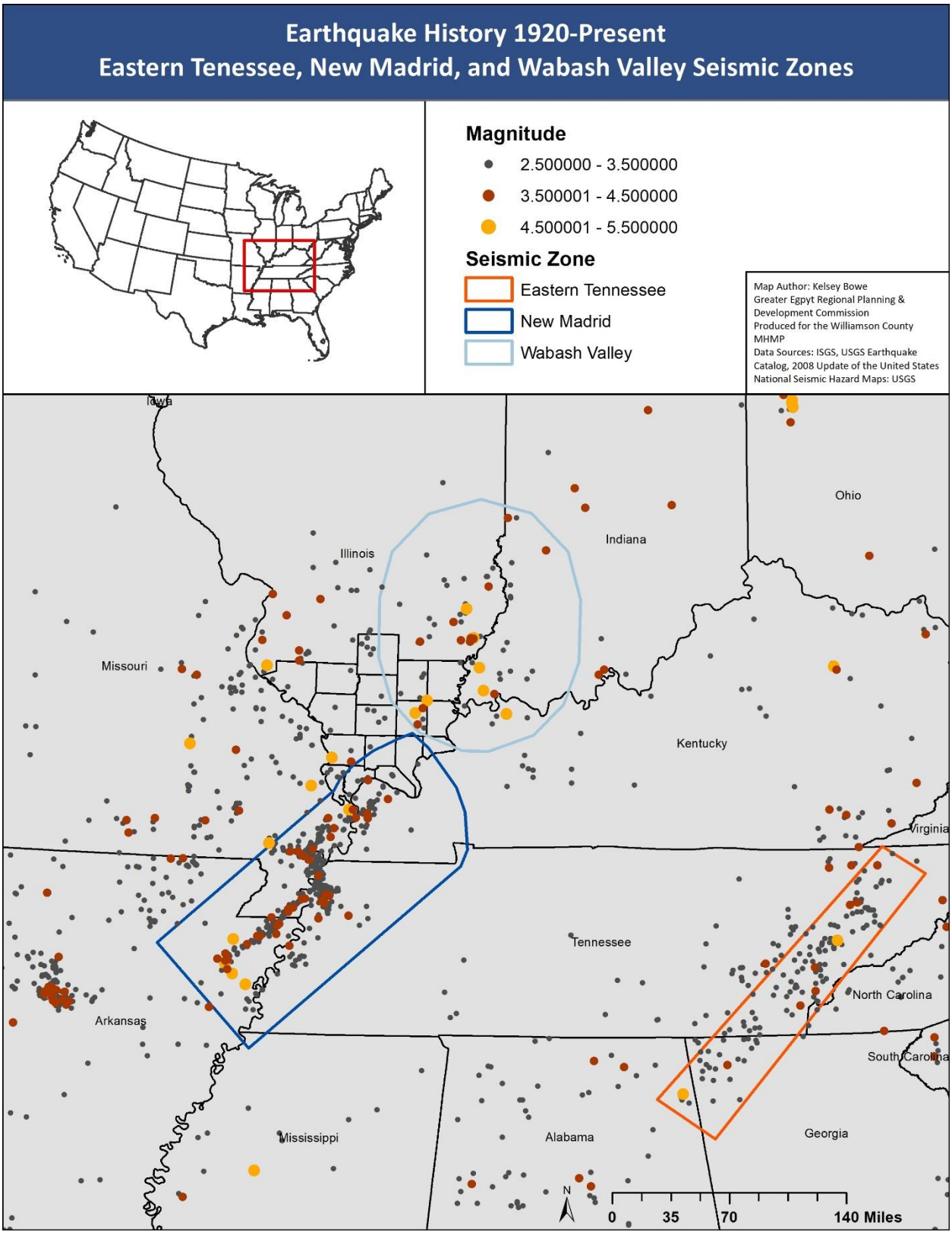
Sections of the Mississippi River are reported to have flown backwards temporarily as a result of uplift.

The Wabash Valley Seismic Zone (WVSZ) occurs around the conjunction of Kentucky, Indiana, and Illinois and may impact seismic activity of southern Illinois counties including Jackson. Although a smaller region than New Madrid, it is estimated to be capable of magnitude 7 earthquakes. There is evidence of liquification sites dated at 6,100 years old, and more recently a magnitude 5.2 earthquake occurred in 2008 with an epicenter near Mt. Carmel, IL. Damage was reported from all three states in the seismic zone[24]. Figure 4.7 shows the seismic zones and earthquake history of southern Illinois and surrounding states.

There have been two recorded earthquakes in Jackson County from 1920-present day. A magnitude 3.0 earthquake occurred on February 28, 1994 north northwest of Murphysboro, and a second magnitude 3.0 occurred in the southwest corner of the county on June 27, 2007.

[24] "Wabash Valley Seismic Zone", Central United States Earthquake Consortium. https://cusec.org/wabash-valley-seismic-zone/

Figure 4.7


Earthquake History 1920-Present
Eastern Tenessee, New Madrid, and Wabash Valley Seismic Zones
Magnitude
2.500000 - 3.500000
3.500001 - 4.500000
4.500001 - 5.500000
Seismic Zone
Eastern Tennessee
New Madrid
Wabash Valley
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Williamson County MHMP
Data Sources: ISGS, USGS Earthquake Catalog, 2008 Update of the United States National Seismic Hazard Maps: USGS
Iowa
Illinois
Indiana
Ohio
Missouri
Kentucky
Virginia
Tennessee
North Carolina
Arkansas
South Carolina
Mississippi
Alabama
Georgia
N
0
35
70
140 Miles

4.4.3. Risk

Figure 4.8 shows the most current USGS earthquake risk map. The values are expressed as a percentage of the acceleration of gravity (g). These values are a probability of 10% chance of exceeding the displayed ground acceleration within 50 years[25]. Jackson County has a probability of 10-15%, while the center area of the New Madrid Seismic Zone has a probability of 40%.

Areas most at risk for liquefaction and sand blows are floodplains where the water table is within five feet of the surface. The highest risk areas for liquefaction in Jackson County are the floodplains of Beaucoup & Galum Creek, the Little Muddy River, and the Mississippi River. Figure 4.9 shows liquefaction risk for the county.

While the county has equal risk of an earthquake occurring, older buildings and infrastructure have a higher risk of damage if one occurred. Construction before international building codes were widely adopted and enforced, and facilities that have not been seismically retrofitted are more likely to be damaged. Unreinforced masonry buildings were one of the most common structures for homes and commercial buildings from settlement through the mid-late 1970s; it is also the most dangerous building types for an earthquake hazard[26]. The Hazus software uses the year 1973 as a threshold for earthquake related building codes. However, in the eastern U.S. they were not widely enforced until much later and it can be difficult to determine the building codes used in old facilities. The Central U.S. Earthquake Consortium (CUSEC) states that most homes in the central U.S. were not built with seismic consideration until 1990.

[25] "USA Earthquake Risk", Layer Description, Map Image Layer by ESRI and USGS, ArcGIS Online.
[26] "Putting down roots in earthquake county- your handbook for earthquakes in the Central United States", U.S. Department of the Interior, U.S. Geological Survey, General Information Product 119.

Figure 4.8

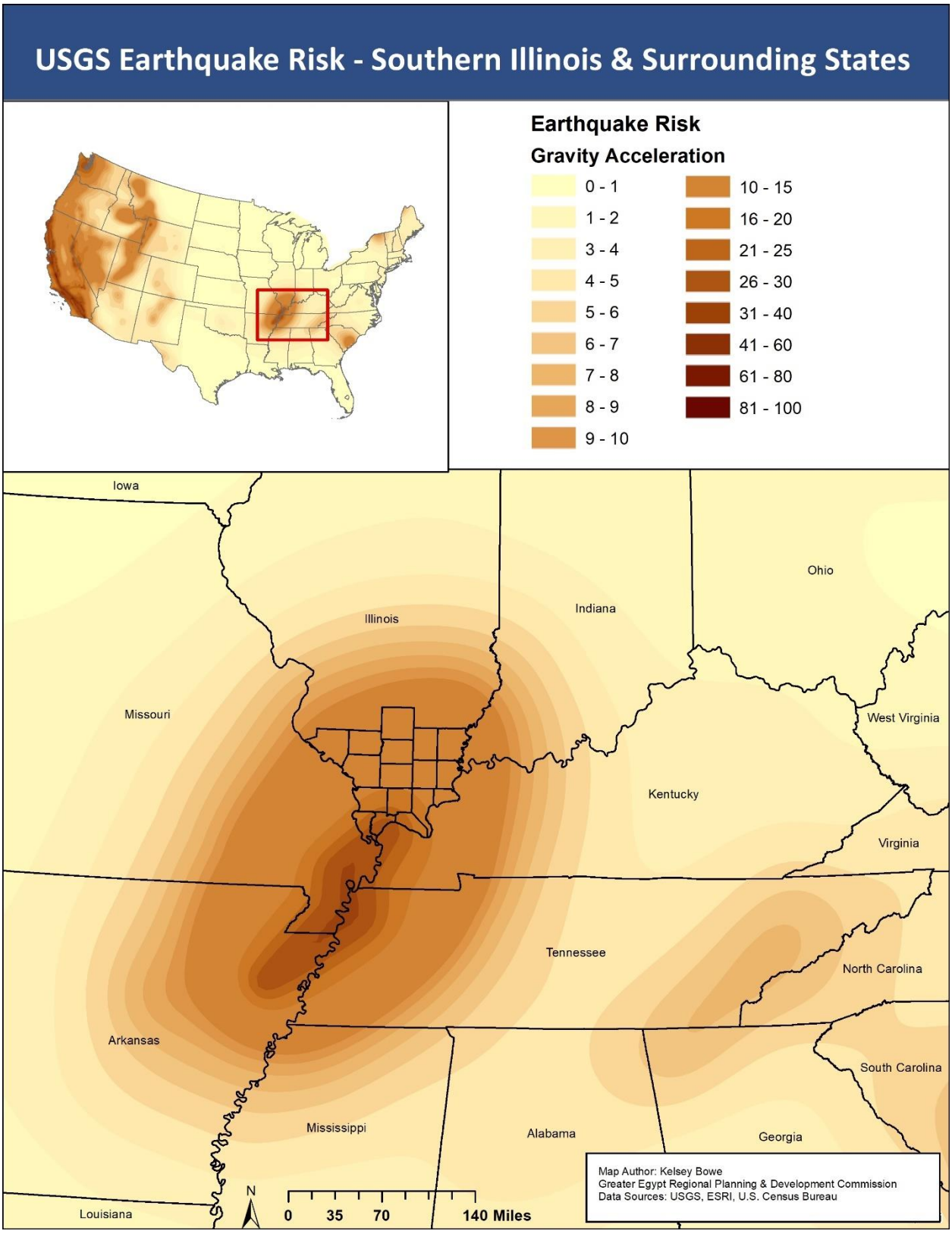
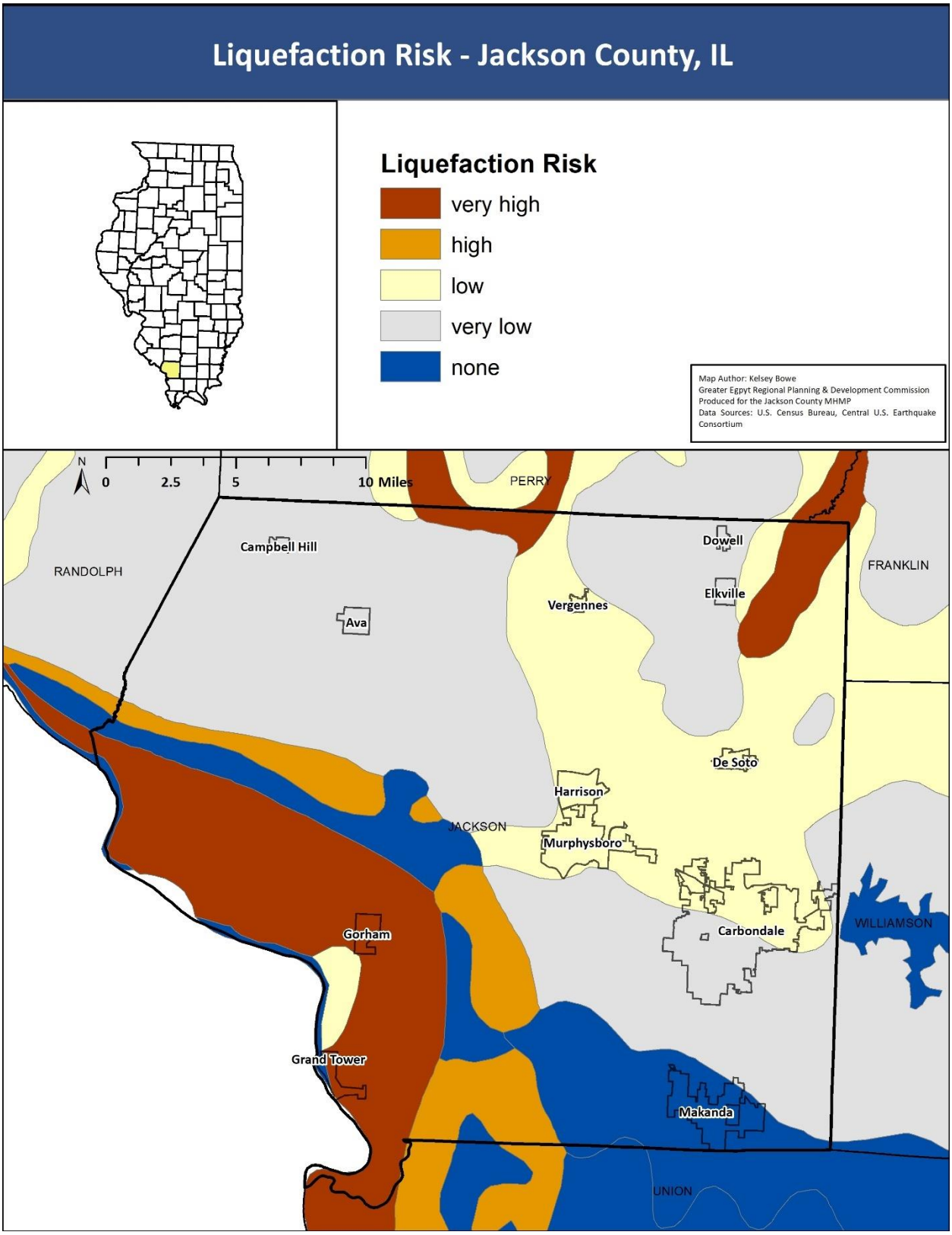

USGS Earthquake Risk - Southern Illinois & Surrounding States
Earthquake Risk
Gravity Acceleration
0 - 1
1 - 2
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
9 - 10
10 - 15
16 - 20
21 - 25
26 - 30
31 - 40
41 - 60
61 - 80
81 - 100
Iowa
Illinois
Indiana
Ohio
Missouri
West Virginia
Kentucky
Virginia
Tennessee
North Carolina
Arkansas
South Carolina
Mississippi
Alabama
Georgia
Louisiana
N
0 35 70 140 Miles
Map Author: Kelsey Bowe
Greater Egypt Regional Planning & Development Commission
Data Sources: USGS, ESRI, U.S. Census Bureau

Figure 4.9


Liquefaction Risk - Jackson County, IL
Liquefaction Risk
very high
high
low
very low
none
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: U.S. Census Bureau, Central U.S. Earthquake Consortium
N
0
2.5
5
10 Miles
PERRY
RANDOLPH
Campbell Hill
Ava
Vergennes
Dowell
Elkville
FRANKLIN
De Soto
Harrison
JACKSON
Murphysboro
Carbondale
WILLIAMSON
Gorham
Grand Tower
Makanda
UNION

4.4.4. Hazard Model

Hazus 5.1 was used to model two different scenarios for Jackson County. Hazus uses data from the 2010 U.S. Decennial Census and the 2019 Homeland Infrastructure Foundation Level Data. Census tracts, population estimates, replacement values, and other data may not reflect the most current values.

Magnitude 5.5 event in Jackson County

Model Parameters:
Hazus Arbitrary Scenario - 5.5 magnitude
Depth - 10km
Latitude - 37.7592
Longitude - -88.3492

Total Households= 25,538

In this scenario, nearly 6,000 buildings are estimated to be moderately or extensively damaged, and 522 buildings are estimated to be completely damaged. Table 4.16 shows the damage estimates by occupancy type. Essential facilities with at least moderate damage include one hospital, 10 schools, one Emergency Operations Center, four police stations, and five fire stations. Transportation systems with at least moderate damage include five highway bridges and one airport. Utility systems that sustain at least moderate damage are two drinking water facilities, four wastewater treatment plants, and seven communication facilities. After seven days all but two wastewater treatment plants are expected to be functioning. Damage to utility pipelines and the effect on households are displayed in tables 4.17 and 4.18.

Table 4.16 – Damage Estimate by Occupancy Type

	None		Slight		Moderate		Extensive		Complete	
Occupancy Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	63.14	0.55	27.57	0.48	32.31	0.77	16.63	0.99	4.35	0.83
Commercial	420.59	3.66	274.12	4.82	339.68	8.14	183.88	10.99	68.74	13.18
Education	26.66	0.23	15.23	0.27	18.78	0.45	9.1	0.54	3.23	0.62
Government	25.93	0.23	13.66	0.24	17.82	0.43	8.97	0.54	3.62	0.69
Industrial	87.83	0.76	52.04	0.91	70.09	1.68	41.72	2.49	15.32	2.94
Other Residential	2323.31	20.21	1360.66	23.9	1581.02	37.9	779.44	46.58	224.57	43.05
Religion	64.8	0.56	33.38	0.59	32.39	0.78	17.77	1.06	6.65	1.27
Single Family	8482.42	73.79	3915.34	68.79	2079.26	49.85	615.77	36.8	195.21	37.42
Total	**11,495**		**5,692**		**4,171**		**1,673**		**522**	

Table 4.17 - Utility Pipeline Damage Estimates

System	Total Pipeline Length (miles)	# of Leaks	# of Breaks
Potable Water	2,634	506	375
Waste Water	1,581	254	188
Natural Gas	24	2	3
Oil	0	0	0

Table 4.18 – Loss of Utility Service Estimates

Number of Households without Service					
	At Day 1	**At Day 3**	**At Day 7**	**At Day 30**	**At Day 90**
Potable Water	10,482	8,726	4,801	0	0
Electric Power	13,320	8,318	3,294	586	17

Physical damage will result in an estimated 236,000 tons of debris, requiring 9,440 truckloads to remove. Monetary losses are displayed in table 4.19.

In addition to the building related losses, there is an estimated $34.42 million in economic losses to the transportation sector and $122.63 million in economic losses to utility systems. Total Economic losses are estimated to be $1.032 billion.

Table 4.19 – Building-related Economic Loss Estimates (millions of dollars)

Category	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses						
Wage	0	1.6395	28.2069	0.8188	3.1878	33.853
Capital-Related	0	0.6965	23.2592	0.5674	0.8376	25.3607
Rental	6.6108	9.2844	12.6088	0.3018	1.5835	30.3893
Relocation	23.2133	10.26	19.5202	1.6572	12.7935	67.4442
Subtotal	**29.8241**	**21.8804**	**83.5951**	**3.3452**	**18.4024**	**157.0472**
Capital Stock Losses						
Structural	40.2258	23.1774	30.6825	6.2418	13.2991	113.6266
Nonstructural	160.5164	110.3308	86.0512	21.2081	41.4693	419.5758
Content	65.0143	32.2137	45.9775	14.8457	23.4282	181.4794
Inventory	0	0	1.1199	2.3793	0.1512	3.6504
Subtotal	**265.7565**	**165.7219**	**163.8311**	**44.6749**	**78.3478**	**718.3322**
Total	**295.58**	**187.6**	**247.43**	**48.02**	**96.75**	**875.38**

Social Impact

The model estimates 674 households will be displaced due to the earthquake. Of those, 483 will need temporary public shelter.

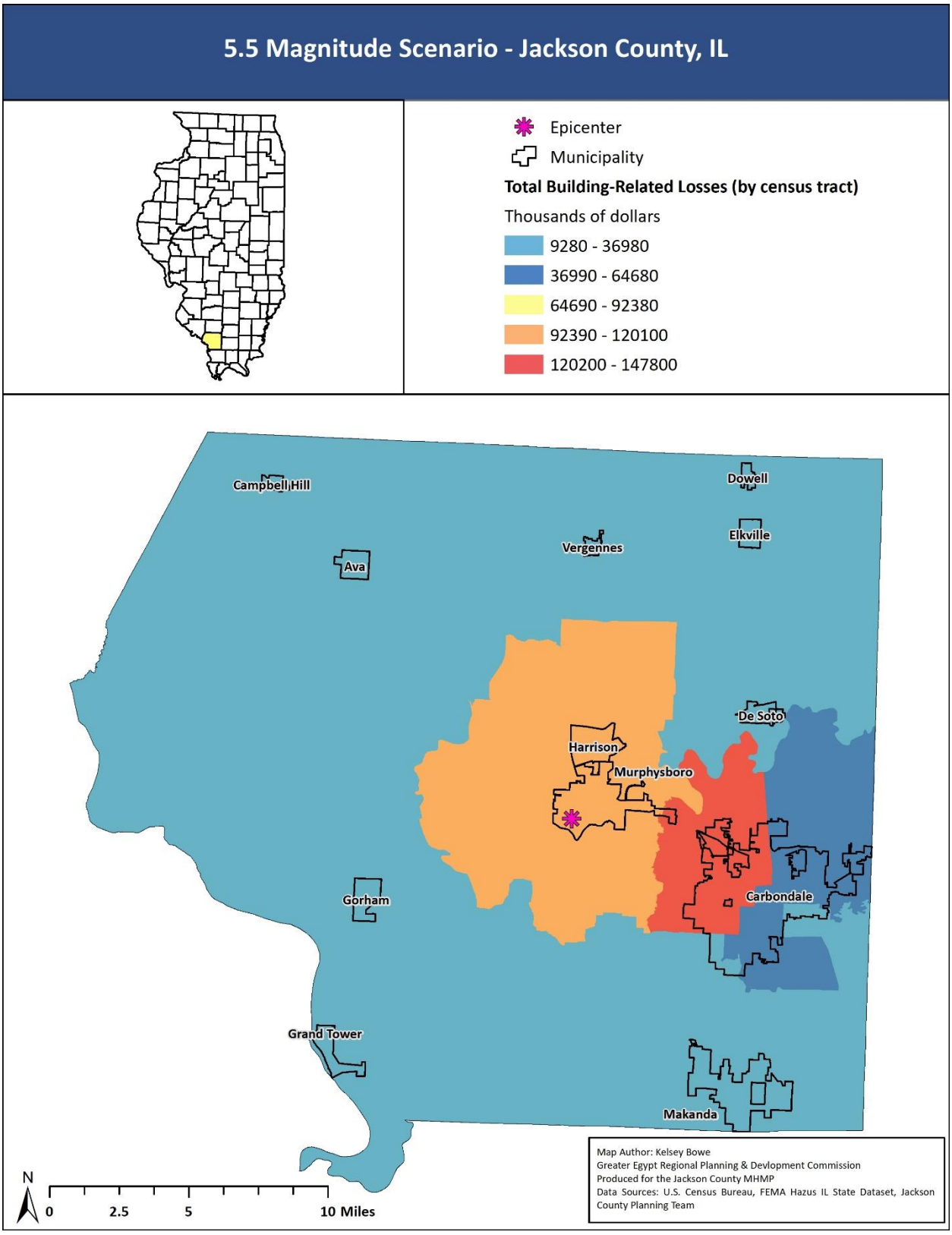
Table 4.20 displays injury and casualty estimates for 3 different occupancy load scenarios. 2:00 AM represents maximum residential occupancy load (most of population home in bed), 2:00 PM represents peak educational, commercial, and industrial occupancy (most of population at work/school), and 5:00 PM represents peak commuter occupancy. Injury severity levels are as follows:

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

Table 4.20 – Injury and Casualty Estimates

Time of Earthquake	Occupancy Type	Level 1	Level 2	Level 3	Level 4
2:00 AM	Commercial	2.71	0.65	0.09	0.17
	Commuting	0.01	0.02	0.03	0.01
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1.71	0.41	0.05	0.1
	Other-Residential	90.78	19.22	2.04	3.87
	Single Family	92.96	21.51	2.94	5.78
	Total	**188**	**42**	**5**	**10**
2:00 PM	Commercial	163.72	39.53	5.33	10.34
	Commuting	0.12	0.15	0.26	0.05
	Educational	96.49	23.67	3.43	6.62
	Hotels	0	0	0	0
	Industrial	12.63	3	0.4	0.76
	Other-Residential	20.92	4.54	0.51	0.94
	Single Family	21.83	5.22	0.75	1.4
	Total	**316**	**76**	**11**	**20**
5:00 PM	Commercial	117.56	28.48	3.88	7.43
	Commuting	2.16	2.77	4.81	0.92
	Educational	28.98	6.87	0.97	1.88
	Hotels	0	0	0	0
	Industrial	7.89	1.88	0.25	0.48
	Other-Residential	34.49	7.46	0.84	1.54
	Single Family	37.29	8.9	1.27	2.38
	Total	**228**	**56**	**12**	**15**

Figure 4.10


5.5 Magnitude Scenario - Jackson County, IL
Epicenter
Municipality
Total Building-Related Losses (by census tract)
Thousands of dollars
9280 - 36980
36990 - 64680
64690 - 92380
92390 - 120100
120200 - 147800
Campbell Hill
Dowell
Elkville
Vergennes
Ava
De Soto
Harrison
Murphysboro
Gorham
Carbondale
Grand Tower
Makanda
N
0
2.5
5
10 Miles
Map Author: Kelsey Bowe
Greater Egypt Regional Planning & Devlopment Commission
Produced for the Jackson County MHMP
Data Sources: U.S. Census Bureau, FEMA Hazus IL State Dataset, Jackson County Planning Team

Magnitude 7.5 event in the New Madrid Seismic Zone

Model Parameters:
USGS ShakeMaps Scenario - M7.5-New Madrid central fault, version 5, bssc2014
Depth - 19.358km
Latitude - 35.83234
Longitude - -90.06303

This model estimates damages and social impacts of a magnitude 7.5 earthquake in the central fault of the NMSZ for Jackson County, Illinois. An earthquake of this magnitude would be catastrophic to the population, infrastructure, and economy of northeast Arkansas, southeast Missouri, western Kentucky, southern Illinois, and surrounding areas; even though the effects in Franklin County are expected to be mild. The Mid America Earthquake Center estimated that if a repeat of the 1811-1812 earthquakes occurred today, the NMSZ would suffer over 3,000 deaths, hundreds of hospitals could lose functionality, millions of households and businesses would lose water and electricity, and total economic losses would be in the hundreds of billions of dollars.

Results:

In this scenario, 1,506 buildings are estimated to be moderately or extensively damaged, and only 17 buildings are estimated to be completely damaged. Table 4.21 shows the damage estimates by occupancy type. No essential facilities are estimated to be damaged. No transportation systems are estimated to be damaged. No utility facilities are estimated to be damaged, but there is some damage to pipelines. Damage to utility pipelines is displayed in table 4.22. No households are expected to lose utility services as a result of the earthquake. Hazus only estimates utility losses for the county as a single unit; it does not take into account that power grids, water lines, and other pipelines may be interconnected across multiple counties or states.

Table 4.21 – Damage Estimates by Occupancy Type

	None		Slight		Moderate		Extensive		Complete	
Occupancy Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	112.92	0.58	17.36	0.72	11.05	0.85	2.51	1.24	0.16	0.89
Commercial	999.95	5.1	167.69	6.92	95.35	7.32	22.38	11.01	1.63	9.38
Education	57.52	0.29	9.17	0.38	5.27	0.4	0.93	0.46	0.12	0.67
Government	55.16	0.28	8.79	0.36	5.16	0.4	0.78	0.39	0.1	0.6
Industrial	207.29	1.06	33.78	1.39	20.71	1.59	4.9	2.41	0.32	1.82
Other Residential	4373.96	22.31	985.67	40.69	795.73	61.05	106.78	52.52	6.85	39.42
Religion	125.59	0.64	17.23	0.71	9.75	0.75	2.22	1.09	0.21	1.21
Single Family	13674.22	69.74	1182.56	48.82	360.42	27.65	62.8	30.89	8	46.01
Total	**19,607**		**2,422**		**1,303**		**203**		**17**	

Table 4.22 – Utility Pipeline Damage Estimates

System	Total Pipeline Length (miles)	# of Leaks	# of Breaks
Potable Water	2,634	42	11
Waste Water	1,581	21	5
Natural Gas	24	0	0
Oil	0	0	0

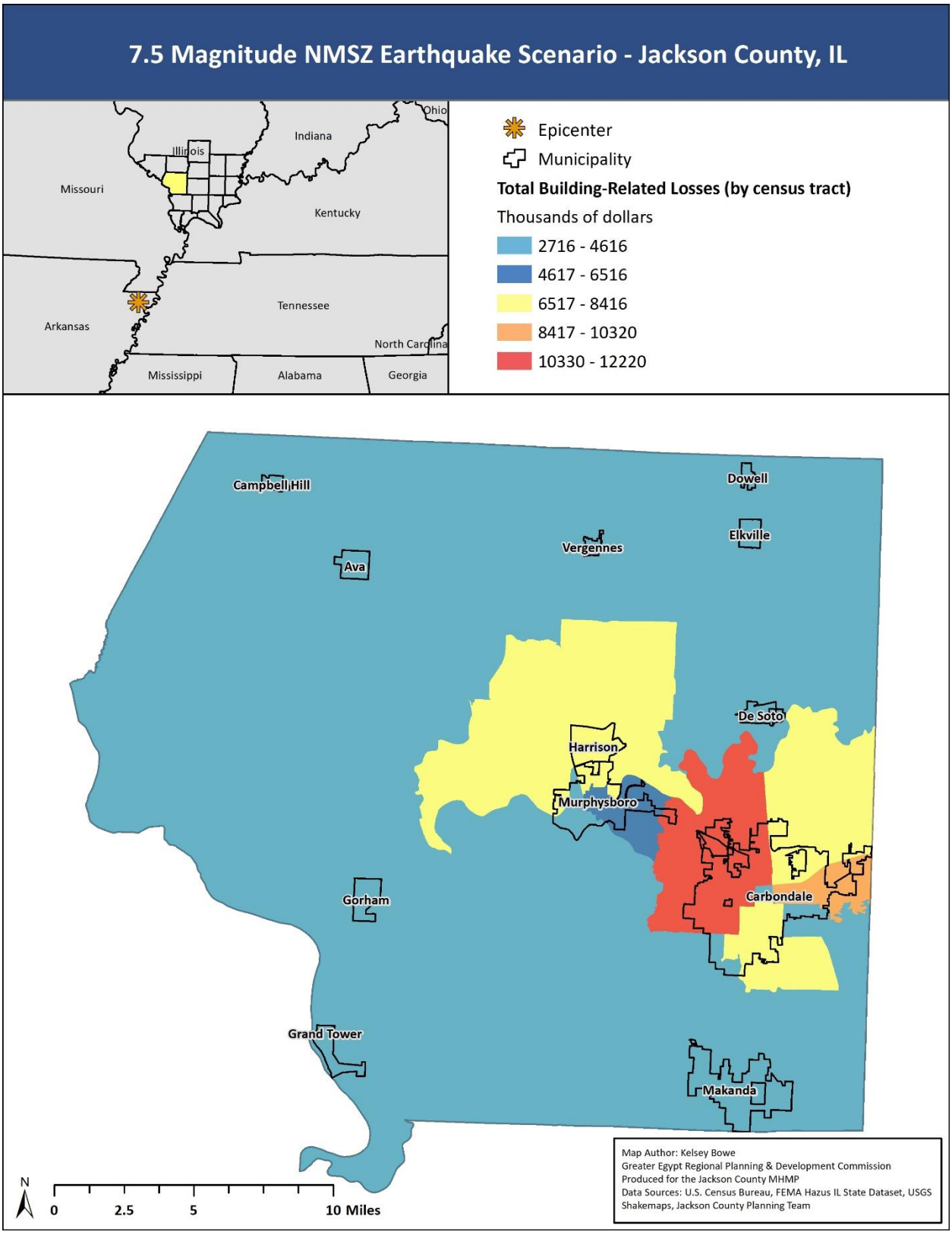
This scenario estimates 31,000 tons of debris will be generated, requiring 1,240 truckloads to remove. 56 households would be displaced as a result of the earthquake, and 44 of the households would be in need of temporary public shelter. This model estimates between 21 and 32 level 1 injuries, 3-5 level 2 injuries, and 0-1 severe injuries or deaths would occur from the earthquake, with the 2pm scenario having the highest estimates.

Table 4.23 and figure 4.11 show building-related economic loss estimates. In addition to the building related losses, there is an estimated $1.84 million economic loss to the transportation sector and $7.59 million economic loss to utility systems. Total Economic losses are estimated to be $94.79 million.

Table 4.23 – Building-related Economic Loss Estimates

Category	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses						
Wage	0	0.1802	4.1913	0.0917	0.4527	4.9159
Capital-Related	0	0.0767	3.5273	0.0663	0.1192	3.7895
Rental	0.811	1.4399	2.0351	0.0416	0.2	4.5276
Relocation	2.843	2.1931	2.9827	0.2591	1.7116	9.9895
Subtotal	**3.654**	**3.8899**	**12.7364**	**0.4587**	**2.4835**	**23.2225**
Capital Stock Losses						
Structural	5.0971	4.0199	3.9843	0.71	1.7438	15.5551
Nonstructural	13.0704	11.093	6.8267	1.2269	3.5891	35.8061
Content	3.2624	2.066	2.9734	0.7296	1.5471	10.5785
Inventory	0	0	0.0753	0.1111	0.0127	0.1991
Subtotal	**21.4299**	**17.1789**	**13.8597**	**2.7776**	**6.8927**	**62.1388**
Total	**25.08**	**21.07**	**26.6**	**3.24**	**9.38**	**85.36**

Figure 4.11


7.5 Magnitude NMSZ Earthquake Scenario - Jackson County, IL
Ohio
Indiana
Illinois
Missouri
Kentucky
Tennessee
Arkansas
North Carolina
Mississippi
Alabama
Georgia
Epicenter
Municipality
Total Building-Related Losses (by census tract)
Thousands of dollars
2716 - 4616
4617 - 6516
6517 - 8416
8417 - 10320
10330 - 12220
Campbell Hill
Dowell
Elkville
Vergennes
Ava
De Soto
Harrison
Murphysboro
Carbondale
Gorham
Grand Tower
Makanda
N
0
2.5
5
10 Miles
Map Author: Kelsey Bowe
Greater Egypt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: U.S. Census Bureau, FEMA Hazus IL State Dataset, USGS Shakemaps, Jackson County Planning Team

4.5. Severe Winter Weather

4.5.1. Hazard Description

Severe winter weather is any cold weather event that poses risk to human life and property. Severe winter weather may also significantly disrupt transportation and economic sectors. Types of severe winter weather are heavy snowfall, extreme low temperatures, freezing rain, sleet, blizzards, ice storms, and strong winds. Freezing rain refers to precipitation falling as a liquid that enters sub-freezing air or cold surfaces, forming ice while sleet refers to precipitation that freezes while falling. The typical definition of severe winter storm for Illinois is an event that produces six inches of snow or more in 48 hours. Severity of winter weather can also be classified by wind speeds and ice.

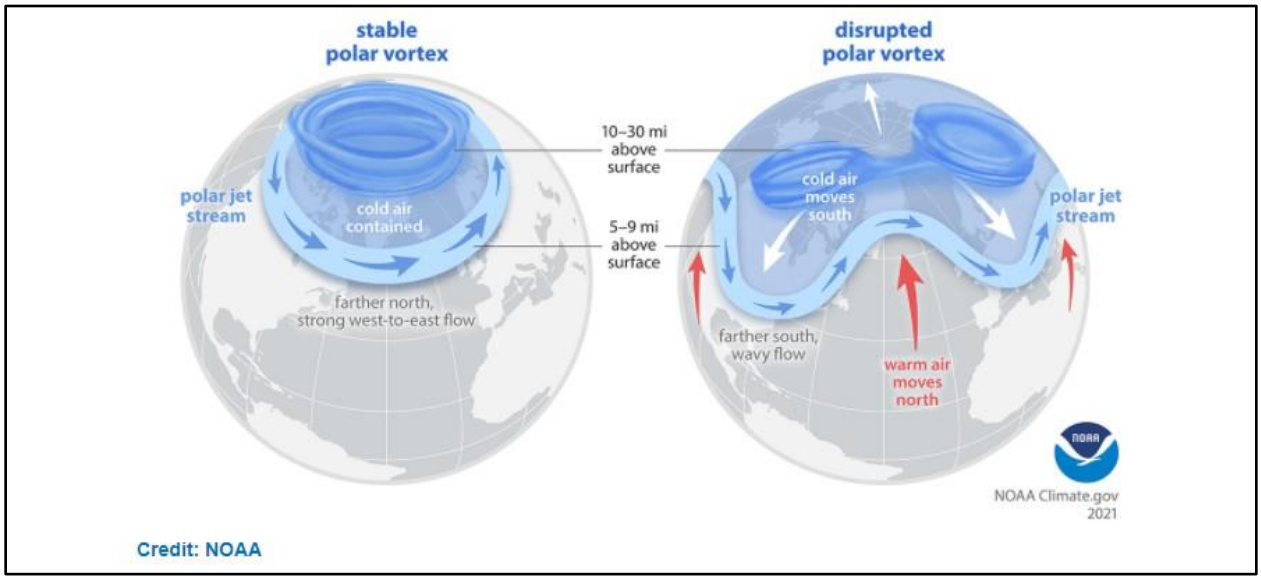
News and weather outlets have been using the term "Polar Vortex" more commonly in recent years. While some outlets are using the term loosely, this report will refer to the NOAA definitions:

- Polar vortex: A band of strong westerly winds that rotate in the stratosphere, 10-30 miles above the surface of the earth, over the north pole. These winds enclose extremely cold air
- Polar Jet Stream: a band of winds in the troposphere, 5-9miles above the earth's surface, over the north pole

Winter weather in the mid to southern United States associated with the polar vortex occurs when it weakens and becomes disrupted or "wobbles". This can in turn interact with the polar jet stream, causing it to move in more wavy forms than its traditional circulation around the north polar regions. These waves of polar jet stream air can dip down far into the U.S., causing severe cold outbreaks, along with ice and snow (figure 4.12)[27]. Some but not all winter storms in southern Illinois are associated with this natural phenomenon.

[27] Lindsey, Rebecca, "Understanding the Arctic polar vortex" NOAA climate.gov, 2021.

Figure 4.12



4.5.2. Specific Impacts

4.5.2.1. Agriculture

Severe winter weather can inflict heavy tolls on the agriculture industry. Planting or harvesting can be delayed. Crops and livestock can die in extreme cases, especially in southern regions where many farmers do not have barns to house their animals in the event of a storm. Unsafe roads can disrupt transportation of harvest and other products on time, and icy conditions can delay barge shipments as well, which is relied on heavily along the Mississippi corridor.

4.5.2.2. Urban

Snow, freezing rain, ice, and sleet can all cause dangerous road conditions, even in small amounts. Disruption of traffic and business closures due to winter weather can negatively impact local and broader economies. Transportation of goods and passengers can be delayed and schools may be shut down when roadways are covered in ice and snow. State, county, and local governments incur large costs for snow removal, salting the roads, and repairing roads that freeze and crack.

Freezing rain can cause immense property damage. When freezing rain comes into contact with surfaces, it forms an ice layer that can quickly become too heavy for power lines, trees, buildings, and roadways. Downed trees and power lines may disrupt power and communication for homes, business, and critical facilities without backup power options. Freezing temperatures can also cause pipes to freeze and burst, which can be very costly to repair.

4.5.2.3. Human Health

Traffic accident frequency increases during winter weather. Negative impacts due to an accident can be exacerbated by delayed medical care - from unsafe roads to health facilities and first responders being stretched thin during winter storm events.

Extreme cold temperature events can lead to frostbite or hypothermia for residents. Windy conditions during a cold weather event lower the wind chill factor, further increasing risk to humans.

4.5.2.4. Natural Landscapes

Effects of the hazard on natural areas are similar to the other sections. Freezing temperatures can cause frostbite and hypothermia in animals. Freezing over of waterbodies can kill some plants and animals. This most often occurs in areas of the south where less species are adapted to winter weather, or when a severe storm occurs later or earlier than normal in a season. Heavy snow and freezing rain can cause limbs to break or whole trees to fall, disrupting forest structure. Economic losses can stem from damaged park facilities, decreased tourism, delays in logging operations, and damaged timber stands.

4.5.3. Climate Change

A major effect of climate change in the Midwest is an increase in severe precipitation events, and an increase in heavy snowfalls has been an emerging pattern over the last decade for the eastern two-thirds of the continental US[28].

While some evidence suggests climate change can be causing the polar vortex to wobble and lead to severe winter weather in more southern latitudes, the relationship is not fully understood. One possibility is that global surface temperature increases, especially over Arctic Sea ice, can cause enough changes in surface temperature and pressure to influence the polar vortex. It is also possible these recent winter weather evets are just natural variations in the flows of the polar vortex and polar jet stream. There is limited historical data on patterns of the stratosphere, making it difficult to predict long-term trends for the future[29].

[28] "Climate Change and Extreme Snow in the U.S." NOAA National Centers for Environmental Information.
[29] Lindsey, Rebecca "Understanding the Arctic polar vortex", NOAA climate.gov, 2021.

4.5.4. Geographic Location and Historical Occurrences

Severe winter storms hold the record in Illinois for most total damage produced by any short-term weather event.

Table 4.24 - Severe winter weather and number of records for Jackson County from 1996-2021.

Weather Type	Days
extreme cold	3
heavy snow	11
ice storm	5
winter storm	30

Source: NOAA Storm Events Database

Table 4.25 - Severe winter weather events that caused property damage in Jackson County

Date	Property Damage	Storm Type
1/1/1999	50000	Ice Storm
1/13/2017	75000	Ice Storm
2/11/2008	500000	Winter Storm
1/26/2009	400000	Winter Storm
2/21/2013	50000	Winter Storm
2/20/2015	40000	Winter Storm
3/3/2008	30000	Winter Storm
2/24/2016	30000	Winter Storm

Source: NOAA Storm Events Database

4.5.5. Risk

Although the risk for severe winter weather is lower in more southern counties, it does occur, and often causes severe damage to property and infrastructure. Severe winter weather can occur anywhere in Jackson County, the entire county has equal risk.

4.6. Severe Thunderstorms

4.6.1. Hazard Description

Thunderstorms are rain bearing clouds that produce lightning. The major thunderstorm categories are single cell, multi-cell, squall line, and supercells. Single-cell storms are short lived and can result in heavy rain and lightning. Multi-cell storms occur along a front and can cause hail, strong winds, tornados, and flooding. Squall storms are a composition of smaller cells that are oriented in a thin line. These systems can cause severe winds and heavy rain. A supercell is a highly energetic storm characterized by a strong rotating updraft. Supercells can cause rain, hail, lightning, high winds, and strong tornados. Thunderstorms can also move together as a system. These are known as Mesoscale Convective Systems (MCS) and may last over 12 hours and cover areas as large as a state[30].

Thunderstorm related hazards can be serious. Lightning can cause injury or death to humans, damage to structures, and start fires. The National Weather Service reports that lightning inures roughly 300 people per year and kills 80 people per year in the United States. High wind speeds caused by thunderstorms can result in damage to homes, buildings, trees, and infrastructure. Hail produced by thunderstorms can cause injury to people and damage to automobiles and infrastructure. According to the National Weather Service, for a thunderstorm to be severe it must either produce hail of at least one inch in diameter, winds of at least 58 mph, or produce a tornado. A combination of 40mph winds and 0.5” hail also qualifies as severe.

4.6.2. Climate Change

The largest impacts the Midwest is experiencing from climate change are an increase in spring and summer precipitation and increased flooding. From 2010-2014, the state of Illinois experienced a record number of extreme precipitation events. There are predicted increases in temperature, precipitation, and evaporation in Illinois, leading to frequent and more intense floods and droughts[31]. The eastern U.S. is expected to have an increase in the number of days favorable for the formation of severe thunderstorms[32].

4.6.3. Geographic Location and Historical Occurrences

There are 201 total records of thunderstorm winds in Jackson County from 1/1/1950 to 1/31/2021, with two records of death or injury and 90 records of property damage. See Table 4.26 for a list of damaging wind records with $10,000 or more in property damage.

There are 129 total records of hail in Jackson County from 1/1/1950 to 1/31/2021, with 11 reports of property or crop damage and no records or death or injury (table 4.27).

There are three total records of lightning in Jackson County from 1/1/1950 to 1/31/2021, see table 4.28.

[30] “Severe Weather 101”, NOAA National Severe Storms Laboratory.
[31] “Climate Change in Illinois” Illinois State Water Survey/Prairie Research Institute
[32] NASA - Global Climate Change, “Severe thunderstorms and climate change”, April 7, 2013.

Table 4.26 – Selected thunderstorm wind records, Jackson County, IL

Location	Date	Deaths	Injuries	Property Damage
Several locations	5/18/1995	0	0	10000
MURPHYSBORO	4/19/1996	0	0	1000000
MURPHYSBORO	4/15/1998	0	0	15000
(MDH)CRBNDL/MRFYSBRO	5/21/1998	0	0	25000
(MDH)CRBNDL/MRFYSBRO	6/12/1998	0	0	50000
CARBONDALE	1/3/2000	0	0	150000
VERGENNES	10/24/2001	0	2	50000
MURPHYSBORO	10/24/2001	0	0	25000
MURPHYSBORO	4/27/2002	0	0	10000
MURPHYSBORO	7/6/2004	0	0	40000
AVA	8/26/2005	0	0	15000
MURPHYSBORO	9/28/2005	0	0	25000
MURPHYSBORO	4/2/2006	0	0	50000
MURPHYSBORO	10/18/2007	0	0	100000
MURPHYSBORO	1/29/2008	0	0	100000
CAMPBELL HILL	5/25/2008	0	0	10000
CARBONDALE	6/27/2008	0	0	30000
MURPHYSBORO	12/27/2008	0	0	100000
NEUNERT	5/8/2009	1	6	100000000
CARBONDALE	4/19/2011	0	0	1200000
MURPHYSBORO	4/19/2011	0	0	30000
VERGENNES	4/19/2011	0	0	15000
CARBONDALE	5/25/2011	0	0	20000
GORHAM	8/6/2011	0	0	50000
MAKANDA	2/29/2012	0	0	50000
MURPHYSBORO	9/7/2012	0	0	30000
MURPHYSBORO	1/29/2013	0	0	40000
MURPHYSBORO	2/20/2014	0	0	10000
SATO	10/13/2014	0	0	10000
CARBONDALE	7/9/2015	0	0	20000
MURPHYSBORO	7/17/2017	0	0	10000
POMONA	5/31/2018	0	0	10000
CAMPBELL HILL	5/31/2018	0	0	10000
ELKVILLE	6/28/2018	0	0	60000
BARR	7/21/2019	0	0	50000
GRAND TOWER	5/24/2020	0	0	10000
MURPHYSBORO	6/20/2020	0	0	40000
AVA	7/15/2020	0	0	20000
POMONA	7/17/2020	0	0	10000
MURPHYSBORO	7/21/2020	0	0	20000
AVA	8/10/2020	0	0	40000
MURPHYSBORO	8/10/2020	0	0	10000

Source: NOAA Storm Events Database

Table 4.27 – Hail records that have caused property or crop damage, Jackson County, IL

Location	Date	Hail Diameter	Property Damage	Crop Damage
	4/29/1963	1	0	0
Murphysboro	8/1/1993	0.75	500	0
MURPHYSBORO	3/28/1997	1.75	50000	0
DE SOTO	6/12/1998	1	40000	0
GORHAM	5/23/2000	1	0	20000
GRAND TOWER	5/2/2002	2	1000000	0
CARBONDALE	9/22/2006	1	10000	0
CAMPBELL HILL	5/25/2008	1.5	5000	0
DE SOTO	5/7/2009	1.75	100000	0
ORAVILLE	5/7/2009	1.75	20000	0
MURPHYSBORO	5/20/2012	1.75	100000	0

Source: NOAA Storm Events Database

Table 4.28 – Lightning records, Jackson County, IL

Location	Date	Deaths	Injuries	Property Damage
MURPHYSBORO	8/7/2000	0	0	10000
CARBONDALE	3/29/2007	1	0	0
CARBONDALE	6/9/2010	0	1	0

Source: NOAA Storm Events Database

4.6.4. Risk

The county has equal risk of severe thunderstorms occurring.

4.7. Flooding

4.7.1. Hazard Description

Flooding in southern Illinois is a significant and recurring hazard. This is a result of lying between the two largest rivers in the U.S. (when ranked by discharge), the Mississippi and Ohio; as well as climactic and seasonal factors. Characteristics of floods are uniquely influenced by precipitation intensity, infiltration rates, hydrogeologic features of a watershed, and interactions with the built environment.

There are 2 different types of floods that may occur in southern Illinois:

4.7.2. Flash/Upstream Floods

Flash flooding occurs when heavy rainfall leads to rapid flooding in upstream catchments and smaller tributaries. Urban flooding, when water overwhelms an area's drainage capacity is also a type of flash flood. Due to the fast-moving water inherent with flash floods, there can be significant hazards to people and the built environment. These can include loss of human life, destroyed buildings, downed trees, submerged vehicles, downed utilities, and more. Flash floods most often occur in the spring and early summer.

Flash flooding from extreme precipitation (defined as a weather event with more than two inches of precipitation) can have many widespread negative effects. Increased stormwater flow can lead to more pollutants in water bodies including excess nutrients from agriculture and urban fertilizers, pesticides and herbicides, sediments, motor oil and other vehicle pollution, and microbial pathogens.

Urban flooding is defined by the State of Illinois as "The inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. 'Urban flooding' does not include flooding in undeveloped or agricultural areas."[33] A major concern with urban flooding is that it can be difficult to predict which areas have the highest risk, according to the summary report of the Urban Flooding Awareness Act, 90 percent of insurance payouts for urban flooding in Illinois occurred outside of FEMA's mapped 100-year floodplain. The report also states that mapping areas of urban flooding is not feasible on a statewide level and should be addressed by communities. Increased precipitation and urban flooding will also increase stormwater pollution. There are currently no counties in southern Illinois that have stormwater ordinances.

4.7.3. Riverine/Downstream Floods

Riverine floods occur along major rivers and develop more slowly. These floods typically form as a result of widespread, long-lasting rainfalls. Riverine floods in smaller tributaries can occur, but they often runoff and lead to larger downstream flooding. The lag between rainfall and elevated river levels provides more warning of an impending flood event, generally allowing for evacuation, some property protection, and other emergency measures to be made. Riverine

[33] IL General Assembly Public Act 098-0858 "Urban Flooding Awareness Act"

floods can have a wide variety of side effects, from immediate damage due to the force of water and debris moving to secondary and tertiary effects such as disruption of power and services, disease spread, change in hydrology of river channels, and many others[34]. The total damages to human health, property, the economy, and the environment depend on the height, duration, and distribution of flood waters.

4.7.3.1. Flooding and Agriculture

Agriculture is a large component of southern Illinois's economy, especially along the Mississippi, Big Muddy, and Ohio rivers. Both flash and riverine floods can have major impacts on farming and ranching. More intense and frequent spring rains can delay planting, overly saturated soil can harbor harmful fungi and other microbes, and stormwater flow can erode necessary top soils. Long-term riverine floods can destroy a harvest completely, damage buildings and equipment, flood out pasture fields, and drown livestock.

4.7.4. Climate Change

Extreme precipitation is expected to increase with the warming climate, which in turn increases the frequency and intensity of floods. Springtime precipitation is expected to increase in southern Illinois by 10-15% by 2050, with Illinois already experiencing dramatic increases in extreme precipitation events over the past two decades [35]. 2019 was the second wettest year ever documented in the U.S., with extreme flooding events occurring along the Arkansas, Missouri, and Mississippi river basins. These floods affected 15 states, and had an estimated combined cost of $20 billion[36]. The Mississippi River experienced its longest lasting flood in 2019, with river gauges at or above flood stage for record breaking periods in Iowa, Illinois, Mississippi, and Louisiana[37]. Similarly, the Big Muddy River at Murphysboro (USGS Stream Gauge 05599490) was at or above flood stage (22ft) for a total of 143 days during 2019. Peak water height was recorded at 31ft on June 11, 2019[38].

4.7.5. Geographic Location and Historical Occurrences

The following tables show flood and flash flood records for Jackson County. Flood records for Jackson County begin at 1996.

There are 147 records of floods for the county, 42 of which caused property or crop damage.

There are 39 records of flash flood in the county, 18 of which caused property or crop damage.

[34] Nelson, S.A., "Flooding Hazards, Prediction, & Human Intervention", Tulane University, 2015.
[35] Frankson, R.K. et al., Illinois State Climate Summary, NOAA Technical Report, 2017.
[36] National Oceanic and Atmospheric Administration, "2019 was the 2nd wettest year on record for the U.S." January 8, 2020.
[37] Donegan, Brian, The Weather Channel, "2019 Mississippi River Flood the Longest-Lasting Since the Great Flood of 1927 in Multiple Locations" May, 22, 2019.
[38] USGS National Water Information System: Web Interface, USGS 05599490 Big Muddy River at RTE 127 at Murphysboro, IL

Table 4.29 - Flood events in Jackson County that caused property or crop damage

Location	Date	Property Damage	Crop Damage
AVA	3/18/2008	1800000	0
GRAND TOWER	1/1/2016	1000000	0
BOSKYDELL	5/1/2011	350000	0
GRAND TOWER	1/1/2016	250000	0
GRAND TOWER	6/1/2019	100000	50000
	5/1/1996	100000	0
JOHNS SPUR	5/1/2017	75000	0
GRAND TOWER	7/1/2019	50000	500000
GRAND TOWER	6/1/2011	50000	50000
MT CARBON	6/1/2019	50000	50000
	5/1/1996	50000	0
GRAND TOWER	5/1/2011	50000	0
GRIMSBY	5/1/2011	50000	0
GRAND TOWER	5/1/2019	50000	0
	4/22/1996	30000	30000
MURPHYSBORO	2/21/2018	30000	0
	3/1/1997	20000	0
	5/1/2002	15000	0
GRIMSBY	7/1/2019	10000	50000
MURPHYSBORO	6/2/2013	10000	10000
	6/17/2000	10000	0
MURPHYSBORO	3/19/2008	10000	0
	7/1/1998	5000	0
HARRISON	3/1/2018	5000	0
MURPHYSBORO	4/1/2018	5000	0
HARRISON	3/20/2020	5000	0
	5/1/1999	4000	0
	5/1/1999	4000	0
	6/1/1997	3000	0
	2/1/1999	3000	0
GRAND TOWER	7/1/2015	2000	25000
GRIMSBY	7/1/2015	2000	5000
	5/8/2002	2000	0
SAND RIDGE	12/1/2011	2000	0
MT CARBON	12/24/2013	2000	0
GRIMSBY	6/17/2015	2000	0

Source: NOAA Storm Events Database

Table 4.29 Continued

Location	Date	Property Damage	Crop Damage
GRAND TOWER	6/17/2015	1000	0
MURPHYSBORO	7/1/2008	0	50000
GRAND TOWER	5/1/2017	0	50000
GRIMSBY	6/18/2008	0	30000
MURPHYSBORO	9/13/2018	0	5000
MT CARBON	7/1/2010	0	1000

Source: NOAA Storm Events Database

Table 4.30 -Flash Flood Events in Jackson County that caused property or crop damage

Location	Date	Property Damage	Crop Damage
MURPHYSBORO	4/22/1996	30000	0
MURPHYSBORO	4/28/1996	100000	20000
MURPHYSBORO	5/10/1996	200000	0
COUNTYWIDE	4/15/1998	30000	0
NORTH PORTION	4/15/1998	20000	0
CARBONDALE	6/29/1998	100000	0
COUNTYWIDE	1/21/1999	100000	0
CARBONDALE	4/3/1999	4000	0
CARBONDALE	6/16/2000	20000	0
COUNTYWIDE	5/12/2002	10000	0
CARBONDALE	10/18/2004	3000	0
COUNTYWIDE	1/13/2005	5000	0
COUNTYWIDE	11/15/2005	50000	0
BARR	7/12/2011	5000	0
CARBONDALE	9/1/2012	30000	0
CARBONDALE	6/19/2015	10000	0
CARBONDALE	7/6/2016	2000	0
CARBONDALE	4/29/2017	100000	0

Source: NOAA Storm Events Database

4.7.6. Risk

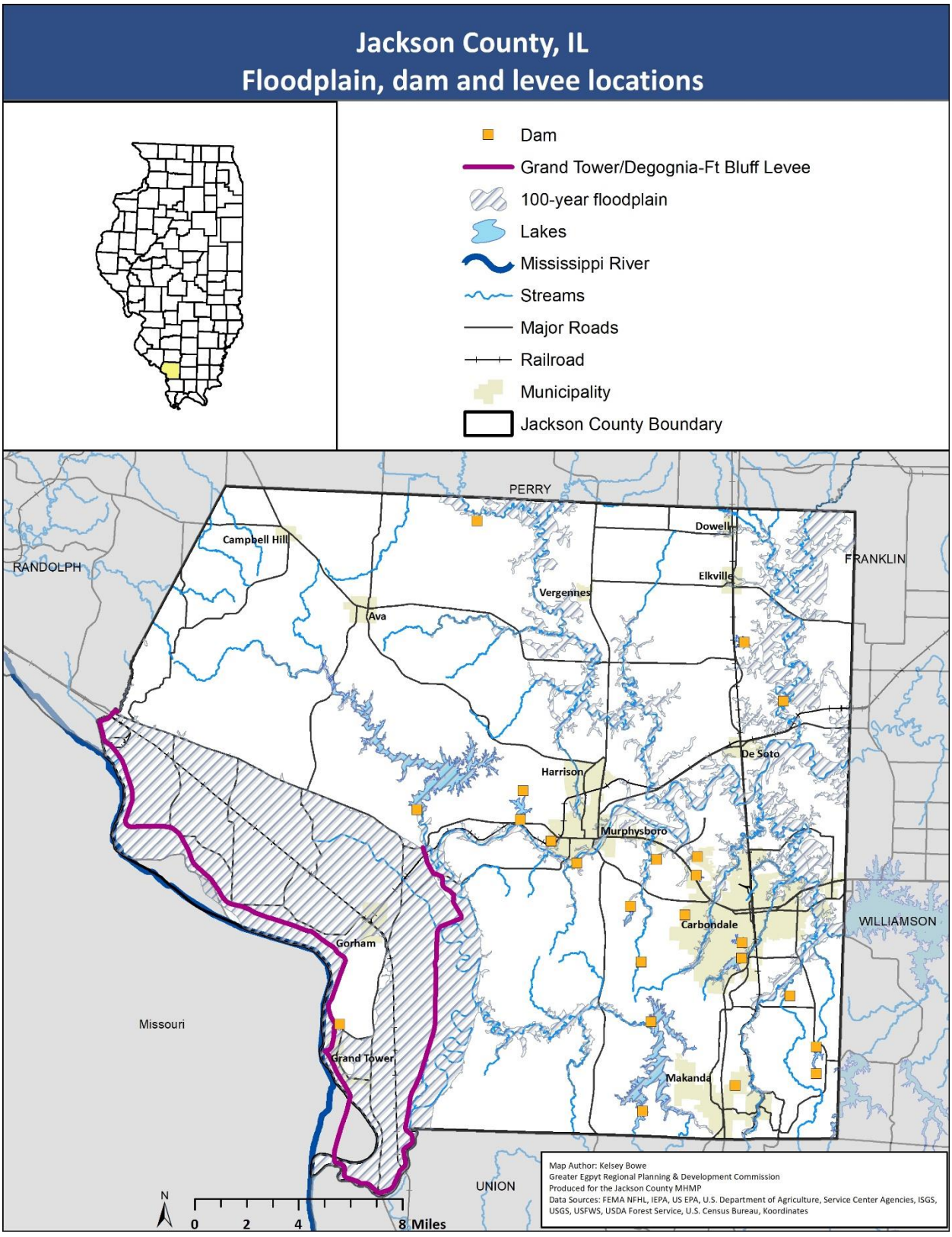
Flooding may occur anywhere during and following heavy precipitation events; In Jackson County, riverine floods are most likely to occur within the floodplains of the Mississippi and Big Muddy Rivers, as well as their larger tributaries such as Beaucoup Creek, Little Muddy River, and Crab Orchard Creek. Flash and urban floods are most likely to occur along low lying

roadways and in areas with a high percentage of impervious surfaces- such as Carbondale and Murphysboro.

There are two essential facilities in Jackson County that are within the 100-year floodplain: Gorham Volunteer Fire Department and Grand Tower Fire Department. However, both of these facilities are protected by the Grand Tower/Degognia-Fountain Bluff Levee System.

Figure 4.13 shows the 100-year floodplain, dam and levee locations, and major water bodies of Jackson County.

Figure 4.13


Jackson County, IL
Floodplain, dam and levee locations
Dam
Grand Tower/Degognia-Ft Bluff Levee
100-year floodplain
Lakes
Mississippi River
Streams
Major Roads
Railroad
Municipality
Jackson County Boundary
PERRY
Dowell
Campbell Hill
RANDOLPH
FRANKLIN
Elkville
Vergennes
Ava
De Soto
Harrison
Murphysboro
Carbondale
WILLIAMSON
Gorham
Missouri
Grand Tower
Makanda
UNION
N
0
2
4
8 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: FEMA NFHL, IEPA, US EPA, U.S. Department of Agriculture, Service Center Agencies, ISGS, USGS, USFWS, USDA Forest Service, U.S. Census Bureau, Koordinates

4.8. Hazardous Materials Release

4.8.1. Hazard Description

Hazardous materials release can take many forms, a general definition is the unintentional release of any material that may cause harm to human health or the environment or cause damage to critical facilities. Areas at highest risk of hazardous materials release are factories and warehouses where chemicals and other dangerous materials are produced or stored, major transportation routes including railways and interstate highways, and mines.

Depending on the type of incident and material released, the extent of such a hazard can range from mild chemical spills to dangerous explosions.

As per the Federal Emergency Planning and Community Right to Know Act (EPCRA) of 1986, IEMA implemented a statewide Hazardous Materials Emergency Planning Program in which any facility that uses or stores threshold amounts of federally mandated substances must report annually to state and local officials, and must immediately report any releases that occur.

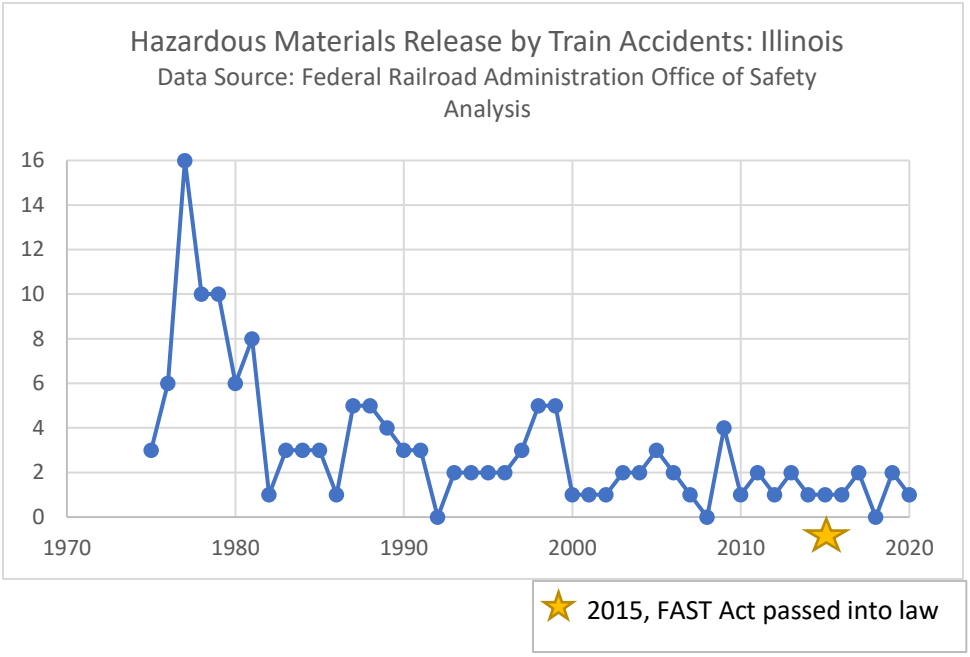
4.8.1.1. Train Derailments

Being in the central of the US, Illinois is a vital part of the transportation industry. The state has over 9,000 miles of railroads; with over 1,300 trains passing through Chicago every day[39]. Illinois leads the nation in number of carloads originating and terminating in the state each year, and has the second highest number of freight rail employees in the country. Additionally, millions of passengers use Amtrack services in the state each year.

Railway safety continues to improve in the United States. The Fixing America's Surface Transportation (FAST) Act of 2015 created new standards for tank cars that carry crude oil, ethanol, and other flammable liquids. These new tank cars, called DOT-117s and replace the older DOT-111 model. They are required to be built with thicker shells and shields, a ceramic thermal protection layer to prevent fire, and a fiberglass insulation layer to keep products at steady temperature and further reduce probability of tank punctures[40]. As of 2018, all DOT-111 crude oil tanks have been replaced. By 2023, all ethanol tanks will be phased out, and by 2025 all other tanks that carry flammable materials will be phased out of service[41]. Figure 4.14 shows number of train accidents that caused HazMat release in Illinois from 1975-2020.

[39] "Rail System" Illinois Department of Transportation
[40] Department of Transportation ""Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains" Final Rulemaking"
[41] Railway Supply Institute "HM-251/FAST Act Timeline"

Figure 4.14



4.8.1.2. Acid Mine Drainage

Acid mine drainage is caused by surface mining, most often for coal. When coal deposits are 100ft or less below the ground, surface mining is the most cost-effective way to extract it. This process involves stripping the surface materials (overburden) away, removing the coal, and refilling the pit back with the overburden. Surface mining is incredibly disruptive to the environment, accelerating the chemical breakdown of minerals and chemicals in the soil. When iron sulfide is exposed to air and water, ferrous sulfate and sulfuric acid are produced and drained into water bodies. Acidic water often dissolves metals present in sediments, including aluminum, iron, manganese, arsenic, cadmium, mercury, and zinc[42]. Sulfate loadings (and secondarily, concentrations of dissolved metals) are directly related to the area of land mined in southern Illinois. It was estimated in 1982 that about 3,500 tons of sulfate per square mile of surface mined land enter streams annually in the Big Muddy and Saline watersheds[11]. Some surface mines in these areas have since closed down, so the numbers may be lower today.

Surface coal mines are found in Gallatin, Jackson, Jefferson, Johnson, Perry, Pope, Randolph, Saline, and Williamson counties (see section 4.7 for more details on coal mining)

[42] L.G. Toler "Some Chemical Characteristics of Mine Drainage in Illinois" GEOLOGICAL SURVEY WATER-SUPPLY PAPER 2078, US Department of the Interior, 1982.

4.8.2. Geographic Location and Historical Occurrences

The most recent IEMA public report on hazardous materials spills includes incidents from 1987-2011. During these years there were 217 reported incidents for Jackson County, with the vast majority being spills of gasoline, diesel fuel, or crude oil[43].

There have been 2 train derailments in Jackson County since 1972 (Based on articles found in The Southern Illinoisian archives), neither of the incidents involved release of hazardous materials.

4.8.3. Risk

Transportation routes with the highest risk of hazardous materials release include state highways and all active railroads.

Other areas of high risk include factories and warehouses that use or store hazardous chemicals, hospitals, colleges, and universities that may store large amounts of cleaning supplies and other hazardous chemicals, and farms that store large amounts of fertilizer, herbicides, or pesticides.

FEMA Hazus Comprehensive Data Management System (CDMS) currently lists one Hazardous Materials Storage Sites for Jackson County, see below.

[43] Data.illinois.gov "IEMA Hazardous Materials Spills"

4.9. Drought and Excessive Heat

4.9.1. Hazard Description

There are many different definitions of drought, but in general the term refers to conditions in which below average rainfall occurs and leads to water shortage problems in a given area. There is no official length of time for the conditions listed to be considered a drought, but they are generally measured in terms of weeks or growing seasons and may last over the span of several years[44].

Drought conditions are often accompanied and exacerbated by extreme heat events. Elevated temperatures result in faster rates of evaporation. This results in worsening of drought conditions and decreased soil moisture content. Drought and extreme heat conditions can negatively impact agricultural productivity, urban and natural landscapes, and human health. Severity of drought events depends on duration and geographical extent of the conditions and can also be affected by land use demands, landcover, and water supply.

4.9.2. Specific Impacts

4.9.2.1. Human Health:

Heat Cramps- Muscular pains and spasms due to heavy exertion, is usually the first sign a person is experiencing heat-related illness.

Heat Exhaustion- Typically occurs when people have been exercising or working strenuously in hot, humid environments. Heavy sweating leads to rapid loss of body fluids, blood flow to the skin increases while blood flow to vital organs decreases- resulting in a form of mild shock. If left untreated, the victim may suffer from a heatstroke.

Heat and Sun Stroke- A life-threatening condition. The body's ability to produce sweat and cool itself stops working; body temperature can rise so high that brain damage and death may result if the victim is not treated quickly[45].

4.9.2.2. Urban:

Urban areas can suffer more from high temperatures than surrounding landscapes due to the Heat Island Effect, where built structures including roads and buildings absorb and re-emit the sun's energy more than natural landscapes. Urban areas can be 1-7°F warmer in the day and 2-5°F warmer during the night than outlying areas[46]. Trees and other vegetation provide shade and moisture, which keep areas cooler. In comparison, a parking lot absorbs heat and evaporates less water- leading to elevated temperatures. Side effects of living in urban heat islands can include higher home energy bills, increased exposure to air pollution, and higher risk of heat-related illness. Urban heat islands tend to have higher greenhouse gas emissions and impaired water quality.

[44] "Droughts: Things to Know" Water Science School, USGS
[45] 2015 plan
[46] U.S. Environmental Protection Agency. 2008. Reducing urban heat islands: Compendium of strategies. Draft. https://www.epa.gov/heat-islands/heat-island-compendium.

4.9.2.3. Agriculture:

Severe drought can stress plants and disrupt normal growing cycles, leading to less productive crops and grazing pasture. This can cause many issues for ranchers, during droughts feed prices go up and cattle prices can plummet[47].

Prolonged drought combined with areas of heavy agriculture can also exacerbate groundwater/aquifer depletion. When groundwater is pumped for crop irrigation (along with other uses) faster than precipitation can recharge the water storage, the water table will lower. If the water table drawdown is significant, wells can run dry in peoples' home, costs associated with pumping water increase, and in severe cases land subsidence may occur. This is an issue in Southwest and Great Plains states[48] and some areas of Chicago suburbs[49], but is less of a concern for southern Illinois.

4.9.2.4. Natural Landscapes:

Forested areas have increased risk of wildfires during droughts and extreme heat. Wildfires are necessary for some natural processes, but when they get out of control wildlife populations can drop to unhealthy levels, habitat loss can be great, and risk of fire spreading to human residences increases. Additionally, uncontrolled fires in natural areas may damage recreational areas such as campgrounds and picnic areas- leading to economic losses in the tourism industry.

Drought and excessive heat can severely harm freshwater habitats. Prolonged periods of both raise water temperature, increasing the risk of Harmful Algal Blooms (HABs). HABs in freshwater systems are usually a result of cyanobacteria, a type of blue-green algae that can reproduce, or bloom, rapidly in nutrient-rich warm waters such as ponds and reservoirs. Cyanobacteria occur naturally across the US, but HABs only occur under certain conditions. The other major factor that increases risk of HABs are fertilizer runoff from agricultural and urban areas.

Some but not all cyanobacteria produce toxins that cause skin irritation and can be deadly if ingested. Swimming and even playing on beaches are not recommended during HABs. Additionally, the EPA recommends waiting two weeks after a HAB ends before eating fish from the waterbody. Other side effects from HABs include lowered dissolved oxygen and increased turbidity of water, which can lead to die-offs of fish, invertebrates, and submerged freshwater plants. Drought can also dry up water bodies completely, with small streams and shallow wetlands being most at risk. This can result in loss of populations of freshwater organisms and altered community structure. The economic impacts from HABS can be significant, causing public beach closures and damaging fishery populations. One EPA report from Ohio estimated that a HAB caused an estimated loss of over $37million from decreased tourism.

[47] Larson, Debra "Drought Impacts on the Cattle Industry" University of Illinois Animal Sciences
[48] "Groundwater depletion across the nation" USGS factsheet, 2003.
[49] Mannix et al., "Groundwater Depletion in Chicago's Southwestern Suburbs" Illinois State Water Survey

4.9.3. Climate change

Evidence suggests that the frequency and severity of droughts in the U.S. will increase with climate change; in the Midwest specifically, droughts are expected to occur in late summer months.[50] Increases in temperature, precipitation, and evaporation will continue in Illinois, leading to frequent and more intense floods and droughts[51].

4.9.4. Geographic Location and Historical Occurrences

There are 11 records of excessive heat in Jackson County from 2010-2019 and 23 records of drought from 1998-2012. One drought in southern Illinois lasting through the month of September in 2007 caused $3,450,000 in crop damage across all of the counties affected[52].

Southern Illinois is home to many lakes, often surrounded by agriculture fields; creating ideal conditions for HABs in late summer. Illinois EPA has a statewide HAB testing and monitoring program, but data with locations of specific blooms are not available from their webpage. IEPA recommends ceasing aquatic recreation activities when Microcystin levels are greater than 10ug/L.

4.9.5. Risk

Jackson County has equal risk for heat waves and drought events. Excessive heat may be exacerbated in urban areas due to the heat island effect. HABs are most likely to occur in small ponds and lakes, or in shallow stagnant fingers of larger reservoirs.

[50] Angel, J. et al. 2018: Midwest. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II U.S. Global Change Research Program, Washington, DC, USA, pp. 872–940.
[51] "Climate Change in Illinois" Illinois State Water Survey/Prairie Research Institute
[52] NOAA Storm Events Database

4.10. Dam and Levee Failure

4.10.1. Hazard Description

Dams and levees are both river engineering structures used to control the path and movement of water. Reservoirs created from damming waterways are used for flood control, recreation, storing municipal water supply, and various other purposes. Dam failure can be a significant hazard to surrounding communities depending on the size of the reservoir, age, and structural integrity of the dam in question.

Most dam failures are caused by overtopping (floods that exceed the capability of the dam), internal erosion, and mechanical failure. Because there is so much variation and uncertainty, it is difficult to predict if or when a dam will fail. Detailed risk assessments are not available for all dams in the United States, although the average rate of large dam (greater then 40ft in height) failure in the US is 0.0001 dams/year[53] This rate does not take into account any factors other than dam height and age and should not be used as a replacement for detailed risk assessments performed on individual dams.

The risk of an incident or failure depends of many factors including height of the dam, size of reservoir, age of dam, and frequency of floods and seismic events that can weaken the structural integrity of dams. The amount of damage also depends on the amount or type of infrastructure and number of people living in the potential hazard zone.

Levees are used to contain a river or waterbody to a certain area, protecting the area behind from flooding events. Most large river levees in the U.S. were built by the United States Army Corps of Engineers (USACE) and are maintained by local levee commissions. 97% of levees are earthen embankments, the remaining 3% are concrete and rock levees as well as floodwalls[54].

Issues that can lead to levee breaches include, seepage, undersizing from floods, erosion, damage from tree roots and burrowing animals, and development projects near the levee. In cases of severe floods, levees can also be overtopped. Levee systems also pose a unique issue to riverine flooding. While they are designed to protect communities and property from flood events, the structures themselves can also exacerbate flood events downstream. Levee systems make river channels narrower, when heavy precipitation occurs the water flows faster and higher than it would without the structures in place.

There are many outdated and deteriorating infrastructures in the U.S. including dams and levees. The average age of all dams in Illinois is 53 years. The American Society of Civil Engineers (ASCE) gives the total of Illinois's infrastructure a grade of C-, with dams receiving a C.[55] This grade is mostly due to aging systems, increased usage, and inadequate funding to inspect, maintain, and repair infrastructures.

[53] Ferrante et al. "Uncertainty Analysis for Large Dam Failure Frequencies Based on Historic Data" nrc.gov
[54] "Overview of Levees" 2021 Report Card for America's Infrastructure
[55] Illinois Section of the American Society of Civil Engineers "Report Card for Illinois Infrastructures", 2018.

Jackson County also contains wing dams (sometimes called dikes, deflectors, or jetties) in the Mississippi River. These structures are perpendicular to the river channel and generally made of rip-rap (concrete pieces or large rocks), wooden piles, or a combination of both. They are designed to direct the flow of water to maintain a certain channel depth for barge traffic and other navigation.

There are over 13,000 wing dams on the river, and most of them are concentrated in the Middle Mississippi (St. Louis to Cairo). Erosion and breaching of wing dams are not necessarily a risk for people and property, but researchers have argued these structures make flooding worse, especially with climate change[56]. Since they make the river channel narrower, when floods occur the water levels are higher than they would be without the structures. The USACE claims wing dams do not alter flood regimes and do not affect aquatic habit or species distributions[57]. There is not much research on the subject, and more studies need to be conducted to confirm either claim[58]. Emergency Management officials and other local leaders should be aware of all potential flood risks for their communities in order to make informed decisions.

Figure 4.15: The top portion of a wing dam visible in the Mississippi River near Cape Girardeau, MO.

The extent of dam failure can be defined in terms of percentage of the structure that fails, the area of land that was flooded, or the monetary value that was damaged as a result of the event.

4.10.2. Climate Change

As of the most recent National Climate Assessment, there are no comprehensive climate change related risk assessments for water infrastructure of the U.S.[59]. Increased frequency in severe weather can put extra stress on dams, levees, and other water infrastructure, leading to increased risk of breaches and other damages. 2019 was the wettest year ever recorded in the U.S., which led to the longest lasting flood recorded for the Mississippi River. The longer levees

[56] Pinter, N. et. al, "Flood trends and river engineering on the Mississippi River system", Geophysical Research Letters, 2008.
[57] Stewart, B., "Redirecting the River" The Southern Illinoisian, August, 28, 2011.
[58] Stewart, B., "Flood Questions Unanswered", The Southern Illinoisian, December, 24, 2011.
[59] Lall, U.T. et. Al. 2018: Water. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II U.S. Global Change Research Program, Washington, DC, USA, pp. 145–173.

are saturated, the weaker they become. In 2019, over 80 levees systems were overtopped or breached, with 700 miles of damage across 6 states[60].

4.10.3. Geographic Location and Historical Occurrences

There is a federal database of dam and levee locations maintained by the USACE. Jackson County has 36.57 miles of levees, maintained by the Grand Tower Levee District and the Degognia-Fountain Bluff Levee District. The Grand Tower/Degognia Levee System was last inspected by the USACE in 2017 and was ranked as having a moderate risk. The levee system is Non-Accredited by FEMA, meaning the height of the levee is not expected to protect the area in the event of a 1% chance annual flood (100-year flood).

In 2013 the Grand Tower Levee District had a drainage pipe failure, conditions were too wet to repair the damage until 2021, the project cost $1.5 million. In addition to direct levee damage, Grand Tower has had issues with seepage water causing sinkholes[61] and floodwaters damaging Devil's Backbone Campground[62], both a result of the 2019 floods (also described in section 4.7).

The USACE National Dams inventory lists 23 dams in Jackson County (table 4.32), seven of which have a high hazard potential. They have an average age of 55 years. None of the dams in Jackson County are used for hydropower. All of the dams are regulated and inspected by Illinois Department of Natural Resources (IDNR), Little Cedar Dam on Cedar Lake is regulated by both IDNR and the U.S. Forest Service.

Dam hazard potential is not the probability of failure, rather it is an estimation of the types and cost of damages that would occur in the event of failure. High hazard potential dams would likely cause loss of human life; in addition, large economic loss, environment and utility damages are also expected. Significant hazard potential would lead to heavy economic loss, environmental damage, or disruption of lifeline facilities but no deaths. Low hazard potential dams would have very small economic damage, typically limited to the owner's property[63].

Many dams have an Emergency Action Plan (EAP) although it is not currently required by USACE or any Illinois regulatory agency. EAPs list potential emergency situations and have detailed instructions to be followed to minimize loss of life and damage to facilities and surrounding properties in the event of a dam failure or other emergency[64].

There are incident databases for dams maintained by the Association of Dam Safety Officials (ASDSO) and the National Performance of Dams Program (NPDP). From these databases, only 1 incident was reported for Jackson County. The incident recorded occurred on January 6, 1999 at Cedar Lake Dam, no other details are available.

[60] Lieb, D, "AP: States brace for long-term flood fight as damages mount", AP News, 2019.
[61] Parker, M, "Massive sinkhole in Grand Tower related to historic flooding of 2019" The Southern Illinoisian, June 11, 2020.
[62] News 3 "Cleaning Devil's Backbone after flooding" August 11, 2019
[63] FEMA, "Federal Guidelines for Dam Safety", April 2004.
[64] Illinois Dam Safety Report 2018

A recent example of a dam failure in the Midwest occurred in May 2020 in Midland County, Michigan. Edenville dam, owned by Boyce Hydro Power company, failed after heavy rains produced a 500-year flood event. The earthen dam was originally constructed in 1925. Old age, the need for a series of repairs, and pressure from the rising reservoir caused the sand embankment to liquefy[65], leading to the failure. 10,000 people had to be evacuated, 2,000 homes, multiple businesses, and several roads and bridges were damaged. The Federal Energy Regulatory Commission (FERC) had issued the owner multiple violations from 2005-2015; and in 2018 revoked their hydroelectric license entirely for lack of compliance with repair requests and failure to meet safety standards. 2019-2020 consisted of a series of permitting arguments and lawsuits between Boyce Hydro and the State, but repairs were never completed[66]. The reservoir size was 66,200 acre-feet, for comparison Kinkaid Lake in Jackson County is 153,000 acre-feet.

4.10.4. Risk

Risk area for dam failure depends on the size of the reservoir. The area that could be flooded is known as the dam breach inundation area. Risk area for levee failure includes the floodplain that is protected by the levee system.

[65] House, K, "Report: Shoddy construction, ignored threats led to Edenville Dam collapse", Bridge Michigan, September 2021.
[66] Roth, C, "Timeline: The Edenville Dam saga, before, during and after the break" MLive.com, September 2020.

Table 4.32 - List of Dams for Jackson County, IL

Dam Name	Location	River	Year Completed	Hazard Potential	EAP
CARBONDALE RESERVOIR DAM	CARBONDALE	PILES FORK	1926	High	Y
CHAUTAUQUA LAKE DAM	MURPHYSBORO	TRIB MUD CREEK	1965	High	Y
KINKAID LAKE DAM	GRIMSBY	KINKAID CREEK	1972	High	Y
SPRING ARBOR LAKE DAM	DESOTO	SYCAMORE CREEK	1972	High	Y
CEDAR LAKE DAM	RATTLESNAKE FERRY	CEDAR CREEK	1974	High	Y
DEER LAKE DAM	Carbondale	TRIB BIG MUDDY RIVER	1985	High	N
STONE CREEK GOLF CLUB LAKE DAM	BOSKYDELL	TRIB DRURY CREEK	2001	High	Y
CAMPUS LAKE DAM	CARBONDALE	TRIB PILES FORK	1869	Significant	Y
LAKE MURPHYSBORO DAM	SAND RIDGE-OFFSTREAM	TRIB BIG MUDDY RIVER	1947	Significant	Y
BORGSMILLER LAKE DAM	MURPHYSBORO	BIG MUDDY RIVER-OFFSTREAM	1970	Significant	N
CARBON LAKE DAM		TRIB BIG MUDDY RIVER		Significant	N
GRAND TOWER STATION ASH POND	GRAND TOWER	MISSISSIPPI RIVER - OFFSTREAM		Significant	N
ELKVILLE COUNTRY CLUB RESERVOIR DAM	DESOTO	TRIB LITTLE MUDDY RIVER	1947	Low	N
NEW THOMPSON LAKE DAM	Carbondale	TRIB BIG MUDDY RIVER-OFFSTREAM	1957	Low	N
LAKE HENRY DAM	MURPHYSBORO	TRIB BIG MUDDY RIVER	1963	Low	N
LITTLE CEDAR	NONE	CEDAR LAKE	1969	Low	NR
LITTLE LAKE DAM	ORAVILLE	TRIB BIG MUDDY RIVER	1970	Low	N
LAKE INDIAN HILLS DAM	CARBONDALE	TRIB INDIAN CREEK	1980	Low	N
CONSOL/BURNING STAR 5/SLURRY IMPOUNDMENT	DESOTO	TRIB LITTLE MUDDY RIVER	1989	Low	N
AQUACULTURE LAKE DAM	POMONA	TRIB SYCAMORE CREEK	1991	Low	Y
CARBONDALE PARK DISTRICT GOLF COURSE DAM	Carbondale	TRIB BIG MUDDY RIVER	1992	Low	N
KNIGHT HAWK COAL/CREEK PAUM MINE/POND 2 DAM	VERGENNES	TRIB GALUM CREEK	2007	Low	N
KAIBAB PARTNERS DAM	MURPHYSBORO	MUD CREEK		Low	N

Data Source: USACE National Inventory of Dams

4.11. Cyberattacks

4.11.1. Hazard Description

Cyberattacks are any unauthorized attempt to access or damage a computer or network system[67] The extent and impacts can vary widely depending on the motivations of the attacker. Common results of a cyberattack include:

- Monetary theft
- Identity theft including loss of personal, medical, business, and/or financial records
- Loss of access to computers, phones, and Bluetooth devices

Cyberattacks can be conducted on a large scale and are also a threat to businesses and government agencies. The Cybersecurity & Infrastructure Security Agency (CISA) (A Federal agency within the Department of Homeland Security formed in 2018) states that a growing concern in the United States is the cybersecurity of critical infrastructure. Facilities and infrastructure such as power grids and transportation routes are linked to cyber space in a number of ways, and our growing reliance on such technologies also increases risk of cyberattacks.

One method of cyberattack that is becoming increasingly common is the use of ransomware. This is a type of malware used to encrypt files, or render them unusable. These cyber attackers will then demand a ransom in return for decryption of the files, often with a threat of selling or releasing the files to another party[68]. Cybersecurity continues to be a top priority for the current administration, and bipartisan legislation is being written to require mandatory federal reporting of all ransomware attacks, although there are ongoing debates as to whether or not the U.S. should ban ransom payments[69]

CISA provides guides for business and local government leaders to learn about and begin implementing cybersecurity protocols within their organizations. The CISA Cyber Essentials Starter Kit includes six major actions that organizations should provide to build a culture of cyber readiness[70]:

- Leader: drive cybersecurity strategy and investment
- Staff: develop security awareness and vigilance
- Systems: protect critical assets and applications
- Surroundings: ensure only authorized users have access to digital workplaces
- Data: undergo scheduled backups to avoid data losses
- Crisis Response: develop and test incident response plans to limit damages and restore normal operations quickly

[67] Ready.gov Cybersecurity
[68] CISA "Ransomware Guidance and Resources"
[69] Bajak, Frank "Ransomware gangs get paid off as officials struggle for fix" Associated Press, June 21, 2021.
[70] Cybersecurity & Infrastructure Security Agency "Cyber Essentials Start Kit: The Basics for Building a Culture of Cyber Readiness" 2021.

In addition to federal resources, the Illinois Attorney General's office has a data breach reporting system for businesses and governments, as well as an identity theft hotline for all Illinois residents.

4.11.2. Geographic Location and Historical Occurrences

Cyberattacks are a continuous national threat. They can occur at any time to individuals, businesses, and government agencies. Cases of identity theft more than doubled from 2019-2020, with a 2,920% increase in cases of victim information being used to apply for government benefit programs[71]. According to the EMSIsoft State of Ransomware in the U.S. report, in 2020 there were ransomware attacks on 113 federal, state, and municipal governments, 560 healthcare facilities, and 1,681 schools, colleges, and universities[72]. The report states that these figures are likely understatements. They also state that the data come from multiple sources, although these sources are not listed.

The most recent cyberattack in the U.S. that gained national attention was the ransomware attack on Colonial Pipeline in May of 2021. The company provides gasoline to 13 states and Washington D.C., with 260 delivery points along the pipeline route. A criminal group locked up the pipeline company's corporate network. The company went offline and shut down their pipeline upon learning of the attack, and later paid a $4.4 million ransom to decrypt their data network. The day following the pipeline shutdown, over 9,500 gas stations ran out of fuel; the company was able to resume operations in a little less than a week[73].

Some recent cyberattacks in the state of Illinois are listed below:

- 2017- Data from Marion County Jail was removed including names, addresses, and social security numbers of former inmates[74]
- 2021- SIU School of Medicine lost patient data in the cyber-attack on Accellion's File Transfer Appliance[75]
- April-May 2021- Ransomware attack on the IL Attorney General's office, loss of case files and court records[76]

4.11.3. Risk

Cyberattacks can be difficult to predict and may be targeted at individuals, businesses, or government offices. Systems that do implement cybersecurity protocols, or have outdated, weaker protection are more at risk.

[71] Skiba, Katherine, "Pandemic Proves to Be Fertile Ground for Identity Thieves" AARP, February 5, 2020; Federal Trade Commission Consumer Sentinel Network Data Book 2020
[72] EMSISOFT Malware Lab "State of Ransomware in the US: Report and Statistics for Q1 and Q2 2020" July 8,2020
[73] Bussewitz, Cathy, "Colonial Pipeline confirms it paid $4.4M to hackers" May 19, 2021 Associated Press.
[74] "MARION COUNTY JAIL ADVISES FORMER INMATES OF DATA BREACH, POSSIBLE IDENTITY THEFT" X95radio news
[75] Davis, Jessica "Trillium, SIU Medicine Added to Tally of Accellion FTA Breach Victims" HealthITSecurity.com
[76] Goudie, Markoff, Tressel, and Weidner, "Cyber attack on Illinois Attorney General's office appears far worse than first thought", May 4,2021, abc7chicago news.

4.12. Terrorism

4.12.1. Hazard Description

Terrorist attacks can take many forms, and stem from foreign or national groups or individuals. There are several types of terrorism that are potential threats to the United States[77]:

4.12.1.1. Attacks in public places

This hazard includes active shooters, intentional vehicle crashes, bombs and any other method of mass attack.

4.12.1.2. Bioterrorism

Bioterrorism involves the use of biological agents to harm or kill people, animals, or crops. Agents that may be used as biological weapons include bacteria, viruses, or other toxins.

The CDC maintains a list of potential biological weapons at https://emergency.cdc.gov/agent/agentlist.asp

4.12.1.3. Chemical attack

Similar to bioterrorism, this involves agents designed to harm people, animals, or crops. There are many different chemicals that may be toxic in vapor, liquid, or solid form.

4.12.1.4. Explosions

Explosive devices can come in many sizes and may be carried by individuals (suicide bombers), in vehicles, or hidden and detonated remotely.

4.12.1.5. Nuclear Explosions

These weapons use nuclear reactions to create explosions and may be incredibly destructive. Nuclear devices can be as large as missiles or small enough to be concealed and carried around.

4.12.1.6. Radiological dispersion device

RDDs are designed to scatter sub-lethal amounts of radioactive material with conventional explosive devices.

4.12.1.7. Other

Other acts of terrorism could include assassination, kidnapping, lynching, sabotage, and rioting.

4.12.2. Geographical Locations and Historical Occurrences

The events on September 11, 2001 was the deadliest single-day terrorist attack in U.S. history. There have been no large-scale attacks in the State of Illinois in recent decades; although gun violence continues to be an issue in many areas. It is difficult to report exact numbers of mass shootings in Illinois or for the whole country as definitions vary by agency. One report from USA Today states 350 “mass killings” occurred in the U.S. from 2006-2017, with 23 of the incidents being from Illinois[78].

[77] Ready.gov
[78] USA Today “Behind the Bloodshed” https://www.gannett-cdn.com/GDContent/mass-killings/index.html#title

4.12.3. Preparedness and survival

While it can be difficult to predict terrorist attacks, there are general steps that can be taken to stay safe. It is recommended to always have exit plans when outside of the home. This includes public places, work, and school. Suspicious packages should be reported instead of being opened. Seeking shelter and contacting law enforcement is the best course of action in the event of any attack. In the case of possible chemical, biological, or nuclear attacks it is imperative to find shelter and stay inside until it is announced safe from potential side effects[79].

Schools and workplaces should have emergency plans in place in the event of any emergency, including terrorist attacks.

The Illinois Terrorism Task Force (ITTF) is an advisory body to the Governor, The Governor's Homeland Security Advisor, and IEMA. They provide guidance for establishing and maintaining long term solutions to the threat of terrorism. The ITTF annual reports and other policies can be found at https://www2.illinois.gov/iema/ITTF/.

4.12.4. Risk

ITTF, IEMA, and County EMA Officials are in charge of monitoring terrorism risk in Illinois. Mass shootings could occur anywhere at any time; and have happened in a variety of places across the United States, including schools, grocery stores, churches, and many other locations.

[79] Ready.gov "Disasters and Emergencies"

4.13. Ground Failure

4.13.1. Hazard Description

Ground failure may refer to any consequence of shaking that affects the stability of the ground[80]. In southern Illinois this is usually caused by subsidence of the land due to sinkholes from karst features or underground mines.

4.13.1.1. Karst

Karst is a type of topography where soluble bedrock (also called carbonate rock) exists. There are different types of soluble bedrock, the most common found in Illinois are limestone and dolomite. Sinkholes form when an area of karst does not have external surface drainage of stormwater. Instead of flowing into waterbodies, rain infiltrates deep into the soil and can dissolve the bedrock over a period of years to decades. As the rock dissolves and forms cracks, soil particles sink into the bedrock and can eventually form visible depressions in the ground. This formation acts as a funnel for stormwater, speeding up formation of the sinkhole. In some cases, the top soil layer will not sag, and instead form a bridge over the void, or shallow cave, that has been forming as the bedrock dissolves. These soil bridges can collapse suddenly and without warning, also leading to sinkholes. Sinkhole collapse usually occurs after intense storm events, but can also occur with severe drought or other causes of water table alteration[81].

While karst sinkholes form naturally, they can be exacerbated by human influence on the landscape. Structures that alter natural drainage and increase stormwater runoff such as paved roads and parking lots, construction sites, and roof downspouts are all examples.

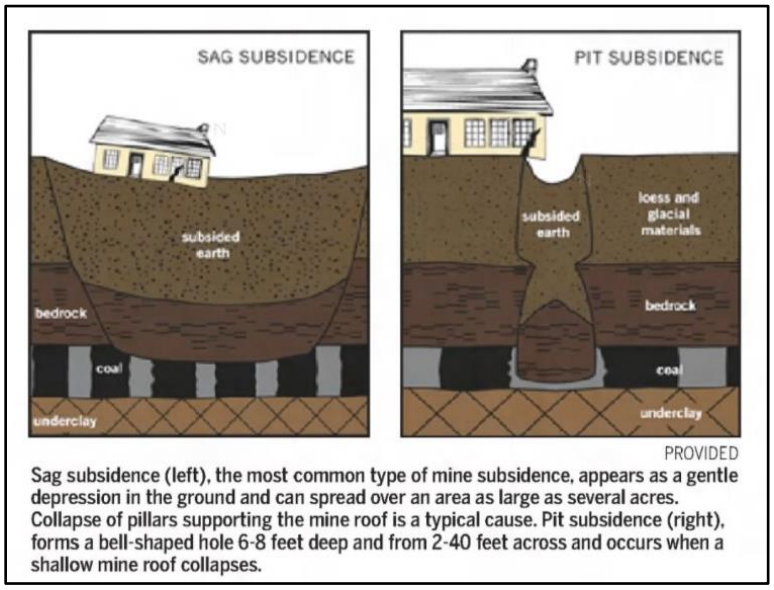
4.13.1.2. Underground Mining

Mining has been a part of Illinois's economy since the state was settled. Mined resources include lead, zinc, fluorites, shale, clay, stone, limestone, dolomite, and coal. Commercial coal mining began around 1810, and since then over 7,400 coal mines have been operated in the state. Much of Illinois contains coal-bearing rock strata.

There are two main types of mine subsidence that may occur. Pit subsidence usually occurs over shallow mines (less than 100ft deep) where bedrock is thin (less than 50ft thick) or composed of weak minerals such as shale. Pits form when the roofs of these shallow mines cave in, and the ground materials above it collapse. This type of subsidence can occur rapidly, the resulting pits are usually 6-8ft deep and less than 16ft across[82]. Sag or trough subsidence occurs when pillars of mine shafts collapse, the size of the subsidence can vary widely depending on how may pillars fall. Sag subsidence may be hundreds of feet long and affect several acres of property. Instead of a single, deep pit forming; sag subsidence produces a low depression in the ground over a large area. Both can cause significant building and property damage.

[80] "ground failure", Earthquake Glossary, USGS.
[81] White, W.B., "Geomorphology and Hydrology of Karst Terrains", Oxford University Press, New York, 1988.
[82] Bauer, R.A., "Mine Subsidence in Illinois: Facts for Homeowners" Illinois State Geological Survey, Prairie Research Institute, 2013.

Figure 4.16: Diagrams of mine subsidence



Source: Illinois Mine Subsidence Insurance Fund

4.13.2. Geographic Location and Historical Occurrences

Many towns and residences are built on top of or adjacent to underground mines. Therefore, there is always a risk of land subsidence on such properties. Additionally, many abandoned mines do not have historical records or were never adequately mapped. The Illinois State Geological Survey (ISGS) provides a free interactive map online to search for underground mine locations throughout the state[83] (see figures 4.14 and 4.15). This mapping tool is up kept updated with mine records and areas of suspected abandoned mine sites. While a useful tool to search for mine sites in your area, the ISGS states there may be inaccuracies, and landowners concerned about subsidence on their property should contact their insurance company.

There is no national or state database with records of ground failure events, however some records have been found from local news sources, these are displayed in table 4.27.

4.13.3. Risk

Areas most at risk for ground failure are highly developed areas over abandoned mines or karst bedrock (figure #). Karst areas with known sinkholes exist along the western border of Jackson County. Coal mine areas are concentrated around the Murphysboro area, and the northeast section of the county.

[83] "Illinois Coal Mines", Illinois State Geological Survey, Prairie Research Institute, https://isgs.illinois.edu/illinois-coal-mines-ilmines.

The following essential facilities may be on top of underground coal mines, based on the ISGS mine dataset, but detailed assessments would need to be conducted to confirm the mine locations and assess risk of subsidence.

- Carruthers Elementary School
- Murphysboro High School
- Dowell Village Police Department
- St Joseph Memorial Hospital
- Dowell Volunteer Fire Department

The following facilities are in areas with limestone bedrock, but they are not within areas of known sinkholes. Risk of karst sinkholes is likely low.

- Grand Tower (Tower Rock) Fire Department
- Grand Tower Water Treatment Plant

The city of Grand Tower has also experienced sinkholes as a result of flood seepage and levee problems, see sections 4.7 and 4.10.

Table 4.33 – Ground failure records from southern Illinois

County	Municipality	Year	# of subsidence events	Type	Diameter	Depth	Other notes	Date	Source
Perry	Du Quoin	1954	1	Mine	50ft		Occurred at 202N Line St, abandoned section of Jupiter Coal and Coke Co mine	December 1954	The Southern, Dec 15, 1954
Franklin	Zeigler	1970	1	Mine	no visible hole formed	NA	mine squeeze- ceiling of mine collapses and ground above shifts, Zeigler No 1 mine, closed in 1948, cracks and other damage to several buildings, street, and water mains	September 1970	The southern, Sept 25, 1970
Williamson	Energy	1979	2	Mine			NW part of village	1979	The Southern, Jun 22, 1981, 3
Williamson	Energy	1981	1	Mine	100ft		Sycamore road closed; water line snapped	March 1981	The Southern, March2, 1981 1
Williamson	Energy	1981	1	Mine	25ft	50ft	Energy village park, formed near playground, took several days to fill, Taylor No1 coal mine	June 1981	The Southern, Jun 22, 1981, 3
Williamson	Energy	1981	1	Mine	25ft	15ft	Energy village park, formed near playground, filled with dirt the day it was discovered, Taylor No 1 coal mine	May 1981	The Southern, Jun 22, 1981, 3
Franklin	Sesser	1986	1	Mine	5ft	27ft	suspected to be caused by subsidence of Old Ben 21 mine, blocked city's sewer system	February 1986	The Southern, Feb 07, 1986, E21
Jackson	Dowell	1986	1	Mine			entire block on NW part of village, multiple areas sinking, hole has been visible since 1971	Oct 1986	The Southern, Oct 10, 1986
Williamson	Energy	1992	1	Mine	20ft	12ft	Energy village park	January 1992	The southern, Jan 15, 1992 5W
Union	Dongola	1993	3	Karst	10ft,10ft,	6ft, 6ft, 50ft	Sinkholes were filled with water, holding the land up, construction of a new well drew down the water table, causing the surface to collapse into the holes	March-May 1993	The southern, June 14, 1993, 3A
Williamson	Cambria	1996	1	Mine	22 by 12 ft	81ft	Madison coal co No 12 mine shaft	April 1996	The Southern Apr 27, 1996 A3
Williamson	Johnston City	2007	1	Mine	NA	NA	active mine roof collapsed from moisture, no workers injured, Mach Mine	September 2007	The Southern, Sep 13, 2007
Jackson	Grand tower	2012	2	Levee pipes burst		deepest 19.5 ft		June 2012	the southern June 17, 2013,1
Jackson	Grand Tower	2020	1	Karst	30ft	5ft	sinkhole formation sped up by flooding on Mississippi, caused sewers to back up, road closures	June 2020	The Southern, June 11, 2020 A3
Perry	Du Quoin	2020	1	Mine	8ft	14ft	Smith Ave	February 2020	Benton News, Feb 29, 2020
Williamson	Carterville	2020	1	Mine	25ft	15ft		2020	Benton News, Feb 29, 2020
Franklin	Macedonia	2020	1	Mine	Planned longwall subsidence	NA	road closures on I-14	June 2020	The Southern, Jun 18,2020 A3

Figure 4.17

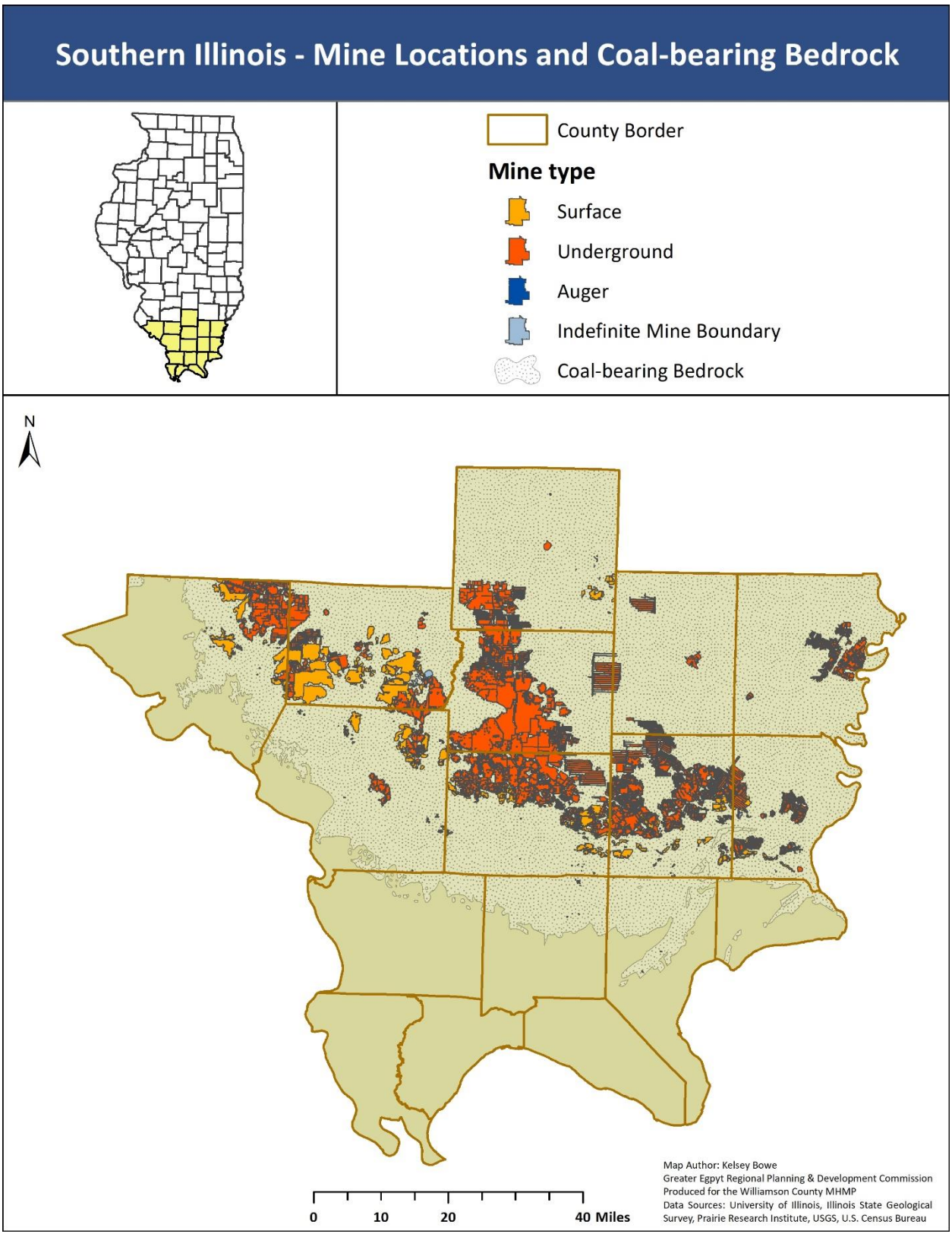

Southern Illinois - Mine Locations and Coal-bearing Bedrock
County Border
Mine type
Surface
Underground
Auger
Indefinite Mine Boundary
Coal-bearing Bedrock
N
0
10
20
40 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Williamson County MHMP
Data Sources: University of Illinois, Illinois State Geological Survey, Prairie Research Institute, USGS, U.S. Census Bureau

Figure 4.18

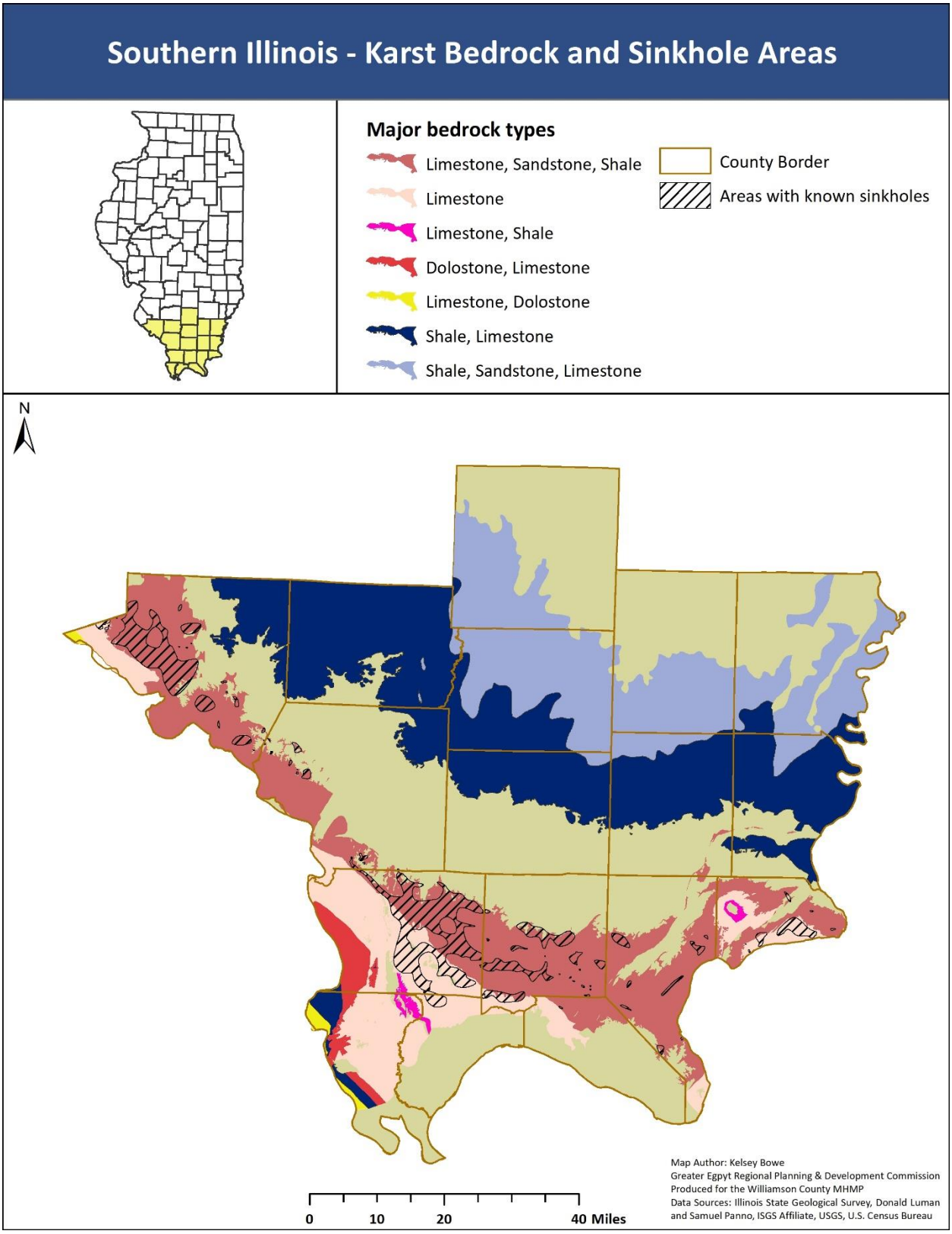
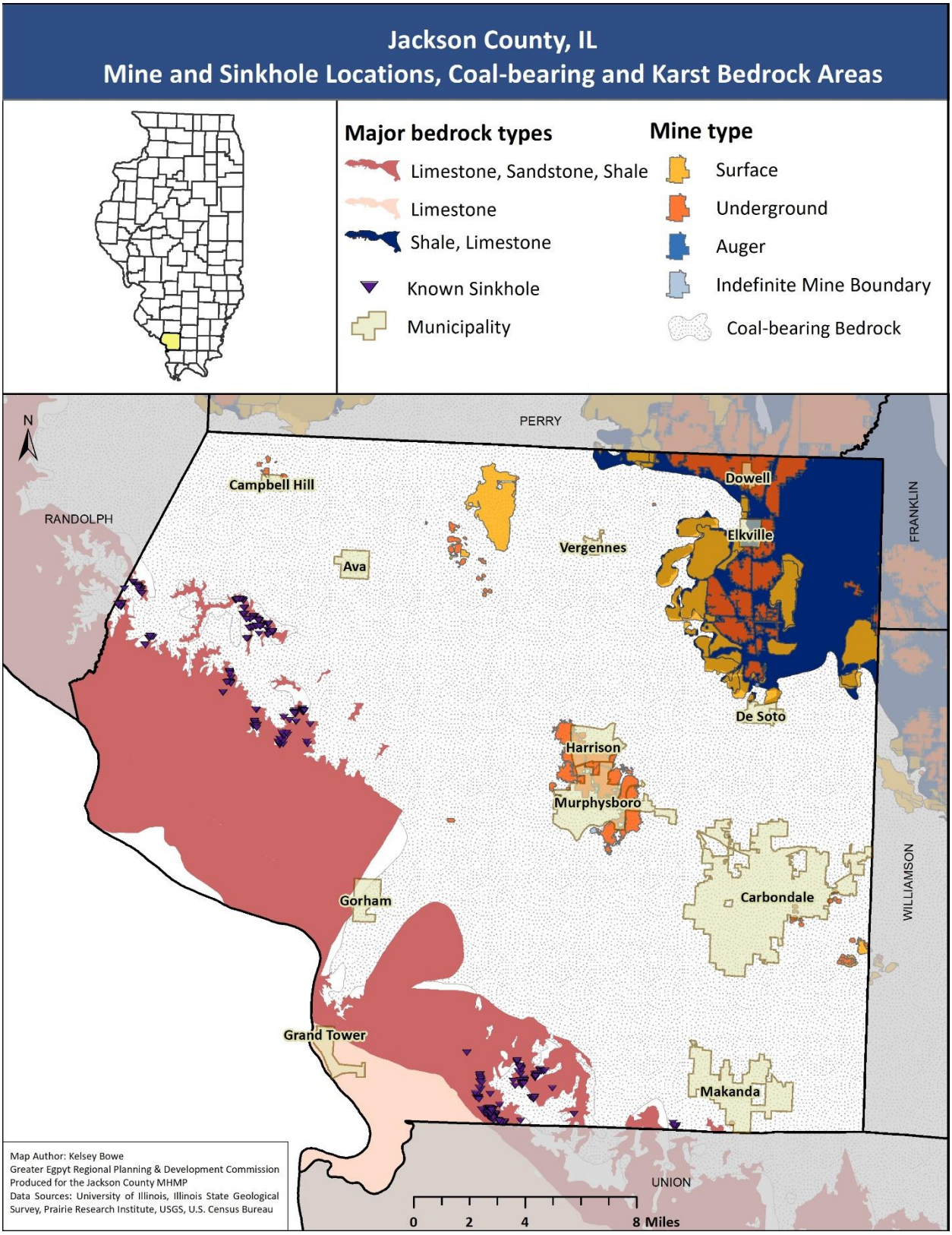

Southern Illinois - Karst Bedrock and Sinkhole Areas
Major bedrock types
Limestone, Sandstone, Shale
Limestone
Limestone, Shale
Dolostone, Limestone
Limestone, Dolostone
Shale, Limestone
Shale, Sandstone, Limestone
County Border
Areas with known sinkholes
N
0
10
20
40 Miles
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Williamson County MHMP
Data Sources: Illinois State Geological Survey, Donald Luman and Samuel Panno, ISGS Affiliate, USGS, U.S. Census Bureau

Figure 4.19


Jackson County, IL
Mine and Sinkhole Locations, Coal-bearing and Karst Bedrock Areas
Major bedrock types
Limestone, Sandstone, Shale
Limestone
Shale, Limestone
Known Sinkhole
Municipality
Mine type
Surface
Underground
Auger
Indefinite Mine Boundary
Coal-bearing Bedrock
N
PERRY
RANDOLPH
FRANKLIN
WILLIAMSON
UNION
Campbell Hill
Ava
Vergennes
Dowell
Elkville
De Soto
Harrison
Murphysboro
Carbondale
Gorham
Grand Tower
Makanda
Map Author: Kelsey Bowe
Greater Egpyt Regional Planning & Development Commission
Produced for the Jackson County MHMP
Data Sources: University of Illinois, Illinois State Geological Survey, Prairie Research Institute, USGS, U.S. Census Bureau
0
2
4
8 Miles

4.14. Utility Disruptions and Power Outages

4.14.1. Hazard Description

This hazard includes short or long-term loss of essential utilities. Essential utilities include electricity, natural gas, potable water supply, wastewater treatment, and communication services (phone and internet). Constellation Energy Company lists the following as the 10 most common causes of power outages[84]:

- Severe weather
- Motor vehicle accidents
- Equipment failure
- Fallen trees
- Wildlife interference
- High energy demand
- Construction work damage
- Public damage (accidental and vandalism)
- Cyberattacks
- Planned outages

Impacts from utility disruptions can range from temporary inconveniences to a widespread public crisis. Loss of power during heat waves or winter storms can lead to weather related deaths. Loss of access to clean water for extended periods can lead to sickness and death. Inoperable communication towers and traffic signals can affect the efficiency of first responders. Local economies may suffer from loss of revenue and inability to pay workers during business closures.

4.14.2. Geographic Location and Historical Occurrences

Utility companies do not make historic records of outages and other issues publicly available. However, residents can search for and report currently active outages from both Ameren Illinois and Egyptian Electric Cooperative. Municipal water companies will publicly post current boil water orders when they occur. Additionally, the IEPA requires water suppliers to inform their customers of water outages and maintenance events that might disturb sediments containing lead.

4.14.3. Risk

Since power outages and other utility disruptions can be caused by a variety of factors, it is difficult to determine risk. In general risk of this hazard is highest during severe weather, and utility lines along highly trafficked roads have a higher risk of being damaged than those in more rural areas. There is also higher risk for older equipment to fail and cause outages.

[84] "10 common causes of power outages" Constellation, 2021.

4.15. Near Earth Object Impact

4.15.1. Hazard Description

Near Earth Objects, or NEOs, are any small Solar System Body that comes into proximity with Earth. This can include comets, asteroids, and meteoroids. NEOs are considered potentially hazardous if they are over 459 feet in diameter and their orbit crosses the orbit of Earth. In general, anything smaller than that is expected to burn up in the atmosphere[85] (although small meteorites do sometimes make contact with the surface).

For clarification a meteoroid is a very small solar system body, usually a piece that broke off of a comet or asteroid. A meteor is a meteoroid that enters Earth's atmosphere, and a meteorite is a meteor that lands on the surface.

The United States and other nations have been undergoing projects to scan for and assess the risk of NEOs since the 1990s under the umbrella term "Spaceguard".[81] The National Aeronautics and Space Administration (NASA) Center for NEO Studies (CNEOS) utilizes Sentry, "a highly automated collision monitoring system that continually scans the most current asteroid catalog for possibilities of future impact with Earth over the next 100 years.[86]" NEOs discovered are ranked on the Palermo and Torino scales. These scales give the NEO a hazard rating based on the probability of impact and the estimated damage. As of January 2019, 19,470 NEOs have been discovered; of these 107 are comets and the rest are asteroids[87].

4.15.2. Geographic Location and Historical Occurrences

There are over 160 known impact craters on the surface of the Earth. Two notable locations are Meteor Crater in Arizona and the Chicxulub Crater in Mexico. Meteor Crater was caused an estimated 50,000 years ago by a meteorite around 150 ft in diameter. The crater is 550 ft deep and nearly a mile wide. The Chicxulub Crater is located in the Gulf of Mexico, just off the coast of the Yucatán Peninsula. The asteroid which caused the crater hit Earth an estimated 66 million years ago, and is widely accepted as the cause of the mass extinction event which led to the demise of the non-avian dinosaurs.

There have been 10 meteorites in Illinois, four from observed falls and the rest were discoveries[88]. The largest of these is known as the Tilden meteorite, which fell on July 13, 1927. It split into three fragments while still in the atmosphere, and landed in three separate counties. The largest of the fragments weighed 110 pounds[89]. The most recent observed meteorite fall occurred in 2003.

4.15.3. Risk

NEO impact could occur anywhere, the county has equal risk.

[85] NASA.gov "NASA on the Prowl for Near-Earth Objects" May 25, 2004.
[86] "Sentry: Earth Impact Monitoring", NASA Jet Propulsion Laboratory, Center for Near Earth Object Studies.
[87] NASA CNEOS "Discovery Statistics"
[88] "Meteorites from Illinois" Washington University in St Louis: Earth and Planetary Sciences
[89] Cargile, Clint, "This Week In Illinois History: Stars Fell On Illinois (July 13, 1927)" WNIJ New, Northern Public Radio, July 12, 2021.

4.16. Wildland fires

4.16.1. Hazard Description

While not as severe or frequent as wildfires in the western United States, Illinois does experience both prescribed and unintentional wildland fire throughout the state. From 2002-2014, Illinois experienced an average of 57 fires per year with an average of 881 acres burned per year[90]. Wildfires are a naturally occurring phenomenon, and can be vital to ecosystem health. Fire is an especially important tool in managing Illinois's remnant tallgrass prairies. The term "wildfire" is used to describe any wildland fire that is unwanted and unplanned. Wildfire usually starts from human caused activities, mostly campfires that spread rapidly. They can also start naturally under the right conditions, or stem from prescribed management fires that get out of control. The extent of a wildfire is generally defined by the number of acres that burned. This is influenced by weather, topography, and amount of fuel available.

4.16.2. Geographic Location and Historical Occurrences

The most recent wildfire to occur in southern Illinois occurred in March 2021 in the Shawnee National Forest Fountain Bluff area. The fire burned about 27 acres. Other small wildfires have occurred in the Shawnee throughout the years, and prescribed management burns take place seasonally, with schedules and alerts available from the National Forest webpage.

4.16.3. Risk

Jackson County has an 81% risk of wildfire to homes by the state ranking system, and 21% by the national rank. There is a 91% wildfire hazard potential by state rank and a 18% wildfire hazard potential by national rank[91].

Risk is highest in camping areas and along the Wildland Urban Interface (WUI). Risk is elevated during droughts and high wind. Many state and federal natural areas have fire danger signs posted that are adjusted daily

[90] "Wildfires" Living With Weather, mrcc.illiois.edu
[91] "Community Wildfire Defense Grant Risk Dataset" Wildfire Risk to Communities, 2022.

4.17. Landslides

4.17.1. Hazard Description

Parts of Illinois have a medium to high landslide potential. While these events in Illinois are usually on a smaller scale than landslides in the west, they have been known to cause significant property and infrastructure damage. Most landslides in Illinois are not life threatening. ISGS defines 6 types of landslides that occur in our state[92]:

- **Rock falls-** These occur when blocks of rock fall freely from a steep slope or cliff. Blocks of loess or till that fall from an undercut bluff face are also considered rock falls. Rock falls are most common along bedrock bluffs of the Mississippi river.
- **Slumps -** Slumps occur when a mass of rocks or earth move down along one or more buried failure planes. Almost 60% of recorded landslides in IL were slumps.
- **Rock slump** – usually a permeable bedrock such as limestone sliding on underlying impermeable bedrock, such as shale.
- **Earth slump –** fine textured glacial materials that slide after failure planes form.
- **Earth slumps on bedrock-** Mass of glacial material sliding down bedrock – often shale, usually caused by water percolating the glacial material until reaching the impermeable shale.
- **Earth flows-** Any flow of sand or unconsolidated earth material
- **Rock creeps-** Blocks of rock that slide slowly over a gentle slope, generally very slow and takes place over the course of years.

4.17.2. Geographic Location and Historical Occurrences

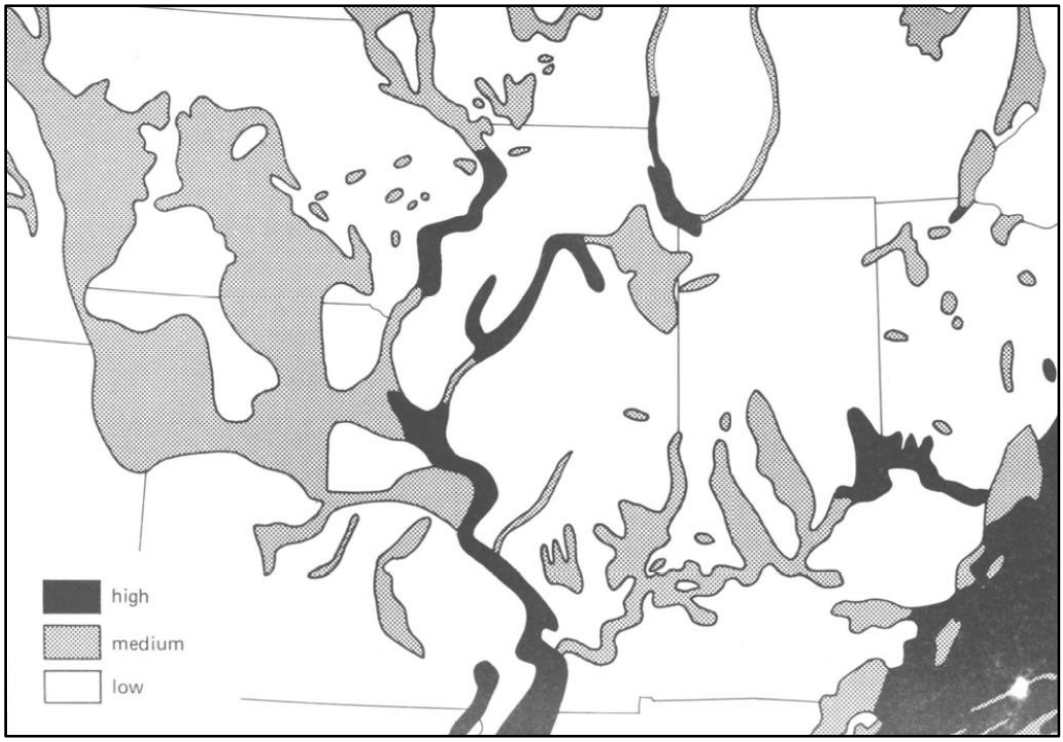
The most recent inventory of landslides in southern Illinois was competed in 1992. During this inventory, ISGS identified 221 landslides that occurred along the Mississippi and Ohio Rivers from Chester to Olmstead[93]. Most of the identified landslides were considered ancient landforms that had occurred during seismic activity of the New Madrid Seismic Zone. Besides earthquakes, heavy rainfall and alteration of risk areas, such as construction projects along bluffs and shorelines can also lead to landslides in southern Illinois.

4.17.3. Risk

Risk of landslide depends on a number of factors including depth and type of bedrock, depth and type of materials overlaying bedrock, slope angle, precipitation, freeze and thaw cycles, and vegetation. Most landslides in Illinois occur near Lake Michigan, and the Mississippi, Illinois, and Ohio Rivers; Jackson County has some areas of high risk (figure 4.17).

[92] Killey, Hines, and DuMontelle "Landslide Inventory of Illinois" Illinois Department of Energy and Natural Resources, State Geological Survey Division, 1985.
[93] Wen June S, "Inventory of landslides in southern Illinois near the New Madrid Seismic Zone and the possible failure mechanism at three sites", Journal Volume: 24:7; Conference: 1992 annual meeting of the Geological Society of America (GSA), 1992.

Figure 4.20: Landslide potential in Illinois



Source: ISGS

4.18. Invasive Species and Infestations

4.18.1. Infestations

An infestation usually refers to a home, business, or farm being overrun or invaded by pests or parasites. This hazard can be caused by native and nonnative species. Home infestations can have a risk of disease spread from the pests. Infestations in agriculture can take many forms and may result in diseased crops or significant loss of crop from pests feeding in large numbers.

The CDC lists the following household pests as potential disease vectors and human health hazards[94]:

- Rodents
- Cockroaches
- Fleas
- Flies
- Fire ants
- Mosquitos
- Termites are also listed as a household threat for the amount of property damage an infestation can cause. In the U.S., termites cause more property damage annually than fires and windstorms combined.

4.18.1.1. Agricultural Infestations

The University of Illinois State Water Survey has a degree day calculator and seasonal maps for estimating peak emergence of common agriculture invertebrate pests, see table 4.34[95]:

Other animals that may cause enough crop damage to be considered an infestation are feral hogs, white-tailed deer, rodents, and birds. Fungal or viral infections and weeds may also be considered agricultural infestations.

[94] Marshall, Carter L MD "Chapter 4: Disease Vectors and Pests" CDC Healthy Housing Reference Manual
[95] "Pest Degree Day Calculators" Illinois State Water Survey: Prairie Research Institute

Table 4.34 – Agricultural Invertebrate Pests of Illinois

Pest	Native Species?
Alfalfa Weevil	no
Armyworm	yes
Bean Leaf Beetle	yes
Black Cutworm	yes
Corn Earworm	yes
Corn Rootworm	yes
European Corn Borer	no
Stalk Borer	yes
Two-spotted Spider Mite	found worldwide, original geographic distribution thought to be Eurasia
Western Bean Cutworm	native to western U.S., has been spreading east
Apple Maggot	yes
Codling Moth	found worldwide, origins unclear
Colorado Potato Beetle	native to Rocky Mtns
Emerald Ash Borer	no
European Red Mite	no
Fruit Tree Leafroller	yes
Grape Berry Moth	no
Oriental Fruit Moth	no
Peachtree Borer	yes
Potato Leafhopper	yes
San Jose Scale	no
Spotted Wing Drosophillia	no
Squash Vine Borer	yes
Brown Marmorated Stink Bug	no
Corn Flea Beetle	yes
Japanese Beetle	no

Source: University of Illinois State Water Survey

4.18.2. Invasive Species

Invasive species are any organism non-native in an ecosystem whose introduction causes or is likely to cause harm to the economy, environment, or human health (Executive Order 13112). Illinois defines exotic weeds as plants not native to North America that when planted, spread vegetatively or naturalize and degrade natural communities, reduce the value of fish and wildlife habitat, or threaten Illinois endangered or threatened species (525 ILCS 10).

Invasive plants and invertebrates can cause significant property damage, decrease crop yields, decrease value of timber stands, as well as disrupt natural communities and impact forest health. Similarly, aquatic invasive species can alter ecosystem structure, decrease water quality, and damage infrastructure. Zebra mussels can be particularly destructive; they breed profusely (a single female may produce 1million eggs/year) and attach to any hard surface in large clusters. Zebra mussels can clog intake pipes of water treatment and power facilities, costing millions of dollars in repair and cleanup[96].

Adopted in 2016, The National Invasive Species Management Plan identifies actions to prevent, eradicate, and control invasive species. It also lists guidelines for restoring ecosystems and other areas affected by invasive species[97].

Illinois has many exotic and invasive species. The Illinois Exotic Weed Act lists 26 species of plant that are illegal to buy, sell, offer to sell, distribute or plant seeds, plants, or parts of plants unless issued a permit by IDNR (Table 4.35). There are many other exotic and invasive plants in Illinois that are not covered by this law, as well as exotic and invasive animals (Tables 4.36, 4.37) Note that these tables may not be complete lists as many species are lacking observation data; additionally, game and agriculture species that are intentionally released (such as honeybees and brown trout) are not included.

[96] "Exotic Aquatic Invertebrates in Illinois" Illinois Department of Natural Resources.
[97] "National Invasive Species Management Plan", USDA National Invasive Species Information Center

Table 4.35 - Plants Listed in the Illinois Exotic Weed Act

Common Name	Scientific Name
Amur honeysuckle	*Lonicera maackii (Rupr.) Herder*
Autumn olive	*Elaeagnus umbellata Thunb.*
Bohemian knotweed	*Reynoutria x bohemica Chrtek & Chrtková*
Buckthorn	*Rhamnus arguta Maxim.*
Chinese buckthorn	*Rhamnus utilis Dcne.*
Common buckthorn, European buckthorn	*Rhamnus cathartica L.*
Dahurian buckthorn	*Rhamnus davurica Pallas*
Giant hogweed	*Heracleum mantegazzianum Sommier & Levier*
Giant knotweed	*Reynoutria sachalinensis F. Schmidt ex Maxim.*
Glossy buckthorn	*Frangula alnus Mill.*
Japanese buckthorn	*Rhamnus japonica Maxim.*
Japanese honeysuckle	*Lonicera japonica Thunb.*
Japanese knotweed	*Reynoutria japonica Sieb. & Zucc.*
Kudzu	*Pueraria montana var. lobata (Willd.) Maesen & S. Almeida*
Lesser celandine, fig buttercup	*Ficaria verna Huds.*
Morrow's honeysuckle	*Lonicera morrowii Gray*
Multiflora rose	*Rosa multiflora Thunb.*
Oriental bittersweet	*Celastrus orbiculatus Thunb.*
Poison hemlock	*Conium maculatum L.*
Purple loosestrife	*Lythrum salicaria L.*
Russian olive	*Elaeagnus angustifolia L.*
Sweet breath of spring	*Lonicera fragrantissima Lindl. & Paxton*
Tamarisk	*Tamarix spp. L.*
Tatarian honeysuckle	*Lonicera tatarica L.*
Teasel	*Dipsacus spp. L.*
Thorny olive	*Elaeagnus pungens Thunb.*

Table 4.36 -Terrestrial Invasive Animal Species

Common Name	Scientific Name
wild boar (feral hog)	*Sus scrofa*
Eurasian collard dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
emerald ash borer	*Agrilus planipennis*
Japanese beetle	*Popillia japonica*
nightcrawler	*Lumbricus terrestris*
southern worm	*Aporrectodea trapezoides*
woodland white worm	*Octolasion tyrtaeum*
soybean aphid	*Agrilus planipennis*
Asian longhorned beetle	*Anoplophora glabripennis*
gypsy moth	*Lymantria dispar*

Sources: IDNR, Invasive.org

Table 4.37 - Aquatic Invasive Animal Species

Common Name	Scientific Name
zebra mussel	*Dreissena polymorpha*
Asian clam	*Corbicula fluminea*
spiny water flea	*Bythotrephes longimanus*
rusty crayfish	*Orconectes rusticus*
bighead carp	*Hypophthalmichthys nobilis*
Silver carp	*Hypophthalmichthys molitrix*
common carp	*Cyprinus carpio*
goldfish	*Carassius auratus*

Sources: IDNR, Invasive.org

4.18.3. Geographic Location and Historical Occurrences

There are not detailed databases that track outbreaks and spread of every pest or invasive species. Agricultural resources and technical assistance can be found from various groups, including the National Resources Conservation Service (NRCS) and University of Illinois Extension offices.

IDNR and National Forest Service provide information about invasive species that harm our native ecosystems, and occasionally provide updates on current projects to manage or remove invasives.

4.18.4. Risk

Risk of infestation or spread of invasive species is variable. Factors include location, time of year, and weather.

5. Mitigation Strategies

> "The purpose of mitigation planning is for State, local, and Indian tribal governments to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources." Stafford Act Title 44, Chapter 1, Part 201.

This chapter will review current mitigation strategies and ordinances, and list new suggestions for further hazard mitigation. The Jackson County Planning Team worked to develop these strategies specific to each jurisdiction based on the MHMP goals listed below:

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 Jackson County.

Goal 2: Create new or revise existing plans/maps for Jackson County	
Objective:	Support compliance with the NFIP for each jurisdiction in Jackson 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 Jackson County residents on the hazards	
Objective:	Raise public awareness on hazard mitigation.
Objective:	Improve education and training of emergency personnel and public officials.

5.1. National Flood Insurance Program Statistics

The National Flood Insurance Program (NFIP) is a federal program managed by FEMA and delivered by a network of multiple insurance agencies. Flood insurance is available to businesses, home & property owners, and renters in communities that participate in the NFIP. Homes and businesses in Special Flood Hazard Areas (SFHA) with government backed mortgages are required to have flood insurance. Flood insurance is also required for some other federal programs, including qualifying for flood-related disaster relief funds and qualifying for grants through the Flood Mitigation Assistance (FMA) Program. Jackson County participates in the NFIP, table 5.1 shows the municipalities that also participate. Jackson County currently has 135 NFIP policies active, covering a total property value of $20,607,900.00 with a total premium of $153,683.00.

Table 5.1 – NFIP participation by municipality

Municipality	Participation	Reason for Non-Participation	Current Effective FIRM Date
Ava	No	Not within SFHA	5/2/2008
Campbell Hill	No	Not within SFHA	5/2/2008
Carbondale	Yes		5/2/2008
Desoto	Yes		5/2/2008
Dowell	Yes		5/2/2008, LOMR 6/12/2019
Elkville	Yes		5/2/2008
Gorham	Yes		5/2/2008
Grand Tower*	No	Suspended by FEMA in 1991	5/2/2008
Makanda	Yes		5/2/2008
Murphysboro	Yes		5/2/2008
Vergennes	Yes		5/2/2008

* Grand Tower previously participated in the NFIP. They were the first community in Jackson County to join, but were suspended from the program in 1991 for violations that included development and construction within the 100-year floodplain after 1983 without obtaining and maintaining floodproofing and elevation certificates. Efforts to rejoin included feasibility studies and applications to raise the Grand Tower and Degognia-Fountain Bluff Levees to withstand 100-year flood levels. However, the U.S. Army Corps of Engineers could not determine if such a project would impact flooding upriver in the Middle Mississippi, and the project was never completed. Other efforts to rejoin the program have not been explored in detail.

5.1.1. Community Rating System (CRS)

The Community Rating System (CRS) is a federal incentive program that offers discounts to communities in the NFIP whose floodplain management requirements and practices exceed the minimum standards set forth in the NFIP. The goals of the program are as follows[98]:

- Reduce and avoid flood damage to insurable property
- Strengthen and support the insurance aspects of the National Flood Insurance Program
- Foster comprehensive floodplain management

Currently, Carbondale is the only community in Jackson County with CRS status.

5.1.2. Repetitive Loss Structures

FEMA defines repetitive loss structures as having at least two paid flood losses over $1,000 each in any 10-year period since 1978. Table 5.2 shows the summary of repetitive loss structures in Jackson County from 1983-2021.

Table 5.2 – Repetitive Loss Structures

Jurisdiction	Occupancy Type	Number of Losses	Total paid
MURPHYSBORO	SINGLE FMLY	2	21,606.64
DOWELL	SINGLE FMLY	2	25,175.81
MURPHYSBORO	SINGLE FMLY	2	14,968.03
CARBONDALE	OTHR-NONRES	3	44,444.22
CARBONDALE	OTHR-NONRES	2	14,669.3
MAKANDA	SINGLE FMLY	3	23,350.28
CARBONDALE	BUSI-NONRES	4	801,241.6
JACOB	SINGLE FMLY	2	9,765.58
TOTAL	**8**	**20**	**$955,221.43**

Source: IEMA

5.2. 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 5.3 lists Jackson County's current ordinances that directly pertain, or can pertain, to hazard mitigation. It is important to evaluate the local building codes and ordinances to determine if they have the ability to reduce potential damages caused by future hazards.

[98] "Community Rating System", FEMA.gov

Table 5.3 - Jurisdictional Ordinances

Community	Building	Electrical	Stormwater	Flooding	Subdivision	Fire	Land Use	Zoning
Jackson County	-	-	State Standards – adopted 2005	State Model (Current)	2015 County Subdivision Ordinance	-	Comp. Plan – adopted 1965	-
					Subdivision Ordinance-Adopted 2015			
Ava	-	-	-	-	-	Municipal Code –	-	-
						adopted 2002		
Campbell Hill	Municipal Code –	-	-	-	-	-	-	Municipal Code –
	adopted 1969							adopted 2002
Carbondale	ICC 2003 IBC	NFPA 2008 Code	State and IDOT Standards (Current)	State Model (Current)	Municipal Code – adopted 1964	International Fire Code 2003	Comp. Plan –	Municipal Code – adopted 1974
							Adopted 2010	
De Soto	BOCA 1999 Code	NFPA 2008 Code	State Standards –	State Model (Current)	State Standards – adopted 2008	State Standards –	Comp. Plan –	-
			adopted 2008			adopted 2008	adopted 2008	
Dowell	BOCA 1999 Code	NFPA Code (Current)	-	State Model (Current)	-	State Standards (Current)	-	-
Elkville				State Model (Current)			Comp. Plan – adopted 1966	
Gorham	-	-	-	State Model (Current)	-	-	-	-
Grand Tower	-	-	-	-	-	Municipal Code – Adopted 1980	Comp. Plan – adopted 1968	-
Makanda	-	-	Municipal Code – Adopted 1987	State Model (Current)	Municipal Code – Adopted 1987	-	-	-
Murphysboro	BOCA 1999 Code	NFPA 2008 Code	-	State Model (Current)	Municipal Code – adopted 1971	Municipal Code – adopted 2012	Comp. Plan – adopted 1965	Municipal Code – adopted 1966
Vergennes	-	-	-	State Model (Current)	-	-	-	-

5.3. Mitigation Strategies

The following tables display all hazard mitigation strategies proposed by the Jackson County Planning Team. Strategies were created with county goals and FEMA STAPLEE criteria. Strategies from the 2015 Plan are noted in the tables. Planning Team members determined project priority based on the immediate need of the community, overall hazard reduction benefits to the community the strategy would provide, and cost-effectiveness of the project to other alternatives.

The timeline for these projects is based on priority ranking and subject to availability of funding. Jurisdictions are strongly encouraged to apply for grants upon final Plan review and adoption, however it is not a requirement of the Plan that these mitigation strategies are completed.

High priority: 1-3 years, Medium Priority: 4-6 years, Low Priority: 7-10 years

For details on specific grant programs, see appendix 6.

Table 5.4 - FEMA STAPLEE 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.

Source: FEMA

All Hazards						
Code	**Mitigation Strategy**	**Status**	**Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
AH1	Promote Disaster Resilience Through Workshops, Education Materials, and Planning Guides: Various agencies have implemented forms of this strategy. Local resources have been used to target and inform the resident population. Additional funding will be sought from the Local, State and Federal sources.	Ongoing	IEMA/FEMA preparedness Grant	High	Jackson County EMA, Health Dept., Schools, SIH	from 2015 MHMP
AH2	Devote Section of Website to Hazard Mitigation: The Jackson County EMA website is used to notify the public about hazard mitigation. Southern Illinois Airport uses their website to provide hazard mitigation related information and will start providing information on social media platforms. SIH and the Shawnee Preparedness and Response Coalition would like to develop communication tools and capacities, including social and digital media, to provide critical updates and information to community. All Jackson County School Districts continue to work with local weather stations to provide up-to-date information for students and families. Unity Point CUSD #140 utilizes Alertnow Messaging Systems to send necessary information to all Unity Point families.	Ongoing		HIgh	Jackson County EMA, Southern Illinois Airport, SIH, Jackson County School Districts	from 2015 MHMP
AH3	Establish Liaison/Groups that Meets Regularly to Discuss Hazard Mitigation and Disaster Risk Reduction: Several groups meet on a regular basis to discuss hazard mitigation including: Jackson County LEPC, Disaster Risk Reduction Group, Shawnee Preparedness and Response Coalition, Jackson Co. Public Health and Medical Preparedness Coalition, Healthy Southern Illinois Delta Network, Shawnee Alliance for Seniors, Map Your Neighborhood Program (Carbondale).	Ongoing		High	various agencies	from 2015 MHMP
AH4	Establish Local Emergency Planning Committee: The Jackson County EMA heads the Local Emergency Planning Committee that complies with the Emergency Planning and Community Right to Know Act (EPCRA) and planning for hazardous materials (HAZMAT) incident response and notification.	Ongoing		High	Jackson County EMA	from 2015 MHMP

All Hazards						
Code	**Mitigation Strategy**	**Status**	**Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
AH5	Enhance Emergency Communication System Infrastructure: The Jackson County EMA will oversee the implementation of this project. Funding has not been secured, but additional funding will be sought from Local, State and Federal resources. The Southern Illinois Airport would like to install an all-tenant communication system. SIH and Shawnee Preparedness and Response Coalition would like to develop and implement a region-wide back-up emergency communication system. Dowell FD and MABAS Division #86 is currently applying for a federal grant to improve communication division. Carbondale CHSD #186 is investigating potential infrastructure improvements for school offices, administration, and security personnel. Unity Point CUSD #140 continues to work with local emergency agencies to enhance the emergency communication system infrastructure.	Ongoing/Proposed	BRIC, Infrastructure Bill, USDA	Medium	Jackson County EMA, Carbondale, Southern Illinois Airport, SIH, Dowell Fire Department, SIU, Jackson County School Districts	from 2015 MHMP
AH6	Improve Communication Between Utility Companies: County and Local Agencies continue to maintain contact with utility companies before during and after hazardous events. Kinkaid-Reed's Creek Conservancy District aims to provide additional information and maintain contact with the County.	Ongoing		Medium	various agencies	from 2015 MHMP
AH7	Distribute/Program NOAA Weather Radios: During severe weather preparedness week, The Jackson County EMA and area fire departments help residents program their NOAA weather radios. Each jurisdiction wishes to seek additional funding to distribute NOAA weather radios. Unity Point CUSD #140 would like to seek funding to distribute more NOAA Weather Radios in the Unity Point buildings which will allow staff to know when severe weather approaches.	Ongoing		Medium	Jackson County EMA, City/Village Fire Departments	from 2015 MHMP
AH8	Improve EMA Training, Staff, Resources, And Equipment: The County EMA and the City of Carbondale oversees the implementation of this project. Funding has not been secured for future training, but additional funding will be sought from Department of Homeland Security, state and local resources.	Ongoing		High	Jackson County EMA, Carbondale	from 2015 MHMP
AH9	Maintain Centralized Geographical Database Including Natural Hazard/Risk Assessment: The County EMA oversees this project with the assistance of SIU. After each mitigation plan update, the geographical database is updated to include new information about hazard events and the number of structures within the 100-year floodplain.	Ongoing		Medium	Jackson County EMA, SIU	from 2015 MHMP

All Hazards						
Code	**Mitigation Strategy**	**Status**	**Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
AH10	Develop/Maintain Comprehensive Plan to Incorporate Natural Hazards: Jackson County and its incorporated jurisdiction participate in the 5-year renewal of the Multi-Hazard Mitigation Plan. The next update process will take place in 2020 and the county will seek federal funds to update the plan.	Ongoing/Proposed		Medium	Jackson County EMA	from 2015 MHMP
AH11	Develop a Vulnerable Population List: The Jackson County Health Dept. is working with Southern Illinois University, Southern Illinois Healthcare, Shawnee Preparedness and Response Coalition, and other local health departments to update and maintain a list of vulnerable populations in the county.	Ongoing		High	Jackson County Health Department, SIU, SIH	from 2015 MHMP
AH12	Develop Mutual Aid Agreements: The Jackson County EMA oversees this mitigation strategy. The County works with local emergency agencies to maintain mutual aid agreements between local communities, MABAS and ILEAS.	Ongoing		High	Jackson County EMA	from 2015 MHMP
AH13	Retrofit/Harden Critical Facilities and Utilities: The County EMA will oversee the implementation of this project. Funding has not been secured as of 2015. Implementation, if HMA funding is available, is forecasted to be initiated within approximately one year. The Jackson County Health Department aims to harden their facility within the next 3-5 years with the help of federal funding, if available. Murphysboro aims to retrofit the City Hill which houses the Murphysboro Police, Fire and Emergency Management, as well as its 911 answering center and emergency operations center. SIH would like to retrofit existing facilities to serve surge healthcare needs in the event of mass casualties. If funding is available, the Village of Dowell would update the Fire Department and Village Hall.	Proposed	BRIC, Infrastructure Bill, USDA	High	Jackson County EMA, Murphysboro EMA, Dowell, SIH	from 2015 MHMP
AH14	Identify and Procure Backup Potable Water Supplies: The County EMA will oversee the implementation of this project. Funding has not been secured as of 2015. Implementation, if funding is available, is forecasted to be initiated within approximately 3-5 years. Kinkaid-Reed's Creek Conservancy District aims to connect to possible outside water sources.	Proposed	BRIC, CDBG, USDA, IEPA PWSLP, other Infrastructure Bill grants	Medium	Jackson County EMA, Kinkaid-Reed's Creek Conservancy District	from 2015 MHMP
AH15	Review and update county & municipality building & zoning codes/ordinances to improve disaster resiliency, community safety, and energy efficiency	Proposed		Medium	County Board, Municipalities	2022 National Initiative to Advance Building Codes

All Hazards						
Code	**Mitigation Strategy**	**Status**	**Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
AH16	Construct Additional Community Safe Rooms: The County EMA will oversee the implementation of this project. Local resources will be used to evaluate the cost benefit of the shelters and define specific locations. Funding has not been secured as of 2015. Implementation, if HMA funding is available, is forecasted to be initiated within approximately 3-5 years. The Jackson County Health Department aims to add a safe room to their facility within the next 3-5 years with the help of federal funding, if available. The City of Murphysboro will seek funding for a public shelter, currently there are no public shelters available in the city. SIH would like to retrofit existing clinics, physician offices, and other SIH facilities to serve as storm safe rooms.	Proposed	Local funds, hospital, BRIC, USDA	High	Jackson County EMA, Murphysboro EMA, SIH	from 2015 MHMP
AH17	Create Additional Heating / Cooling Shelters: The County EMA will oversee the implementation of this project. Funding has not been secured as of 2015. Implementation, if state funding is available, is forecasted to be initiated within approximately 1-3 years.	Proposed	BRIC, USDA, CDBG	Medium	Jackson County EMA	from 2015 MHMP
AH18	Equip Critical Facilities with Back-Up Generators	Proposed/Ongoing	BRIC, HMGP	High	Jackson County EMA, Agencies in need of generator	from 2015 MHMP
AH19	Acquire Portable Lighting for Mass Casualty Preparation: SIH and the Shawnee Preparedness and Response Coalition Purchase an adequate number of light towers to use for mass casualty care.	Proposed	IDPH, Preparedness Grant		SIH	from 2015 MHMP
AH20	Have a plan in place for debris clean up, make sure all residents are accounted for following disasters	Proposed	Local funds	High	Elkville fire & police	Lauana Wright, Elkville Village Clerk
AH21	Keeping written/photo/video records of key infrastructure maintenance. These records are vital in the event a disaster damages infrastructure, there are records that the damage was due to the event and not negligence, and can be reported to FEMA accurately in assistance applications	Proposed/Ongoing	Local/county funds	High	IDOT, Road Commissions, Levee Commissions, Dam Personal, Water Plant managers, etc.	IEMA Downstate Disaster workshop 2022
AH22	Forming & training local damage assessment teams and COADs (Community Organizations Active in Disaster)	Proposed	Local/county funds, EMPG	High	IEMA, County EMA, Community Members	IEMA Downstate Disaster workshop 2022
AH23	Saving emergency funds at the county and municipal level to increase resiliency should a disaster occur.	Proposed/Ongoing	Local/county funds	High	County & Municipal Governments	IEMA Downstate Disaster workshop 2022
AH24	Create/maintain an animal welfare disaster planning committee in order to properly follow requirements of IL PETs Act, and to have protocols in place for rescuing and sheltering pets and livestock during natural disasters. Provide training to staff/volunteers regarding animal rescue procedures and safety.	Proposed	Animal control, volunteer/donations	Low	County Animal Control & Sheriff's Office, Local Animal Rescue Groups	Jenny Richardson, Project Paws of Southern Illinois (PPSI)

Tornados, Severe T-Storms						
Code	**Mitigation Strategy**	**Status**	**Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
T1	Continue to upgrade and maintain outdoor warning siren system. Increase/Improve outdoor warning sirens. Construct a public facility with a hardened area open to the public as a shelter location. Develop a community storm shelter open to residents during severe weather events.	Ongoing		High	Jackson County EMA//IEMA// Murphysboro EMA	Brian Manwaring (Murphysboro EMA Director)
T2	There is no public storm shelters available in Murphysboro. If a new public facility is built, including a public storm shelter would assist the public in remaining safe during severe thunderstorms. Provide a community storm shelter for those who do not have appropriate shelter in their home. Public facilities should be hardened or replaced with hardened structures which can withstand severe thunderstorms. Harden public facilities to withstand severe thunderstorms.	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	High	Jackson County EMA//IEMA// Murphysboro EMA	Brian Manwaring (Murphysboro EMA Director)
T3	Improve our use of a County-wide mass notification system for all County residents. Continue to upgrade the processes we have in use currently. Develop a Community Storm Shelter program to be included in new building construction planning.	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	High	County EMA/ETSB-911./	Orval Rowe (Deputy Coordinator of Jackson County)
T4	Assist in alerting levee district residents of disasters/impending disasters utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system. Hold a public meeting with citizens from the district to disseminate emergency protective strategies including available safe zones at the Gorham Volunteer Fire Department and Christ Lutheran church basement and a list of contact information for emergency personnel in the area including Jackson County officials and the Gorham Volunteer Fire Department first responders. Keep a copy of relevant disaster plans and hazmat plans from Jackson County EMA and other relevant offices in the township office for public knowledge.	Ongoing		Medium	Jackson County EMA/ Fire Department	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
T6	Build residential or community safe rooms at mobile home parks, fair grounds, shopping malls or vulnerable public spaces. Make sure these areas are accessible by the public at all times. Develop a program that helps retrofit mobile homes to have appropriate foundations; tie downs for roofs as well as comply with national standards of manufacture. Local businesses and community support groups can donate time and supplies for the project.	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	Medium	Jackson County EMA/ Fire Department	Ryan Hall (Carbondale EMA Coordinator)
T7	Educate citizens about burying utility lines or trim trees near above-ground lines. Know the difference between a severe thunderstorm watch (issues when severe thunderstorms in your area) and a warning (severe thunderstorms have been sighted by radar) Carbondale Emergency operations Center can help educate citizens for future severe weather events.	Proposed	Local/county funds	Low	Jackson County EMA/ Fire Department	Ryan Hall (Carbondale EMA Coordinator)

Tornados, Severe T-Storms						
Code	**Mitigation Strategy**	**Status**	**Funding Source/Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
T10	Institute a plan for protection and recovery. Will provide a guideline on how to protect and respond to such event. Recovery efforts will be made and the damage would be evaluated.	Proposed	School district or EMA funds	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
T11	Provide information for students regarding storm safety and practice response via drills. Staff will provide education to students regarding severe storm and tornado drills. Secure "go bags" for teachers and staff that contain emergency information and first aid kits. Each classroom is outfitted with backpacks that contain emergency information and first aid supplies.	Ongoing	local	High	Unity Point Staff/ Makanda Township Fire Department	Mary Beth Goff (Dean of Students at Unity Point)
T12	Working on improving the notifications to our residents with a call service. Educating residents on the proper procedures during these events. Having storm Shelters in different locations of the village for the safety of our residents.	Ongoing	local	Medium	Fire department of De Soto/ Jackson County EMA	Ben Doan (Chief of Police of De Soto)
T13	Continued education throughout our community. Improve and inform the use of an all call system for our community. Set up warming and cooling shelters during times of snow.	Ongoing	local	Medium	Fire department of De Soto/ Jackson County EMA	Ben Doan (Chief of Police of De Soto)
T14	Informing area residents on how to be ready for severe storms in the event. Would have to work with local agencies for cleanup.	Ongoing	Local	High	Village of Belle Rive EMA	Kim McCormick (Village President of Belle Rive)
T15	In the event of a tornado; sound the sirens and use the weather radios.	Ongoing	Local; Federal	Medium	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
T16	In the event of a severe thunderstorm; activate storm spotters' protocol and warn everyone to stay alert.	Ongoing	Local; Federal	Medium	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
T17	Retrofit existing structures to withstand high winds. Update and maintain a list of temporary shelters.	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	Medium	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
T18	In the event of a severe thunderstorm; Enhance emergency communication system infrastructure, warning system enhancements. Retrofit existing structures to withstand high winds.	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	Medium	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
T19	Prepare and distribute severe weather plans for all employees. Monitor weather conditions so employees can move to secure locations when necessary	Ongoing	Local	Medium	KRCCD	Scott Wilmouth, KRCCD
T20	Retrofitting select infrastructure and building safe rooms to improve airport safety	Proposed	BRIC, USDA, CDBG, Infrastructure Bill, DOT safety grants	Medium	Southern Illinois Airport Authority	Gary Shafer, SIAA

Tornados, Severe T-Storms						
Code	**Mitigation Strategy**	**Status**	**Funding Source/potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
T21	Construct additional community safe rooms, anchor manufactured homes, provide jurisdiction wide siren coverage, enhance ordinances to exceed minimum construction standards for high winds, retrofit outdated structures	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	high	Campbell Hill fire, Jackson County EMA, SIH	Laci Misselhorn, Campbell Hill Board
T22	Ensure building are in compliance with building codes. Ensure evacuation signs are clearly posted and evacuation process is in place.	Ongoing	s	High	SIU	Benjamin Newman, SIU Chief of Police
T23	Ensure severe weather sirens are maintained and tested. Maintain alert notification system for staff, students and faculty along with response mechanism for Emergency Operations Center.	Ongoing	s	high	SIU	Benjamin Newman, SIU Chief of Police
T24	Construct safe rooms in essential facilities, create and update list of emergency equipment	Ongoing	l,s,f	High	Ava	Candice Cotter, Mayor of Ava
T25	Make sure warning sirens are working properly and tested regularly. Ensure City has proper equipment to handle severe weather	Ongoing	l	Low	Ava	Candice Cotter, Mayor of Ava
T26	Install Lightening Detection System: The City of Carbondale, Carbondale CHSD #165, Tricounty CSUD #176, De Soto CCSD #86, and Southern Illinois Airport will oversee the implementation of this project and include the school districts. Implementation, if HMA or state funding is available, is forecasted to be initiated within approximately 1-3 years.	Proposed	BRIC, USDA, CDBG, Infrastructure Bill	Medium	Carbondale, Southern Illinois Airport, Carbondale CHSD #186, De Soto CCSD #86, Tricounty CUSD #176	from 2015 MHMP

Pandemic/Disease Outbreak						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
P1	Develop a plan within each department for employees to work in isolation / groups during times of pandemic so that we do not take a chance that an entire department is wiped out due to illness. maintain critical PPE supplies on hand to deal with a contagious outbreak.	Ongoing	Local; State; Federal	Medium	Jackson County EMA//ICDC// Murphysboro EMA// DHHS//DHS	Brian Manwaring (Murphysboro EMA Director)
P2	Continue to stock PPE supplies to fill the needs to County Departments and Office Holders. Also, to assist in stop gap measures for other entities in the County. (Lessons Learned)/ Assist and promote non pharmaceutical resources. Update our County Emergency Operations Plan with lessons learned and new Standard Operational Procedures from our extended COVID-19 response.	Ongoing	State	Medium	Jackson County EMA/ IEMA/ Health Department	Orval Rowe (Deputy Coordinator of Jackson County)
P3	Invest in strengthening core public health infrastructure; including water and sanitation systems. Southern Illinois Healthcare will be a major partner in making these proposals happen. City of Carbondale should invest in creating a stockpile of PPE supplies for future disease outbreaks/ epidemics. Communication is needed between the local governments and the Illinois emergency management agency/ local suppliers.	Ongoing	Local; State	Medium	Jackson County EMA/ IEMA/ Health Department	Ryan Hall (Carbondale EMA)
P4	Institute awareness and procedures to help prevent and protect against the outbreak. CCHS would work with programs to educate and prevent spread of the epidemic. Procedures and guidelines will be set and followed by guidance of the local health department and federal laws.	Proposed	Health dept, IDPH	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
P5	Develop Contact tracing protocols and action plan. Develop and disseminate contact tracing protocols.	Proposed	Local	Medium	Unity Point Staff/ Jackson County Health Department	Mary Beth Goff (Dean of Students at Unity Point)
P6	Stocking up on PPE and educating residents on how we could help if there is an outbreak that has taken place. Work on isolation shelters and implementing them in those locations throughout or village.	Ongoing	Local	Medium	Fire department of De Soto/ Jackson County Health Department	Ben Doan (Chief of Police of De Soto)
P7	Inform the public on health mandates.	Ongoing	Local;State	Medium	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
P8	Enhance reporting and contact tracing protocols. Develop/update plans for mass care situations.	Proposed	Local, Health dept, IDPH	Medium	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
P9	Strengthen our plan with SIH to house a mass casualty site on the field, including morgue facility. Improve our notification system, We have a current agreement with SIH that needs to be reviewed to ensure current conditions. Creation of cell/text notification system for all hazards notifications	Proposed	Local, Health dept, IDPH	Medium	SIAA, SIH	Gary Shafer, SIAA
P10	Educate community on pandemics, develop software/website that allows public to pre-register to receive mass-prophylaxis medication, develop solutions for schools to report absences and infected students	Ongoing	l,s,f,p	High	Jackson County Health Dept, Campbell Hill	Laci Misselhorn, Campbell Hill Board

Pandemic/Disease Outbreak						
Code	**Mitigation Strategy**	**Status**	**Funding Source/ Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
P11	Ensure Emergency Operations Center is positioned to combat public health emergencies. Follow in compliance with state and federal mitigation strategies.	Ongoing	State	Medium	SIU	Benjamin Newman, SIU Chief of Police
P12	enhance reporting and contact tracing protocols. Ensure PPE is available	Proposed	Local, health dept, IDPH	Low	Ava	Candice Cotter, Mayor of Ava
P13	Educate Community on Pandemics and How to Mitigation their Impacts: Potential funding sources includes: Illinois Department of Public Health, U.S. Dept. of Health and Human Services, and various Private foundations	Ongoing	s,f	High	Jackson County Health Department	from 2015 MHMP
P14	Purchase Software/Develop Website which Allows the Public to Pre-Register to Receive Mass Prophylaxis Medications: Potential funding sources includes: Illinois Department of Public Health, U.S. Dept. of Health and Human Services, and various Private foundations	Ongoing	s,f,p	Medium	Jackson County Health Department	from 2015 MHMP
P15	Develop Technological Solutions for Schools to Report Large Numbers of School Absences: This strategy will limit the spread of disease, facilitate situational awareness and rapid cycle decision making for school closures, parenting messaging, etc. Potential funding sources includes: Illinois Department of Public Health, U.S. Dept. of Health and Human Services, and various Private foundations.	Ongoing	s,f,p	Medium	Jackson County Health Department	from 2015 MHMP

Code	Mitigation Strategy	Status	Funding Source/Potential Grants	Priority	Responsible Organization/ Agency	Strategy Proposed by
Earthquakes						
EQ1	Identify and reduce earthquake hazards at home and work. These mitigation efforts should include: Securing heavy objects to walls and floors, such as shelves, bookcases, cabinets, and water heaters. Placing large, heavy, or breakable objects on lower shelves. Hanging heavy items – such as pictures and mirrors – away from areas where people sit or gather frequently. Bracing overhead light fixtures. Repairing defective electrical wiring and leaky gas connections. These are potential fire risks. Repairing any deep cracks in ceilings or foundations. Get expert advice if there are signs of structural defects. Storing flammable products and hazardous material securely on bottom shelves in cabinets that are closed with latches. Follow MSDS storage guidelines. Continue Earthquake Preparedness Education campaign. Teach people to mitigate risks at home and at work. Retrofit / harden or replace critical facilities (city hall, public works, police, fire, school) buildings to withstand a major earthquake.	Proposed	Local; EMPG	Low	Jackson County EMA//IEMA// Murphysboro EMA	Brian Manwaring (Murphysboro EMA Director)
EQ2	Continue to educate County residents on ways to protect themselves during and after an earthquake. The future ability to build a new Regional Emergency Operations Center (SIEOC) in the County. We currently have a grant proposal moving through Senator Duckworth's office for this purpose. Our hopes are that we get approved for this grant.	Ongoing	Local	Medium	Jackson County EMA/IEMA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
EQ3	Assist in alerting levee district residents of disasters/impending disasters utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system. Hold a public meeting with citizens from the district to disseminate emergency protective strategies and a list of contact information for emergency personnel in the area including Jackson County officials and the Gorham Volunteer Fire Department first responders. Keep a copy of relevant disaster plans and hazmat plans from Jackson County EMA and other relevant offices in the township office for public knowledge.	Ongoing	Local	Medium	Jackson County EMA/ Fire Department	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
EQ4	Establish a seismic committee to provide recommendations. Recommend changes in state and local seismic safety standards and perform annual assessments of seismic safety improvements. Retrofit critical facilities to ensure they remain operational post-earthquakes (schools, governments, and corporations)	Proposed	IEMA/FEMA preparedness grant	High	IEMA/Jackson County EMA	Ryan Hall (Carbondale EMA Coordinator)

Code	Mitigation Strategy	Status	Funding Source/ Potential Grants	Priority	Responsible Organization/ Agency	Strategy Proposed by
			Earthquakes			
EQ5	Institute a build back and recovery plan for loss of properties. CCHS will apply for FEMA and other funds available for recovery and efforts to rebuild. The building would have to be back to code prior to allowing the building to be functional.	Proposed	State	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
EQ6	Work with Unity Point Safety Committee to review and revise Emergency action plan. Develop Emergency action plan.	Ongoing	Local	Low	Unity Point Staff/ Makanda Township Fire Department	Mary Beth Goff (Dean of Students at Unity Point)
EQ7	Educating residents on proper procedures during an event.	Ongoing	Local	Low	Fire department of De Soto/ Jackson County EMA	Ben Doan (Chief of Police of De Soto)
EQ8	Make sure everything is secured properly in the event of an earthquake.	Ongoing	Local; State; federal	Low	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
EQ9	Develop earthquake emergency action plans. Install automatic shutoff valves.	Proposed	Local, EMPG, BRIC, USDA	High	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
EQ10	Develop earthquake emergency action plans.	Ongoing	Local	Medium	KRCCD	Scott Wilmouth, KRCCD
EQ11	Design utility services to supply critical facilities first during emergency situations.	Ongoing	Local	Medium	KRCCD	Scott Wilmouth, KRCCD
EQ12	Modification of structures to withstand reasonable earthquake event: Certain structures at the airport lack seismic protection. We will identify those buildings and design/implement corrective measures. Non-Federal funding source from local funding.	Proposed	Local, BRIC, CDBG, USDA	Medium	SIAA	Gary Shafer, SIAA
EQ13	Map and assess community vulnerability to earthquakes, retrofit water supply systems, retrofit critical facilities, install automatic shutoff valves, develop and update emergency action plans	Proposed	Local, BRIC, CDBG, USDA, IEPA	High	Campbell Hill, Jackson County EMA, Jackson County Health Dept	Laci Misselhorn, Campbell Hill
EQ14	Promote/Ensure buildings are in compliance with building codes. Develop additional earthquake emergency action plans as needed (Appendix D-21). Exit signs and evacuation routes clearly posted.	Ongoing	state	High	SIU	Benjamin Newman, SIU Chief of Police
EQ15	construct backup water mains, install automatic shutoff valves	Ongoing	Local; State; federal	high	Ava	Candice Cotter, Mayor of Ava
EQ16	Develop Specially-Engineered Pipelines in Areas Subject to Faulting, Liquefaction, Earthquakes, or Other Ground Failure: Kinkaid-Reed's Creek Conservancy District is will oversee the implementation of this project. Funding has not been secured as of 2015. Implementation, if HMA funding is available, is forecasted to be initiated within approximately 3-5 years.	Proposed	BRIC, USDA, IEPA, Infrastructure Bill	Medium	Jackson County, KRCCD	from 2015 MHMP
EQ17	Retrofit Water Supply Systems: Jackson County EMA, Murphysboro WWTP and Kinkaid-Reed's Creek Conservancy District would oversee this project. Implementation, If HMA funding is available, is forecasted to be initiated within approximately one- three years. Kinkaid-Reed's Creek Conservancy District would like to retrofit water plant buildings, booster stations, and ground storage tanks.	Proposed	BRIC, USDA, IEPA, Infrastructure Bill	High	Jackson County, KRCCD	from 2015 MHMP

Code	Mitigation Strategy	Status	Funding Source/ Potential Grants	Priority	Responsible Organization/ Agency	Strategy Proposed by
			Winter Storms			
W1	The City of Murphysboro maintains multiple trailers mounted generators to power critical infrastructure in the event of a power loss. Have generators available to power critical facilities in the event an ice storm takes out power lines. It is critical to maintain a sufficient supply of salt and cinders to be applied to city streets during winter storms. Maintain a sufficient supply of salt and cinders to apply to city streets following a severe winter storm.	Ongoing	Local; State; Federal	High	Jackson County EMA//Murphysboro EMA// IEMA	Brian Manwaring (Murphysboro EMA Director)
W2	Continue education of County residents protect their families during severe winter weather events. Plan to look at locations in the County for safe shelters and warming shelters, cooling shelters with generators while power is lost for long periods of time.	Ongoing	Local	Medium	Jackson County EMA//Murphysboro EMA// IEMA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
W3	Assist in alerting levee district residents of disasters/impending disasters utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system. Hold a public meeting with citizens from the district to disseminate emergency protective strategies including available safe zones at the Gorham Volunteer Fire Department and Christ Lutheran church basement and a list of contact information for emergency personnel in the area including Jackson County officials and the Gorham Volunteer Fire Department first responders. Keep a copy of relevant disaster plans and hazmat plans from Jackson County EMA and other relevant offices in the township office for public knowledge.	Ongoing	Local	Medium	Jackson County EMA//Murphysboro EMA// IEMA	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
W4	Snow Plowing and salting the roads; New trucks and snow plows. (Find a grant for new vehicles for snow plowing)	Ongoing	Local; State; Federal	High	Jackson County EMA	Patricia Sherman (Treasurer/Clerk/Office Manager of Vergennes)
W5	Identify locations for heating centers or shelters for vulnerable populations and stranded motorist. Carbondale has a warming center in place on East College Street. Coordinate with local utility organizations to increase the homeowner and community education about potential storm effects and possible mitigation activities	Proposed	Local; IDPH	Medium	Jackson County EMA/ Utility companies	Ryan Hall (Carbondale EMA)
W6	Early dismissal/release procedures	Ongoing	Local	Medium	IDOT/ Jackson County Road Crew (Salt trucks and plows)	Larry Lovel (Superintendent of Trico CUSD #176)
W7	Set plan in place for such event. We would cancel school and close the building in efforts for safety. We would assess damages and apply for funding if need be.	Proposed	Local	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
W8	Education for community of where warming shelters are available. Improvements made on the notification system for the community on an all-call service.	Ongoing	Local	Medium	Fire department of De Soto/ Jackson County EMA	Ben Doan (Chief of Police of De Soto)
W9	Make sure the roads are taken care of; cleared of ice, salted, and that trucks are properly maintained. Use fire department if needed for a warming center.	Ongoing	Local; State	Medium	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)

Code	Mitigation Strategy	Status	Funding Source	Priority	Responsible Organization/ Agency	Strategy Proposed by
Winter Storms						
W10	Purchase/maintain a supply of salt and other de-icing chemicals. Develop a vulnerable population list.	Proposed	Local	High	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
W11	SIAA has a plan to deal with this Risk, however, continual review and updating is necessary. Updating our stock of emergency supplies sufficient for a predetermined number of people would be a wise investment.	Proposed	Local, DOT/FAA safety grants	High	SIAA	Gary Shafer, SIAA
W12	Acquire deicing chemicals, establish network of 4WD/off road vehicles to access stranded people, create additional warming center, equip critical facilities with backup generators	Proposed	Local, mutual aid agreements, BRIC, CDBG	High	Campbell Hill fire, County EMA, County Highway Dept, IDOT	Laci Misselhorn, Campbell Hill Board
W13	Maintain emergency notification system for staff, faculty and students. Response mechanism for Emergency Operations Center if needed.	Ongoing	State	Medium	SIU	Benjamin Newman, SIU Chief of Police
W14	purchase/maintain salt stockpile, ensure City has proper equipment	Ongoing	l	Low	Ava	Candice Cotter, Mayor of Ava
W15	Purchase deicing chemicals: The Jackson County EMA and Southern Illinois Airport will oversee the implementation of this project. Funding has not been secured, but additional funding will be sought from local resources. Implementation is forecasted to begin within approximately five years. Southern Illinois Airport has a limited quantity of deicing chemicals and is in need of a delivery vehicle.	Proposed	DOT/FAA grant, infrastructure bill	High	Jackson County, Southern Illinois Airport	from 2015 MHP
W16	Purchase snow fences: Southern Illinois Airport has identified a need for snow fences along airport entrance roads. Funding has not been secured, but additional funding will be sought from local resources. Implementation is forecasted to begin within approximately 1-3 years.	Proposed	DOT/FAA grant, infrastructure bill	High	Southern Illinois Airport	from 2015 MHP
W17	Establish a network of 4WD/Off-road vehicles to access stranded people: The Villages of Dowell and De Soto currently have 4x4 vehicles ready for use at the Fire Departments and in the Villages	Ongoing	l	Medium	Dowell, De Soto	from 2015 MHP

Flooding, Dam/Levee Failure						
Code	**Mitigation Strategy**	**Status**	**Funding Source/ Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
F1	Maintain Participating Status in the NFIP by Enforcing a Flood Damage Prevention Ordinance: The Jackson County Emergency Management Agency is responsible for the general administration of the Jackson County Flood Damage Prevention Ordinance. Each participating jurisdiction has a representative responsible for the administration of the individual Flood Damage Prevention Ordinances.	Ongoing	local	High	Jackson County EMA and City/Village Building Services	from 2015 MHMP
F2	Acquire Repetitive Loss Properties, Severe Repetitive Loss Properties, Structures and/or Vacant Land subject to flooding in and/or outside of the Special Flood Hazard Area.	Ongoing	Local; State; Federal	High	Jackson County EMA	from 2015 MHMP
F3	The North-West side of Murphysboro drains via a creek knows as Pond-Creek. This creek is prone to flooding during heavy rain. Previous events have flooded both entrance roads to Murphysboro High School, making it inaccessible, as well as flooding the Roberta Drive and N 7th Street neighborhoods. Improving the drainage of pond creek would greatly reduce the threat of flash flooding. Improve the Pond-Creek drainage system. The city can acquire flood prone properties, demolish any structures and place restrictions on the property which prevent any structures from being built on the property in the future. Buyout property which is prone to flooding.	Ongoing	Local; State; Federal	Medium	Jackson County EMA// City of Murphysboro	Brian Manwaring (Murphysboro EMA Director)
F4	Repair aging or deficient levees; Install a piping and valve to interconnect the City of Murphysboro water system with an adjacent water supply system. In the event of a dam failure at Kinkaid Lake, the city would be able to supply water via the interconnected system.	Proposed	Local; FMA, BRIC, USDA, Infrastructure Bill, IEPA	Medium	Jackson County EMA// City of Murphysboro	Brian Manwaring (Murphysboro EMA Director)
F5	Shawnee #84 will continue practicing our emergency flood plan in the event a flood happens while school is in session. Shawnee #84 will continue practicing and improving emergency flood procedures if an event occurs when school is in session. This includes: running emergency bus routes when flood waters cover roads, keeping a school population list to ensure all students and staff are accounted for and having an emergency off-site location to go to if the campus has to be evacuated quickly. This location would be the rally point for parents to pick up their children.	Ongoing	Local	High	Jackson County EMA	Shelly Clover-Hill (Superintendent of Shawnee CUSD #84)

Flooding, Dam/Levee Failure						
Code	**Mitigation Strategy**	**Status**	**Funding Source/ Potential Grants**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
F6	Shawnee CUSD #84 will continue to work with local levee commissioners to coordinate emergency efforts in the event of a levee failure. We can assist with emergency communications including a warning system. Our gymnasium can also serve as a temporary shelter if the flooding does not directly impact our campus.	Ongoing	Local	High	Jackson County EMA	Shelly Clover-Hill (Superintendent of Shawnee CUSD #84)
F7	Work with State and Federal partners to replace flood gates at Highway 3 at Cora with a solid levee. Highway 3 should go over the levee, not through. Form a plan with State and Federal partners to install and maintain permanent De-watering pumps in the Grand Tower area. Protection of Life and Property.	Proposed	Local; FMA, BRIC, IDOT	High	Jackson County EMA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
F8	Continue to work with the State of Illinois and Jackson County to facilitate the closure of the lock structure at Cora City and building the Route 3 highway over the top of the levee. This is an ongoing project that has passed the design phase and is awaiting approval for state funding. Hold a public meeting in conjunction with the US Army Corps of Engineers (USACE) with residents from the district to disseminate brochures and information about warning systems in place with Jackson County, evacuation plans in the event of a levee break and other risk management issues. Present at the public forum the USACE developed computer- simulated flood inundation program that simulates potential flooding scenarios with regarding to levee breaks at different areas in the district to help residents and officials better plan for evacuation and other preparedness activities in the event of a emergency.	Proposed	Local; FMA, BRIC, IDOT	High	Jackson County EMA	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
F9	Continue working with the USACE on levee maintenance in order to alleviate problem areas/sand boils in the levee. Continue to seek funding through fundraising efforts, local, county, state and federal funds for improving problem areas in the levee system, which are prone to sand boils. Maintain a contact list of emergency workers/volunteers available in the community for emergency sand bagging in the event of a sand boil.	Ongoing	Local; State	High	Jackson County EMA// Army Corps of Eng.//IEMA	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)

Flooding, Dam/Levee Failure						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
F10	Regularly perform drainage system maintenance including culvert replacement, cleaning ditches, pump and lock maintenance, and annual upkeep and inspection of seep wells. Continued participation in FEMA's National Flood Insurance Program and remaining in compliance with their floodplain management policies. Work with FEMA on a buy-out program, if necessary, in the event of a future flooding disaster.	Ongoing	Local; State	High	Jackson County EMA// Army Corps of Eng.//IEMA	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
F11	Replace the roads on Steele/Gale/and Harrison Streets/Roads in Vergennes, in order to alleviate flooding. Possibly replace culverts if needed. Make a purchase for barricades to close roads.	Ongoing	Local; State; Federal	Medium	Jackson County EMA//IEPA//IEMA/ Fire Department	Patricia Sherman (Treasurer/Clerk/Office Manager of Vergennes)
F12	Raise utilities and appliances. Electrical panel box, furnaces, water heaters, and appliances such as washers and dryers should be elevated out of the base flood height. Utilize GIS to determine which homes in your community are in a flood plain or at risk of flooding. Alert residents and provide information on how they can mitigate their homes and property against floods	Proposed	Local; private	Medium	Homeowners// City engineers and GIS specialist	Ryan Hall (Carbondale EMA Coordinator)
F13	Implement an emergency action plan to help identify potential emergency conditions at a dam and specifies pre-planned action to help minimize property damage. Early warning systems to help notify residents of possible dam failure including public audible systems as well as adopting visible systems (strobe lights).	Ongoing	Local; State	Medium	US fish and wildlife services//IDNR/ IEPA/ Jackson County EMA	Ryan Hall (Carbondale EMA Coordinator)
F14	Trico district as emergency housing for displaced families in the event of levee failure	Proposed	Local	Medium	American Red Cross/ County EMA/ Local First Responders (Fire Dept. and Police Dept.)	Larry Lovel (Superintendent of Trico CUSD #176)
F15	Utilize a plan, where CCHS may be of assistance to other agencies. Due to elevations in the area, flooding is unlikely. A plan would be set in place to open the building up for other agencies to use.	Proposed	Local	Low	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
F16	Utilize building for other agencies. The building could serve as a headquarters for other agencies. The school/building itself is not close to a dam or levee.	Proposed	Local	Low	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)

Flooding, Dam/levee Failure						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
F17	Keep ditches cleared of debris, and ensure other water ways are maintained.	Ongoing	Local	Low	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
F18	Regularly perform drainage system maintenance. Update urban areas to withstand stormwaters.	Proposed	Local	Medium	Jackson County EMA	Kevin Spain (Superintendent of Elverado CUSD #196)
F19	In the event of a dam failure: Regularly perform drainage system maintenance; Update evacuation protocols for high potential loss dams and levee districts.	Proposed	Local	Medium	Jackson County EMA	Kevin Spain (Superintendent of Elverado CUSD #196)
F20	Monitor lake levels during flooding, visually inspect spillway for blockages and debris	Ongoing	Local	Low	KRCCD	Scott Wilmouth, KRCCD
F21	Regularly inspect dam for damage or signs of failure	Ongoing	Local	Medium	KRCCD	Scott Wilmouth, KRCCD
F22	INDR conducts scheduled inspections, document any changes that occur	Ongoing	State	Medium	IDNR	Scott Wilmouth, KRCCD
F23	Look at further downstream detention facilities to reduce flooding impact on the eastern portion of Airport Road. Continue to measure runoff from Airport and current detention facility effectiveness. Improvements or additional detention facilities to be funded at the local level with SIAA funds.	Proposed	Local,Federal	Medium	SIAA	Gary Shafer
F24	flood proof or elevate critical facilities/utilities that are a risk, culvert replacement, elevate low lying roads, retrofit water supply system	Proposed	l,s,f,p	Medium	County EMA, KRCCD, County Highway Dept, Cities and Villages	Laci Misselhorn
F25	go door to door during severe floods to make sure no one is stranded	Proposed	l,s,f	High	Elkville Police & Fire	Lauana Wright
F26	Culvert replacement, raise vulnerable structures	Ongoing	l	Low	Ava	Candice Cotter
F27	Update urban areas to withstand stormwater (rain gardens, bioswales, urban tree planting, permeable pavement, storm drain debris catchment, etc.). Other Best Management Practices (BMPs) to reduce flooding impacts and erosion of waterbodies and agricultural areas	Proposed/ongoing	l,s,f	Medium	Municipalities, Greater Egypt, Other interested groups (SIU, non-profits, etc)	Greater Egypt
F28	Continue regular levee maintenance & repairs. Repair/replace floodgates and pumping stations as needed, document all activities in writing and with photos in case flood damage occurs	Ongoing	l,s,f	Medium	Levee Districts	from 2015 MHMP, downstate disaster workshop recommendations
F29	Implement nature-based/green/traditional infrastructure solutions to reduce flood risk and/or improve water quality in/around the City of Carbondale and Jackson County by performing mitigation activities including, but not limited to, stream/wetland restoration,	Proposed	L,s,f	High	Jackson County EMA, City of Carbondale, Greater Egypt	Jonathan Remo (Southern Illinois University Carbondale)

	bank/shoreline stabilization, retention/detention basins, land conservation/acquisition, and realignment of critical infrastructure.					

HazMat Release						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
HM1	Provide Hazmat training for first responders in Murphysboro. When possible, involve transportation companies such as Union Pacific Railroad. Hazmat training for first responders in Murphysboro. Develop evacuation plan for critical facilities (schools) which are within close proximity to major transportation line (UP RR)	Proposed	Local	Medium	Jackson County EMA// IEMA//IEPA	Brian Manwaring (Murphysboro EMA Director)
HM2	Continue to test and exercise our capabilities while learning from our improvements through our exercises. Continue to work with our County LEPC committee to educate and prepare our County for a Hazard Material release.	Ongoing	Local	Medium	Jackson County EMA// IEMA//IEPA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
HM3	Maintain maps of railroad crossings in the levee district and alternate egress routes available in the event of a train derailment and hazardous materials event. Assist in alerting levee district residents of disasters/impending disasters utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system.	Ongoing	Local	Medium	Jackson County EMA/ Fire Department	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
HM4	Strengthen and enforce safety procedures and policies. Require training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials. Canadian National can possibly help fund this project. Develop and maintain emergency plans/ risk management plans as required by the U.S EPA.	Ongoing	Local	Low	Jackson County EMA/ Carbondale Fire Department	Ryan Hall (Carbondale EMA Coordinator)
HM5	Institute awareness, protection, and procedures to lower risks of exposure. Will provide training and guidelines through Crisis Plan book.	Proposed	Local	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)

HM6	Educating our residents on what to do and where to go in the event of a possible train derailment, and proper procedures if such events took place. Set up isolation areas within the village. Work on types of communication that would better suit our needs; such as a P-25 digital radios	Ongoing	Local	Medium	Fire department of De Soto/ Jackson County EMA	Ben Doan (Chief of Police of De Soto)
HM7	Block off dangerous area from the public and contact the local HazMat team assist.	Ongoing	Local; State; Federal	Low	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)

HazMat Release						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
HM8	Develop and update HazMat emergency plans. Equip facilities with centralized positive-pressure HVAC systems.	Proposed	Local	High	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
HM9	Continually update risk management plan, continue to perform preventative maintenance on all hazardous material equipment	Ongoing	Local	Medium	KRCCD	Scott Wilmouth, KRCCD
HM10	Develop/update emergency action plans for HazMat release, conduct hazardous material commodity flow study, update facilities that store HazMats to current regulations, purchase emergency equipment	Proposed	l,s,f,p	Medium	Campbell Hill fire, County EMA	Laci Misselhorn, Campbell Hill Board
HM11	SIAA has a current plan for such releases. It should be reviewed and strengthened as necessary	Proposed	Local	High	SIAA	Gary Shafer, SIAA
HM12	Discuss and create joint plan with fire dept, acquire protective gear for first responders	Proposed	l,s,f	Low	City of Ava, Ava Fire Dept	Candice Cotter
HM13	Promote compliance with safety codes and regulations. Develop and enforce plans that regulate the location of sites with hazardous chemicals. Develop action or contingency plan	Ongoing	s	High	SIU	Benjamin Newman, SIU Chief of Police
HM14	Purchase Emergency Equipment – i.e., Chlorine Scrubbers, etc.: Kinkaid-Reed's Creek Conservancy District would like to purchase Chlorine Scrubbers to contain and treat accidental releases of chlorine gas. Implementation, if funding is available, is forecasted to be initiated within approximately three years. As SIH updates their hazmat response plan they will seek to purchase additional response equipment as necessary	Proposed	l,s,f,p	High	KRCCD	from 2015 MHMP

Drought, Extreme Heat						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
D2	Have a public shelter facility available to act as a cooling shelter in times of excessive heat.	Proposed	Local; State; Federal	Medium	Jackson County EMA//Murphysboro EMA// IEMA	Brian Manwaring (Murphysboro EMA Director)
D3	While working to build storm shelters in the County, we would make them accessible for warming/cooling centers.	Proposed	Local; State; Federal	Medium	Jackson County EMA// IEMA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
D4	Establish community cooling centers for vulnerable populations. Convert the winter warming center into a cooling center during the warmer months. Create a water supply plan management of water conservation for rain water catchments and storage.	Ongoing	Local	Low	City of Carbondale/ Jackson County Housing and Utilities department/ Homeowner	Ryan Hall (Carbondale EMA Coordinator)
D5	Use building as a resource and aid to agencies or community. The school itself would close due to extreme heat. The building could be use as a headquarters for other agencies if need be.	Proposed	Local	Low	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
D6	Fire department/ church can be used as cooling centers if needed.	Ongoing	Local	Low	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
D7	Provide cooling centers for vulnerable populations. Establish wildfire prevention management strategies.	Proposed	Local	Low	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
D8	monitor lake levels during drought, update emergency response plant when necessary.	Ongoing	Local	low	KRCCD	Scott Wilmouth, KRCCD
D9	develop a water action plan, retrofit water supply systems, develop and enforce water use restrictions and burn ordinances during droughts, create additional cooling shelters, equip critical facilities with generators.	Proposed	l,s,f,p	Medium	Campbell Hill Fire, County EMA, KRCCD, Cities/villages	Laci Misselhorn, Campbell Hill Board
D10	Check on elderly & those without electricity during heat waves	Proposed	l,s,f,p	High	Elkville Police & Fire	Lauana Wright

D11	Promote the idea of cool roofs (paint roofs white; reflective tiles = reflects sunlight, absorbs less heat). Acquire secondary resources for water and cooling. Follow State mitigation plan for reduced water consumption following the Governors mandates for provisions	Proposed	s	Medium	SIU	Benjamin Newman, SIU Chief of Police
D12	provide cooling centers for vulnerable population, establish fire prevention strategies	Proposed	l	Low	Ava	Candice Cotter
D13	Retrofit At-Risk Structures with Ignition-Resistant Materials or Sprinklers and Foam Extinguisher Systems: Southern Illinois Airport has a select number of buildings without adequate sprinkler and or/foam extinguisher systems. Implementation, if state or federal funding is available, is forecasted to be initiated within approximately 1-3 years	Proposed	l,s,f,p	High	SI Airport	from 2015 MHMP

Cyberattack						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
C1	Continue to educate the County employees with the safest processes for opening emails and clicking sites.	Ongoing	Local;State	High	Jackson County EMA // Jackson County IT Department	Orval Rowe (Deputy EMA Coordinator of Jackson County)
C2	Develop and implement a multi-factor authentication platform to help mitigate possible cyber-attacks.	Proposed	Local	Low	City of Carbondale IT Department/ Jackson County EMA // Jackson County IT Department	Ryan Hall (Carbondale EMA Coordinator)
C3	Plan and procedures set in place. Set up procedures on how to respond and repair issues.	Proposed	Local	Low	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
C4	Provide resources for the public on cyber security for home computers and smartphones; Make local businesses and government offices aware of the Illinois Attorney General's office of data breach reporting system.	Proposed	Local; State	Low	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
C5	Assess weaknesses and vulnerabilities within SIAA systems and identify mitigation measures	Proposed	Local	High	SIAA	Gary Shafer, SIAA
C6	Update virus protection software for City network, provide cybersecurity resources for the public.	Proposed	l	Low	Ava	Candice Cotter, Mayor of Ava

Terrorism						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
TR1	Offer active shooter training at high-risk facilities. Maintain a dedicated frequency with a repeater for first responders to communicate with school personnel in Murphysboro.	Ongoing	Local	High	Jackson County EMA//Murphysboro EMA//County law enforcement and Murphysboro Police	Brian Manwaring (Murphysboro EMA Director)
TR2	Work with all County First Responders to update our communications to a P-25 compliant digital platform. There is momentum beginning to build for this project to take shape.	Proposed	Local; State; Federal	High	Jackson County EMA// Law Enforcement// Fire Department	Orval Rowe (Deputy EMA Coordinator of Jackson County)
TR3	Assist in alerting levee district residents of terrorism/active shooter emergencies utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system.	Ongoing	Local	Medium	Jackson County EMA// Law Enforcement// Fire Department	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
TR4	Call Jackson County Police; Implementing a notification system in order to alert the public of Vergennes to stay safe and inside their homes.	Ongoing	Local	Medium	Jackson County EMA// Law Enforcement// Fire Department	Patricia Sherman (Treasurer/Clerk/Office Manager of Vergennes)
TR5	Develop an active shooter preparedness plan that includes the following elements: security assessment, preparedness, communications, incident plan, training and exercise, and post incident recovery. Carbondale police already have an active shooter plan in place. Ensure first aid/ trauma kits are updated, and located in appropriate areas and are accessible.	Ongoing	Local	High	Carbondale Police Department/ Jackson County Police Department/ SIH Medical	Ryan Hall (Carbondale EMA Coordinator)
TR6	Institute training, and procedures to protect the school and persons. Would utilize hands on training and instructions to equip persons within the building how to response and react to such an occurrence.	Proposed	Local	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
TR7	Active Shooter Protocol and Plan in place. Review and revise active shooter policy and plan. Participate in yearly active shooter drill with students and educate them on plan should active shooter/Intruder be present on campus.	Ongoing	Local	High	Jackson County EMA/ Jackson County Fire and Sherriff's Departments	Mary Beth Goff (Dean of Students at Unity Point)

TR8	Education for local schools on active shooter procedures. Improving communication with community and with local schools for public safety.	Ongoing	Local	Medium	Jackson County EMA/ Jackson County Fire and Sherriff's Departments	Ben Doan (Chief of Police of De Soto)
TR9	Upgrade/install emergency communication equipment; Upgrade school security systems.	Proposed	Federal	High	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
TR10	Continue training programs among key staff for responding to such incidents. Airport Police Department currently engages in this training but continual improvement is needed. Key staff across all airport entities is also important. Local funding from SIAA.	Ongoing	l,s,f	High	SIAA	Gary Shafer, SIAA
TR11	Upgrade school entrances to make it difficult for intruders to enter	Proposed	l,s,f,p	Medium	Campbell Hill fist response, County sheriff's dept	Laci Misselhorn, Campbell Hill Board
TR12	Enhance warning/ notification system. Develop Active Shooter/ Terrorism emergency action plan (Appendix D-18). Maintain up to date mutual aid agreements. Campus presentations for preparedness. Initiate incident command	Ongoing	s	High	SIU, Jackson County, City of Carbondale	Benjamin Newman, SIU Chief of Police

Ground Failure						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
G1	Use ground penetrating radar to create a more accurate map of underground mines. Maintain maps of known underground mines. Avoid building any critical infrastructure or public facilities on areas known to be undermined. Maintain a map of areas known to be undermined by coal mines.	Ongoing	Local; State; Federal	Medium	Jackson County EMA//EMA//USGS//IDNR	Brian Manwaring (Murphysboro EMA Director)
G2	Build a relationship with the Illinois Department of Natural Resources (IDNR) to partner with information sharing before a response to an incident.	Proposed	Local	Medium	Jackson County EMA//EMA//USGS//IDNR	Orval Rowe (Deputy EMA Coordinator of Jackson County)
G3	Stormwater control measures will be implemented to minimize surface water run off into known or encountered karst/sink holes. Post-Construction monitoring of identified areas will occur annually to identify any evidence of further sinkhole development with implementation of any measures necessary to prevent further solutions of underlying bedrock	Ongoing	Local	Low	Jackson County EMA/ EPA	Ryan Hall (Carbondale EMA Coordinator)
G4	Institute plan to rebuild or revamp damage to structures and property. CCHS would apply for funding to rebuild or demolish structures. The buildings and properties would be monitored and evaluated.	Proposed	Local	Medium	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
G5	Fill in any possible sinkholes.	Ongoing	Local; State	Medium	Jackson County EMA/ Village of Dowell Fire department	Village Clerk (Village of Dowell)
G6	Maintain a list of structures constructed over underground mines. Education programs/literature regarding mine subsidence insurance for home and landowners.	Proposed	Local; State	Medium	Jackson County EMA/ Elverado School District	Kevin Spain (Superintendent of Elverado CUSD #196)
G7	Maintain a list of structures constructed over underground mines.	Proposed	Local	low	KRCCD	Scott Wilmouth, KRCCD

G8	Monitor ground for evidence of subsidence	Ongoing	Local	low	KRCCD	Scott Wilmouth, KRCCD
G9	Map and asses community vulnerability to ground failure, maintain list of buildings over underground mines	Proposed	l,s,f,p	medium	Campbell Hil fire, County EMA	Laci Misselhorn, Campbell Hill
G10	Make a list of properties over old mine sites, education programs about mine subsidence insurance	Proposed	l,s,f	low	Ava	Candice Cotter, Ava

Power outage/ utility disruption						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
O1	We maintain several trailer mounted generators to supply power to critical infrastructure in the event of an extended power outage. Maintain a handful of portable generators to supply power to critical infrastructure. Retrofit all critical facilities with generator power or at least with a transfer switch to easily supply power with an external generator.	Proposed	Local; State; Federal	Medium	Jackson County EMA// Murphysboro Utility Department	Brian Manwaring (Murphysboro EMA Director)
O2	Retrofit all critical Infrastructures in the County with backup generators or transfer switches for portable generator systems. Continue working relationships with local power companies for assistance when a response occurs.	Proposed	Local; State; Federal	Medium	Jackson County EMA // Jackson County Utility Department// IEMA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
O3	Find communication through radios; and having a backup generator for the community center as a means of emergency response.	Ongoing	Local; State; Federal	High	Jackson County EMA // Jackson County Utility Department// IEMA	Patricia Sherman (Treasurer/Clerk/Office Manager of Vergennes)
O4	Install backup power systems, such as good generators at critical facilities. City of Carbondale already have back up power systems located in city hall, Carbondale police department, Carbondale fire department, the water treatment plant, and the public works facility.	Ongoing	Local	High	City of Carbondale/ Utilities department	Ryan Hall (Carbondale EMA Coordinator)
O5	Perform procedures and instructions on how to respond. Work with local agencies, and building coordinators to respond quickly.	Proposed	Local	Low	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
O6	Keep in constant contact with local power companies. Continued education on what to do during an extended power outage. Provide warning for cooling shelters and warming shelters for people to go to during long term outages.	Ongoing	Local	Medium	Jackson County EMA/ Jackson County Fire and Sheriff's Departments	Ben Doan (Chief of Police of De Soto)

O7	In the case of a power outage, check on people who have medical machines and make sure they have a way to power them. Fire department can be used as a possible shelter if needed.	Ongoing	Local	Low	Jackson County EMA/ Village of Dowell Fire Dept.	Village Clerk (Village of Dowell)
O8	Identify key facilities not currently served by back-up generators. The Airport's sewer lift station may be a good candidate. Local funds from SIAA	Proposed	l,s,f	Medium	SIAA	Gary Shafer, SIAA
O9	Improve communication between utility companies, create additional warming/cooling centers, install backup generators at critical facilities	Proposed	l,s,f,p	Medium	Ameren, Egyptian Electric, Campbell Hill fire, County EMA	Laci Misselhorn, Campbell Hill Board
O10	notify public on social media, notify on-duty police	Proposed	l,s,f	High	Elkville Police & Fire	Lauana Wright, Elkville Village Clerk
O11	Regularly service/check power generators throughout campus. Maintain alert notification system.	Ongoing	s	Low	SIU	Benjamin Newman, SIU Chief of Police
O12	Cooling and/or warming centers for vulnerable population. Acquire backup generators.	Proposed	l,s,f	low	Ava	Candice Cotter, Mayor of Ava

Wildfires						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
WF1	Have a mutual aid network in place to provide necessary resources in the event of a major wildfire. Properly manage forest through control burns.	Ongoing	State;Federal	Medium	Jackson County EMA//Murphysboro Fire Department	Brian Manwaring (Murphysboro EMA Director)
WF2	Assist in alerting levee district residents of disasters/impending disasters utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system. Hold a public meeting with citizens from the district to disseminate emergency protective strategies and a list/contact information for emergency personnel in the area including Jackson County officials and the Gorham Volunteer Fire Department first responders. Keep a copy of relevant disaster plans from Jackson County EMA and other relevant offices in the township office for public knowledge.	Ongoing	State;Federal	Medium	Jackson County EMA/ Fire Department	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
WF3	Call the fire department/MABIAS. Coordinate with a volunteer group to help with caring for fire fighters while they manage possible wildfires.	Ongoing	State;Federal	Low	Jackson County EMA/ Fire Department	Patricia Sherman (Treasurer/Clerk/Office Manager of Vergennes)
WF4	Create a safety zone to separate homes from combustible vegetation. Prune all branches around residential homes and building s to a height of 8-10 feet. Keep trees adjacent to buildings free from dead or dying wood and moss. Make sure electrical lines are buried properly.	Proposed	Local; Private	Low	Carbondale Utilities department (Ameren)/ homeowners/ Fire department/ Jackson County EMA	Ryan Hall (Carbondale EMA Coordinator)

WF5	Work with local fire agencies. Assess damages and apply for funding to rebuild and restore.	Proposed	Local	Low	Carbondale Community High School Staff//Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
WF6	Continue prescribed fires to reduce accumulated fuels, work with private landowners to conduct burns on their land	Ongoing	Federal	Medium	USFWS	Scott Wilmouth, KRCCD
WF7	Develop/enforce water use restrictions and burn ordinances during droughts, have an alternative Emergency Operations Center	Proposed	l,s,f,p	High	IDNR, Campbell Hill fire, county EMA	Laci Misselhorn
WF8	Public outreach on wildfire risk, work with other counties to establish protocols	Proposed	l,s,f	Low	Ava, Jackson County	Candice Cotter, Mayor of Ava
WF9	Wildfire: Write a Community Wildfire Protection Plan for Jackson County	Proposed	L,f	High	County EMA, All fire depts	Makanda Township Fire, US Forest Service

Near-Earth Object Impact (asteroids, meteorites)						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
N1	Assist in alerting levee district residents of disasters/impending disasters utilizing the district's email network, the Community for a Safe Levee Facebook page, and Jackson County EMA's alert warning system	Ongoing	Local	Medium	Jackson County EMA	Mark Holt & Rita VanPelt (Levee Commissioner/Secretary of Degognia)
N2	Assess damage and utilize recovery plan. Work with other agencies to assess damage and make recovery efforts	Proposed	Local	Low	Carbondale Community High School// Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)

Other Potential Hazards						
Code	**Mitigation Strategy**	**Status**	**Funding Source**	**Priority**	**Responsible Organization/ Agency**	**Strategy Proposed by**
OH1	Create a map of the county which identifies any areas which may be susceptible to landslides. Most landslides in this area are along and near highways; Have a plan to address areas along state highways which are prone to landslides.	Proposed	State; Federal	Medium	IDOT//USGS/Jackson County EMA	Brian Manwaring (Murphysboro EMA Director)

OH2	Acid Ponds - Form a working relationship with IDNR to explore hazards contained in the County from Acidic Ponds left over from strip cutting coal mines.	Proposed	Local; State	Low	Jackson County EMA/ IDNR	Orval Rowe (Deputy EMA Coordinator of Jackson County)
OH3	Train Derailment- Continue to train and exercise with County and State partners to exercise our capabilities before an actual response.	Ongoing	Local; State; Federal	High	Jackson County EMA// Fire Department	Orval Rowe (Deputy EMA Coordinator of Jackson County)
OH4	Pipeline Explosion- Continue to attend Annual Pipeline Safety meetings and build relationships with their representatives before an actual response.	Ongoing	Local; State; Federal	High	Jackson County EMA	Orval Rowe (Deputy EMA Coordinator of Jackson County)
OH5	Landslide- Utilize plan to recover and rebuild. Work with other agencies to help with restoring the property.	Proposed	Local	Low	Carbondale Community High School// Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
OH6	Infestation/Invasive Species- Utilize plan to eliminate the issue. Set a plan in place to eliminate the issue.	Proposed	Local	Low	Carbondale Community High School// Jackson County EMA	Stephanie Dillow (CCHS School Resource Officer)
OH7	Infestation/Invasive Species: Create plans with IDN and County Animal Control	Proposed	l,s,f,p	Medium	IDNR, Jackson County Animal Control	Laci Misselhorn, Campbell Hill Board
OH8	Invasives: use herbicides	Proposed	l,s,f,p	Low	Village of Elkville	Lauana Wright, Elkville Village Clerk

6. Plan Implementation

6.1. Implementation through Existing Programs

Throughout the planning process, the Jackson County 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 loses 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 Jackson County Emergency Management Agency will be the local champion for the mitigation actions. The Jackson County 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 actions.

Greater Egypt will use the MHMPs from all 5 counties in the region as guidance in other planning initiates including the Comprehensive Economic Development Strategy (CEDs), Transportation Planning, and Environmental Planning. It is recommended that the County and municipalities also incorporate this document into their local planning efforts.

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 Jackson County Emergency Management Agency and forwarded to the Planning Team for discussion. Education efforts for hazard mitigation will be an ongoing effort of Jackson County. 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 Jackson County Emergency Management Agency.

6.2. Monitoring, Evaluation, and Updating the MHMP

Throughout the five-year planning cycle, the Jackson County Emergency Management Agency will reconvene the Planning Team to monitor, evaluate, and update the plan on an annual basis. Members of the planning committee are readily available to engage in email correspondence between annual meetings. If there is a 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 Jackson County Board.

Appendix 1: Planning Team List

Name of municipality/organization	Participation Type	Name(Last,First)	Title
County EMA			
		Rowe, Orval	Deputy EMA Coordinator
		Moloney, Tim	Communications Leader
County			
Jackson County Highway Department		Burdick, Mitch	County Engineer
		Cox, Josh	Assistant Engineer
County Board		Mueller, Tamiko	Vice Chairwoman
County Board		Petersen, Julie	Board Member
		Berkowitz, Maureen	Assessor
		Whitbeck, Jeff	Administrator
County Sheriffs Office			
		Burns, Robert	Sherriff
		Lindsay, Jennifer	Captain
Cities/Villages			
Ava	Jurisdiction	Anderson, Rodney	Fire Chief
		Cotter, Candice	Mayor
Campbell Hill	Jurisdiction	Misselhorn, Laci	Board Member
Carbondale	Jurisdiction	Hall, Ryan	Carbondale EMA/ fire dept
		Mitchell, Steven	Economic Development Director
Carbondale Township	Jurisdiction	Bilderback, Michael	Fire Chief
		Dennis Poshard	Township Supervisor
De Soto	Jurisdiction	Hexamer, Doug	Village president
		Parks, Paula	Village Clerk
		Doan, Ben	Chief of Police
Dowell	Jurisdiction	Groves, Mindy	Village Clerk
Elkville	Jurisdiction	Wright, Lauana	Village Clerk
Gorham	Jurisdiction	Guetersloh, Ron	Fire Chief
		Howell, Dennis	Board Member
		Howell, Karissa	Volunteer
		VanPelt, Jessica	Volunteer
Grand Tower	Jurisdiction	Freeman, Josh	Mayor
Makanda	Jurisdiction	Shingleton, Tina	Village President
		Yambert, Leslie	Village Clerk
		Ross, Elaine	Village Trustee
		Dalton, Janet	Village Trustee
Murphysboro	Jurisdiction	McBride, Steve	Fire Chief
		Manwaring, Brian	Director, Murphysboro EMA
Vergennes	Jurisdiction	Clark, Shannon	Fire Chief
		Sherman, Patricia (Trish)	Treasurer, Clerk, Office Manager

Name of municipality/organization	Participation Type	Name(Last,First)	Title
Schools			
CCHS 165	Jurisdiction	Dillow, Stephanie	School Resource Officer
		Booth, Daniel	Superintendent
Shawnee CUSD 84	Jurisdiction	Clover-Hill, Shelly	District Superintendent
Southern Illinois University	Jurisdiction	Sherill, Tatiana	Safety Officer III
		Remo, Jonathon	Associate Professor, Geography and Environmental Resources
		Newman, Benjamin	Chief of Police
Unity Pointy School	Jurisdiction	Goff, Mary	Dean of Students
Carbondale Elementary School District 95	Stakeholder	Trimberger, Eric	Business Manager
De Soto School District 86	Jurisdiction	Mayerhofer, Steve	Superintendent
Elverado CUSD 196	Jurisdiction	Spain, Kevin	Superintendent
TRICO CUSD 176	Jurisdiction	Lovel, Larry	Superintendent
Murphysboro school district	Stakeholder	Evers, Andrea Dr.	Superintendent
Health/ Emergency Jurisdictions			
Jackson County Ambulance Service	Jurisdiction	Kuhns, Mark	Major
		Schafer, Kenton	Director
Regional Hospital Coordinating Center	Stakeholder	Herrmann, Arien	Region V manager
		Caffrey-Bey, Tamara	Regional Emergency Planning Coordinator
Jackson County Health Department	Jurisdiction	Grammer, Jessica	Preparedness & Compliance Specialist
Jackson County 911	Stakeholder	Woker, Melinda	Director
Other			
Degognia-fountain Bluff Levee District	Jurisdiction	Holt, Mark	Levee commissioner
		VanPelt, Rita	Secretary/treasurer
Grand Tower Levee District	Stakeholder	McMahan, Shawn	Levee commissioner
Kinkaid-Reed's Creek Conservancy District	Jurisdiction	Wilmouth, Scott	Manager
		Jenkins, JT	Water Plant Superintendent
Southern Illinois Airport Authority	Jurisdiction	Shafer, Gary	Manager
Franklin County EMA	Neighboring Jurisdiction	Buckingham, Ryan	Director
Jefferson County EMA	Neighboring Jurisdiction	Lueker, Steve	Coordinator
		Hertenstein, Keith	Assistant Coordinator
Williamson County EMA	Neighboring Jurisdiction	Burgess, Brian	Director
		Creek, Pat	Deputy Director
Perry County EMA	Neighboring Jurisdiction	Genesio, Charles	Director

Appendix 2: Jackson County Essential Facilities

Ambulance Stations

Name	Address	City	Zip	Backup Power	Kitchen	Shelter Capacity	Equipment	Sq Ft	Replacement Value	Census Tract
Jackson County Ambulance Service Headquarters	520 North University Avenue	Carbondale	62901	Yes	Y, Small	15-20	3-Advanced Life Support licensed and equipped ambulances; 1-Advanced Life Support licensed command non-transport truck 4X4; 1-SUV 4x4	5220	$1,013,273	17077010800
Jackson County Ambulance Service-Station 2	1439 North 14th Street	Murphysboro	62966	No	Y, Small	10	2-Advanced Life Support licensed and equipped ambulances	1980	$375,994	17077010400
Jackson County Ambulance Service-Station 3	302 South 3rd Street	Ava	62907	No	Y, Small	10	2-Advanced Life Support licensed and equipped ambulances	1620	$369,435	17077010100

Fire Stations

Name	Address	City	Zip	Backup Power	Kitchen	Shelter Capacity	Equipment	Sq Ft	Replacement Value	Census Tract
Ava Fire Department	312 W Main St	Ava	62907					11000	$2,796,530	17077010100
Campbell Hill Rural Fire District 162	109 West Front Street	Campbell Hill	62916					11000	$2,796,530	17077010100
Carbondale Fire Department Station 1	600 E. College St	Carbondale	62901	Y	Y			11000	$2,796,530	17077011200
Carbondale Fire Department Station 2	401 N. Glenview	Carbondale	62901	Y	Y			10840	$3,100,000	17077010800
Carbondale Township Fire Department	1125 E Park St	Carbondale	62901					11000	$2,796,530	17077011400
De Soto Township Fire Protection District	210 W Lincoln St	De Soto	62924					11000	$2,796,530	17077010200
Dowell Volunteer Fire Department	215 Union Ave	Dowell	62927					11000	$2,796,530	17077010200
Elkville Volunteer Fire Department	103 N 5th St	Elkville	62932					11000	$2,796,530	17077010200
Gorham Volunteer Fire Department	205 Washington St	Gorham	62940					11000	$2,796,530	17077010300
Grand Tower (Tower Rock) Fire Department	620 Front St	Grand Tower	62942					11000	$2,796,530	17077010300
Makanda Township Volunteer Fire Dept Station 1	5420 Old Highway 51	Carbondale	62903					11000	$2,796,530	17077011600
Makanda Township Volunteer Fire Dept Station 2	5975 Giant City Rd	Carbondale	62902					11000	$2,796,530	17077011600
Murphysboro Fire Department Station 1	219 North 10TH ST	Murphysboro	62966	Y				11000	$2,796,530	17077010700
Murphysboro Fire Department Station 2	1616 Pine St	Murphysboro	62966					11000	$2,796,530	17077010700
Murphysboro-Pomona-Somerset Fire Protection Station 2	771 Kimmel Bridge Rd	Murphysboro	62966					11000	$2,796,530	17077010400
Murphysboro-Pomona-Somerset Fire Protection Station 1	322 S Williams St	Murphysboro	62966					11000	$2,796,530	17077010700
Vergennes Fire Department	700 W Porter Ave	Vergennes	62994					11000	$2,796,530	17077010100

Emergency Operations Centers

Name	Address	City	Zip	Backup Power	Sq Ft	Replacement Value	Census Tract
Carbondale Emergency Operations Center	401 N. Glenview	Carbondale	62901	Yes	10840	$3,100,000	17077010800
Jackson County Emergency Operations Center	1001 Mulberry St.	Murphysboro	62966	Yes	11000	$2,796,530	17077010700

Hospitals

Name	Address	City	Zip	# Beds	Backup Power	Kitchen	Shelter Capacity	Sq Ft	Replacement Value	Census Tract
Memorial Hospital of Carbondale	405 W Jackson St	Carbondale	62901	159	Yes				$21,633,143	17077010800
St Joseph Memorial Hospital	2 Hospital Dr	Murphysboro	62966	25	Yes				$3,401,438	17077010400

Police Stations

Name	Address	City	Zip	Backup Power	Kitchen	Shelter Capacity	Sq Ft	Replacement Value	Census Tract
Ava Police Department	312 W Main St	Ava	62907				11000	$2,796,530	17077010100
Carbondale Police Department	501 S. Washington Street	Carbondale	62901	Yes			32000	$9,325,090	17077011200
Desoto Police Department	210 W Lincoln St	De Soto	62924				11000	$2,796,530	17077010200
Dowell Village Police Department	215 Union Ave	Dowell	62927				11000	$2,796,530	17077010200
Elkville Police Department	507 E Kimmel St	Elkville	62932				11000	$2,796,530	17077010200
Jackson County Sheriff's Department	1001 Mulberry St	Murphysboro	62966	Yes			11000	$2,796,530	17077010700
Murphysboro Police Department	202 N 11th St	Murphysboro	62966	Yes			11000	$2,796,530	17077010700
Southern Illinois Airport Authority	605 N Airport Rd, Suite 205	Murphysboro	62966				11000	$2,796,530	17077010800
SIU Carbondale Police	1175 South Washington St.	Carbondale	62901				11000	$2,796,530	17077011702

Schools

County	District/Type	Name	Address	City	Zip	Kitchen	Shelter Capacity	Sq Ft	Replacement Value	Census Tract
Jackson	Carbondale Elementary Dist #95	Carbondale Middle School	1150 East Grand Avenue	Carbondale	62901			32714.29	$6,596,182	17077011200
Jackson	Carbondale Elementary Dist #95	Lewis Elementary School	801 S. Lewis Lane	Carbondale	62901			21142.86	$4,263,035	17077011200
Jackson	Carbondale Elementary Dist #95	Parrish School	121 N Parrish Ln.	Carbondale	62901			38571.43	$7,777,158	17077011000
Jackson	Carbondale Elementary Dist #95	Thomas Elementary School	1025 North Wall Street	Carbondale	62901			24785.71	$4,997,543	17077010900
Jackson	CCHS District #165	Carbondale Community High School	1301 E Walnut St	Carbondale	62901			78714.29	$15,871,162	17077011200
Jackson	De Soto Cons. School Dist #86	DeSoto Grade School	311 Hurst Rd	De Soto	62924			17428.57	$3,514,123	17077010200
Jackson	Elverado CUSD #196	Elverado High School	514 S 6th St	Elkville	62932			10642.86	$2,145,920	17077010200
Jackson	Elverado CUSD #196	Elverado Intermediate	190 Harrison St	Vergennes	62994			7428.571	$1,497,823	17077010100
Jackson	Elverado CUSD #196	Elverado Junior High	190 Harrison St	Vergennes	62994			6357.143	$1,281,791	17077010100
Jackson	Elverado CUSD #196	Elverado Primary School	114 S 8th St	Elkville	62932			9000	$1,814,670	17077010200
Jackson	Giant City CCSD #130	Giant City School	1062 Boskydell Rd	Carbondale	62902			18571.43	$3,744,557	17077011600
Jackson	Murphysboro CUSD #186	Carruthers Elementary School	80 Candy Ln	Murphysboro	62966			33500	$6,754,605	17077010400
Jackson	Murphysboro CUSD #186	General John A Attendance Center	320 Watson Rd	Murphysboro	62966			36357.14	$7,330,691	17077010700
Jackson	Murphysboro CUSD #186	McElvain School	593 Ava Rd	Murphysboro	62966			9214.286	$1,857,876	17077010400
Jackson	Murphysboro CUSD #186	Murphysboro High School	50 Blackwood Dr	Murphysboro	62966			45500	$9,174,165	17077010400
Jackson	Murphysboro CUSD #186	Murphysboro Middle School	2125 Spruce St	Murphysboro	62966			34785.71	$7,013,843	17077010600
Jackson	Not-for-profit Private School	Brehm Prepatory School	950 S Brehm Ln	Carbondale	62901			5642.857	$1,137,769	17077011400
Jackson	Not-for-profit Private School	Carbondale New School	1302 E Pleasant Hill Rd	Carbondale	62902			5071.429	$1,022,552	17077011700
Jackson	Private School	Immanuel Lutheran School	1915 Pine St	Murphysboro	62966			3071.429	$619,292	17077010600
Jackson	Private School	Montessori School of Southern Illinois	507 N 9th St	Murphysboro	62966			428.5714	$86,413	17077010700
Jackson	Private School	Saint Andrew School	723 Mulberry St	Murphysboro	62966			9428.571	$1,901,083	17077010700
Jackson	Private School	Trinity Cristian School	1218 West Freeman St.	Carbondale	62901			9785.714	$1,973,094	17077011000
Jackson	Public University	Southern Illinois Univ. - Carbondale	1263 Lincoln Dr	Carbondale	62901			1595333	$272,881,750	17077011700
Union	Shawnee CUSD #84	Shawnee Elementary School / Junior & Senior High	3365 IL-3	Wolf Lake	62998	Y, commercial	1914	22000	$20,000,000	17181950200
Jackson	Tri County	COPE Alternative School	1725 B Shomaker Dr	Murphysboro	62966			1142.857	$230,435	17077010600
Jackson	Tri County	TC Center School & Education Annex	1725 Shomaker Dr	Murphysboro	62966			642.8571	$129,620	17077010600

County	District/Type	Name	Address	City	Zip	Kitchen	Shelter Capacity	Sq Ft	Replacement Value	Census Tract
Jackson	Trico CUSD #176	Trico Elementary School	16343 Highway 4	Campbell Hill	62916			31357.14	$6,322,541	17077010100
Jackson	Trico CUSD #176	Trico High School	16533 Highway 4	Campbell Hill	62916			19071.43	$3,845,372	17077010100
Jackson	Trico CUSD #176	Trico Junior High School	16533 Highway 4	Campbell Hill	62916			20928.57	$4,219,828	17077010100
Jackson	Unity Point CCSD #140	Unity Point School	4033 S Illinois Ave	Carbondale	62903			54357.14	$10,960,031	17077011600

Appendix 3: Risk Indices

Hazard	Avg risk index	# lists included	total lists received	% importance	weighted risk index
epidemic	15.10	21	29	0.72	10.93
tornado	13.08	26	29	0.90	11.72
earthquake	10.67	27	29	0.93	9.93
levee failure	10.40	10	29	0.34	3.59
cyber attack	10.25	4	29	0.14	1.41
utility disruption	10.00	3	29	0.10	1.03
winter storm	7.92	25	29	0.86	6.83
flooding	7.86	22	29	0.76	5.97
dam failure	7.60	5	29	0.17	1.31
thunderstorm	7.54	26	29	0.90	6.76
hazmat release	6.65	23	29	0.79	5.28
active shooter	6.50	2	29	0.07	0.45
extreme heat	6.05	20	29	0.69	4.17
meteor	3.83	6	29	0.21	0.79
terrorism	3.42	12	29	0.41	1.41
ground failure	3.15	13	29	0.45	1.41
wildfire	2.75	8	29	0.28	0.76
landslide	2.00	4	29	0.14	0.28
infestation	2.00	3	29	0.10	0.21
invasive spp	2.00	3	29	0.10	0.21

Ava	
Hazard	**Risk Index**
earthquake	12
tornado	12
winter storm	8
thunderstorm	4

Campbell Hill	
Hazard	**Risk Index**
epidemic	32
tornado	32
earthquake	24
thunderstorm	16
hazmat	6
winter storm	6
flooding	4
ground failure	2
terrorism	2
infestation/invasives	1
meteor	1

Carbondale	
Hazard	**Risk Index**
earthquake	16
dam failure	8
epidemic	8
thunderstorm	8
tornado	6
hazmat	4
wildfire	4
winter storm	4
terrorism	2

Carbondale Township	
Hazard	**Risk Index**
Thunderstorm	16
winter storm	16
earthquake	12
flooding	6
ground failure	6
wildfire	4
extreme heat	3
hazmat	2

Desoto	
Hazard	**Risk Index**
tornado	24
winter storm	12
epidemic	8
extreme heat	6
thunderstorm	6
earthquake	4
hazmat	4

Dowell	
Hazard	**Risk Index**
meteor	8
tornado	6
earthquake	4
winter storm	4
thunderstorm	4
ground failure	4
epidemic	2
extreme heat	2
hazmat	1

Elkville	
Hazard	**Risk Index**
epidemic	32
tornado	32
winter storm	32
thunderstorm	32
flooding	8
extreme heat	8
earthquake	4

Gorham	
Hazard	**Risk Index**
Levee Failure	16
hazmat	16
tornado	12
flooding	8
earthquake	8
thunderstorm	6

Grand Tower	
Hazard	**Risk Index**
epidemic	32
earthquake	16
hazmat	16
levee failure	16
tornado	16
flooding	8
thunderstorm	4
winter storm	3

Makanda	
Hazard	**Risk Index**
hazmat	24
epidemic	16
cyberattack	16
winter storm	16
earthquake	12
flooding	12
extreme heat	12
tornado	12
terrorism	8
meteor	8
thunderstorm	6
landslide	4
ground failure	4
wildfire	4

Murphysboro	
Hazard	**Risk Index**
epidemic	32
tornado	24
earthquake	24
thunderstorm	16
flooding	8
winter storm	4
hazmat	2
mine subsidence	2

Vergennes	
Hazard	**Risk Index**
tornado	12
utility disruption	12
epidemic	9
earthquake	8
flooding	8
winter storm	8
hazmat	6
terrorism	1
cyberattack	1
extreme heat	1
ground failure	1
infestation/invasives	1
thunderstorm	1
meteor	1
landslide	1
wildfire	1

County EMA	
Hazard	**Risk Index**
earthquake	16
epidemic	16
cyberattack	12
terrorism	12
tornado	12
utility disruption	12
extreme heat	8
flooding	8
thunderstorm	8
winter storm	8
hazmat	8
dam/levee failure	6

Murphysboro fire	
Hazard	**Risk Index**
tornado	16
earthquake	8
thunderstorm	8
flooding	6
winter storm	6
extreme heat	4
terrorism	4
hazmat	3
epidemic	2
levee failure	2
ground failure	2

SI Airport Authority	
Hazard	**Risk Index**
earthquake	24
tornado	16
epidemic	12
winter storm	12
extreme heat	6
flooding	6
thunderstorm	4
terrorism	4
hazmat	3

KRCCD	
Hazard	**Risk Index**
earthquake	16
hazmat release	16
dam failure	8
flooding	4
tornado	4
winter storm	3
levee failure	2
extreme heat	2
landslide	1

RHCC	
Hazard	**Risk Index**
cyber attack	12
epidemic	12
hazmat release	12
dam failure	8
earthquake	8
extreme heat	8
tornado	8
flooding	6
utility disruption	6
ground failure	4
infestation/invasives	4
meteor	4
terrorism	4
wildfire	4

Degognia/ft bluff levee dist.	
Hazard	**Risk Index**
erosion/sand boils	24
tornado	16
earthquake	8
levee failure	8
flooding	6
ground failure	4
winter storm	3
thunderstorm	2
meteor	1
terrorism	1
wildfire	1

Shawnee CUSD	
Hazard	**Risk Index**
levee failure	16
flooding	12

SIU EHS	
Hazard	**Risk Index**
earthquake	8
epidemic	8
tornado	8
winter storm	8
extreme heat	4
hazmat	4
thunderstorm	4
terrorism	2

CCHS	
Hazard	**Risk Index**
tornado	8
winter storm	8
earthquake	6
epidemic	6
hazmat	6
extreme heat	4
flooding	4
thunderstorm	4
terrorism	1

Carterville sd	
Hazard	**Risk Index**
earthquake	16
epidemic	16
tornado	16
dam failure	8
thunderstorm	8
flooding	4
hazmat	4
winter storm	3
extreme heat	3
ground failure	2

Murphysboro school district	
Hazard	**Risk Index**
epidemic	32
thunderstorm	8
extreme heat	8
tornado	6
earthquake	4
flooding	4
ground failure	4
hazmat	4
levee failure	4
winter storm	4

De Soto SD 86	
Hazard	**Risk Index**
epidemic	8
extreme heat	8
flooding	8
tornado	8
winter storm	8
earthquake	4
terrorism	4
meteor	4

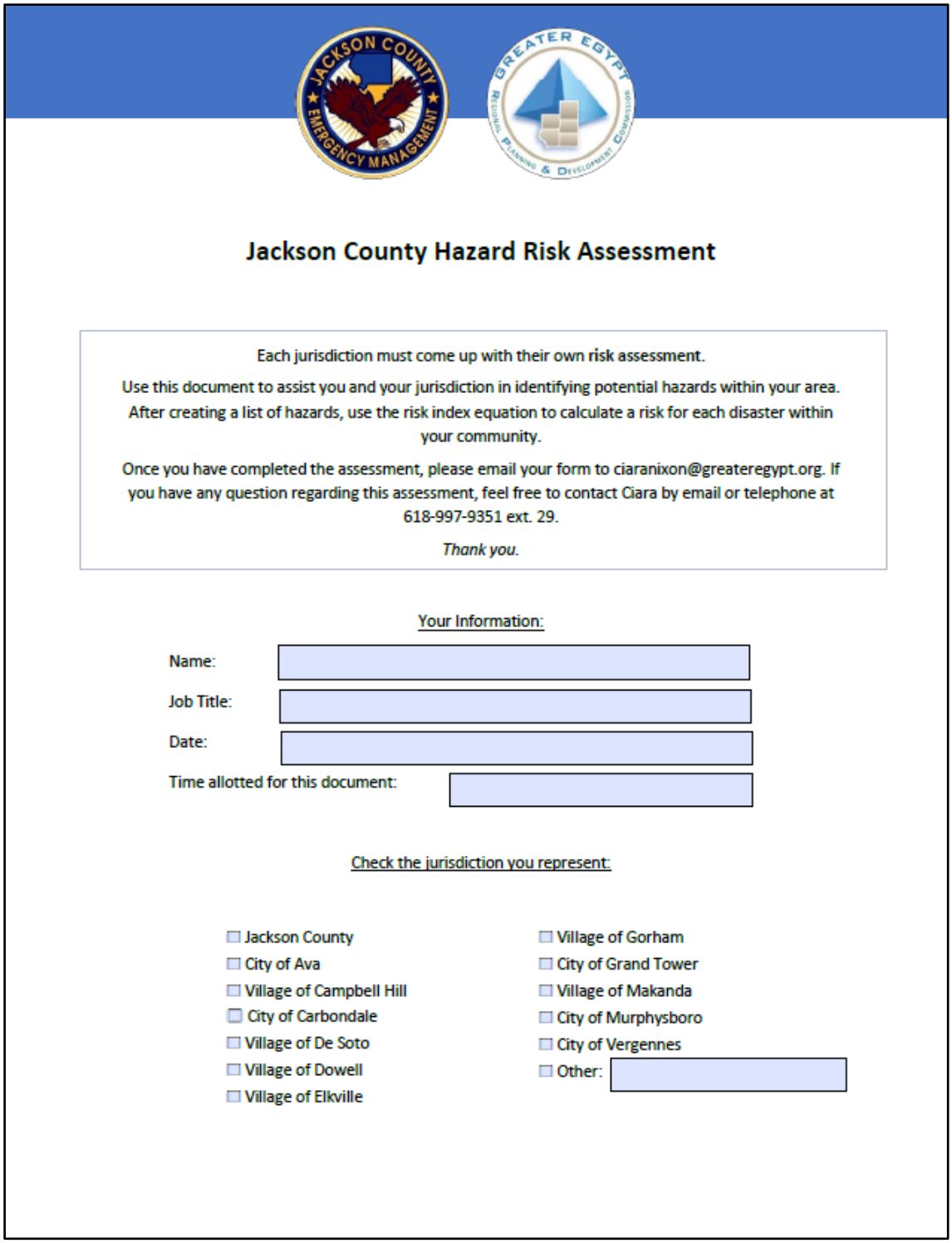
CES95	
Hazard	**Risk Index**
earthquake	8
tornado	8
winter storm	8
extreme heat	4
flooding	4
thunderstorm	4

Trico CUSD 176	
Hazard	**Risk Index**
epidemic	24
levee failure	18
flooding	15
tornado	6
thunderstorm	6
ground failure	6
hazmat	4
earthquake	2

Giant City School	
Hazard	**Risk Index**
tornado	16
earthquake	12
extreme heat	8
terrorism	8
thunderstorm	8
epidemic	6
hazmat	4

Risk Assessment Worksheets

Below is the example worksheet of the Jackson County Risk Assessment and responses from Planning Team members.



Jackson County Hazard Risk Assessment

Each jurisdiction must come up with their own risk assessment.

Use this document to assist you and your jurisdiction in identifying potential hazards within your area. After creating a list of hazards, use the risk index equation to calculate a risk for each disaster within your community.

Once you have completed the assessment, please email your form to ciaranixon@greateregypt.org. If you have any question regarding this assessment, feel free to contact Ciara by email or telephone at 618-997-9351 ext. 29.

Thank you.

Your Information:

Name:

Job Title:

Date:

Time allotted for this document:

Check the jurisdiction you represent:

- ☐ Jackson County
- ☐ City of Ava
- ☐ Village of Campbell Hill
- ☐ City of Carbondale
- ☐ Village of De Soto
- ☐ Village of Dowell
- ☐ Village of Elkville
- ☐ Village of Gorham
- ☐ City of Grand Tower
- ☐ Village of Makanda
- ☐ City of Murphysboro
- ☐ City of Vergennes
- ☐ Other:

Let's start by thinking about any and all-natural hazards that have affected your community in the past. Do any historical natural hazard events come to mind? If so, start your list of possible natural hazards with experiences that you have been through or have heard of within your community. What happened previously is a great guide in planning and preparing for what may happen again. Even for events that took place 100 or more years ago, there is still the possibility that is could happen again.

Though this list may start with your own personal experiences or based off of stories you've heard, this should not be the only way you come up with a list of natural hazards. There are other natural hazards that may be possible in the future, that may not have happened yet. The nature of some threats may change overtime, whether that is due to weather pattern changes, or just the rarity of that threat happening. It's always good to be prepared for anything and everything, and remember:

*It's not **IF** it happens, it's **WHEN** it happens.*

Below are two different lists of hazards. The first list is of hazards that have historic data in the state of Illinois. The second list of hazards are less probable to happen in Illinois, but are still possible.

Check the box next to each hazard you feel your community should be prepared for.

List of Possible Hazard:

- ☐ Dam Failure
- ☐ Earthquake
- ☐ Epidemic
- ☐ Extreme Heat
- ☐ Flooding
- ☐ Ground Failure (mine subsidence/karst/sinkhole)
- ☐ Hazardous Materials Event
- ☐ Infestation
- ☐ Invasive Species
- ☐ Landslide
- ☐ Levee Failure
- ☐ Meteor Impact
- ☐ Terrorism
- ☐ Thunderstorm
- ☐ Tornado
- ☐ Volcanic Eruption
- ☐ Wildfire
- ☐ Winter storm/Ice storm

Are there any other hazards that your community would like to add to their list?

Now, to rank the hazards from the list that you have created, we first need to understand the **Risk Index** equation.

RISK INDEX = PROBABILITY * SEVERITY

The **PROBABILITY** of an event is how likely the event will occur.

The **SEVERITY** of the event is the degree to which a hazard affects the functionality of society and the natural environment.

Use the table below to give each hazard a probability and severity ranking. Then, use the above equation to complete the hazard risk assessment by giving each hazard a risk index. Use the risk index of each hazard to then rank each hazard by most threatening/important to least threatening/importance.

Probability	Characteristics
4 – Highly Likely	Event is probable within the next calendar year. These events have occurred, on average, once every 1-2 years in the past.
3 – Likely	Event is probable within the next 10 years. Event has a 10-15% chance of occurring in any given year. These events have 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. These events have 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. These events have occurred, on average, once every 50-200 years in the past.

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 in 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.

Jurisdiction Hazard Risk Assessment

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank

Jackson County EMA, Orval Rowe

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	2	8	16	1
Epidemic/Pandemic	2	8	16	2
Tornado	3	4	12	3
Utility Disruption	3	4	12	4
Cyber-Attack Data	3	4	12	5
Active Shooter Incident	3	4	12	6
Flood	4	2	8	7
Severe Weather (Year Around)	4	2	8	8
Train Derailment	2	4	8	9
Hazardous Material Release	3	2	6	10
Dam/Levee Failure	2	3	6	11
Pipeline Explosion	2	2	4	12
Acidic Ponds	2	2	4	13
Ground Failure	2	1	2	14

Village of Makanda, Tina Shingleton

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	3	4	12	12
Epidemic	4	4	16	16
Extreme Heat	3	4	12	12
Flooding	3	4	12	12
Ground Failure	2	2	4	4
Hazardous Materials	3	8	24	24
Landslide	2	2	4	4
Meteor Impact	2	4	8	8
Terrorism	2	4	8	8
Thunderstorm	3	2	6	6
Tornado	3	4	12	12
Wildfire	2	2	4	4
Winter Storm/Ice Storm	4	4	16	16
Cyber Security	4	4	16	16

RHCC region V, Arien Herrmann

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Dam Failure/ Levee Failure	1	8	8	2
Earthquake	1	8	8	2
Epidemic	3	4	12	1
Extreme Heat	4	2	8	2
Flooding	3	2	6	3
Ground Failure	2	2	4	4
Hazardous Materials Event	3	4	12	1
Infestation	2	2	4	4
Invasive Species	2	2	4	4
Landside	2	1	2	6
Space Weather	2	2	4	4
Terrorism	1	4	4	4
Thunderstorm	3	1	3	5
Tornado	2	4	8	2
Wildfire	1	4	4	4
Winter Storms	2	1	2	6
Draught	2	1	2	6
Cyber Attack	3	4	12	1
Utility Disruption	3	2	6	3
Chemical, Bio, Radiologic, Nuclear	2	2	4	4
Civil Disruption	2	4	8	2

City of Ava, Candice Cotter

Hazard	Probability *(1-4)*	Severity *(1,2,4, or B)*	Risk Index *(P*J)*	Rank
Earthquake	3	4	12	
Thunderstorm	4	1	5	
Winter Storm/Ice Storm	4	2	8	
Tornado	3	4	12	

Giant City CCSD #30, Belinda Hill

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	3	4	12	2
Epidemic	3	2	6	7
Extreme Heat	2	4	8	5
Hazardous Materials Event	2	2	4	8
Terrorism	2	4	8	6
Thunderstorm	4	2	8	4
Tornado	4	4	16	1
Winter storm/Ice storm	4	2	8	3

Southern Illinois University - Carbondale, Tatiana Sherill

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8}*	Risk Index *(P*I}*	Rank
Earthquake	2	2/4/	4/8	4
Epidemic	2	4	8	3
Extreme Heat	4	1	4	2
Hazardous Materials Event	4	1	4	1
Thunderstorm	4	1	4	5
Tornado	2	2/4	4/8	7
Winter Storm/Ice Storm	4	1/2	4/8	6
Terrorism	1	2	2	8

CESD #95, Eric Trimberger

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *{P*I}*	Rank
Winter Storm/Ice	4	2	8	1
Tornado	2	4	8	2
Earthquake	2	4	8	3
Flooding	2	2	4	4
Thunderstorm	4	1	4	5
Extreme Heat	4	1	4	6

CCHS 165, Stephanie Dillow

Hazard	Probability *{1-4}*	Severity *{1,2,4, or 8}*	Risk Index *{P*I}*	Rank
Earthquake	3	2		8
Epidemic	3	2		6
Extreme Heat	4	1		2
Flooding	4	1		5
Hazardous Materials Event	3	2		7
Terrorism	1	1		9
Thunderstorm	4	1		4
Tornado	4	2		3
Winter storm/Ice storm	4	2		1

Carbondale Township Fire Dept., Michael Bilderback

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Thunderstorm	4	4	16	1
Winter storm/Ice storm	4	4	16	2
Wildfire	2	2	4	4
Earthquake	3	4	12	3
Extreme Heat	3	1	3	7
Flooding	3	2	6	5
Ground Failure	3	2	6	6
Hazardous Materials Event	1	2	2	8

Trico CUSD 195, Larry Lovel

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
EARTHQUAKE	1	2	2	6
EPIDEMIC	4	6	24	1
FLOODING	3	5	15	3
GROUND FAILURE	3	2	6	4
HAZARDOUS MATERIALS	2	2	4	7
LEVEE FAILURE	3	6	18	2
THUNDERSTORM	2	3	6	4
TORNADO	2	3	6	4

Degognia-Fountain Bluff Levee District, Mark Holt

Hazard	**Probability** *(1-4)*	**Severity** *(1,2,4, or 8)*	**Risk Index** *(P*I)*	**Rank**
Earthquake	1	8	8	3
Flooding	3	2	6	4
Hazardous Materials Event	2	2	4	5
Levee Failure	1	8	8	3
Meteor Impact	1	1	1	8
Terrorism	1	1	1	8
Thunderstorm	2	1	2	7
Tornado	2	8	16	2
Wildfire	1	1	1	8
Winter Storm/Ice Storm	3	1	3	6
Sand Boils and Erosion	3	8	24	1

De Soto SD #86, Steve Mayerhofer

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	1	4	4	7
Epidemic	2	4	8	2
Extreme Heat	4	2	8	5
Flooding	2	4	8	3
Meteor Impact	1	4	4	8
Terrorism	1	4	4	6
Thunderstorm	4	1	4	9
Tornado	2	4	8	1
Winter Storm	4	2	8	4

Village of Dowell, Mindy Groves

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Meteor Impact	1	8	8	1
Tornado	3	2	6	2
Thunderstorm	4	1	4	3
Earthquake	2	2	4	3
Ground Failure	2	2	4	3
Winter Storm	2	2	4	3
Epidemic	2	1	2	4
Extreme Heat	2	1	2	4
Hazardous Materials	1	1	1	5

City of Carbondale, Dylan Fairfield

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Dam Failure	1	8	8	2
Earthquake	2	8	16	1
Epidemic	2	4	8	4
Hazardous Materials Event	4	1	4	6
Terrorism	2	1	2	9
Thunderstorm	4	2	8	3
Tornado	3	2	6	5
Wildfire	4	1	4	8
Winter storm/Ice storm	4	1	4	7

Village of Elkville, Lauana Wright

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	2	2		
Epidemic	4	8		
Extreme Heat	4	2		
Flooding	4	2		
Thunderstorm	4	8		
Tornado	4	8		
Winter Storm / Ice Storm	4	8		

SI Airport, Gary Shafer

Hazard	**Probability** *(1-4)*	**Severity** *(1,2,4, or 8)*	**Risk Index** *(P*I)*	**Rank**
Earthquake	3	8	24	1
Epidemic	3	4	12	3
Extreme Heat	3	2	6	4
Flooding	3	2	6	4
Hazardous Materials	3	1	3	6
Terrorism	2	2	4	5
Thunderstorm	4	1	4	5
Tornado	4	4	16	2
Winter Storm/Ice Storm	3	4	12	3

Village of Gorham, Dennis Howell & Karissa Howell

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	1	4	4	6
Epidemic	2	2	4	5
Extreme Heat	4	4	16	3
Flooding	3	8	24	1
Hazardous Material Event	1	2	2	9
Levee Failure	2	8	16	2
Thunderstorm	4	2	8	4
Tornado	2	2	4	7
Wildfire	2	1	2	10
Winter Storm/Ice Storm	2	2	4	8

City of Grand Tower, Josh Freeman

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	2	8	16	3
Levee Failure	2	8	16	2
Flooding	4	2	8	6
Epidemic	4	8	32	1
Hazardous Material Event	2	8	16	4
Winter Storm	3	1	3	8
Tornado	2	8	16	5
Severe Thunderstorm	4	1	4	7

Elverado CUSD #196, Kevin Spain

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	1	1	1	7
Epedemic	2	2	4	4
Ground Fault	2	1	2	6
Hazardous Materials	2	2	4	5
Thunderstorm	4	1	4	3
Tornado	3	2	6	2
Winter storm/Ice storm	3	2	6	1

Village of Campbell Hill, Laci Misselhorn

Hazard	Probability (1-4)	Severity (1,2,4, or 8)	Risk Index (P*I)	Rank
Earthquake	3	8	24	2
Epedemic	4	8	32	1
Extreme Heat	3	2	6	4
Flooding	2	2	4	5
Ground Failure	1	2	2	6
Hazardous Material	3	2	6	4
Infestation	1	1	1	7
Invasive Species	1	1	1	8
Meteor Impact	1	1	1	9
Terrorism	2	1	2	6
Thunderstorm	4	4	16	3
Tornado	4	8	32	1
Winter Storm / Ice Storm	3	2	6	4

Kinkaid-Reed's Conservancy District, Scott Wilmouth

Hazard	Probability (1-4)	Severity (1,2,4, or 8)	Risk Index (P*I)	Rank
Dam Failure	1	8	8	3
Earthquake	2	8	16	1
Extreme Heat	2	1	2	11
Flooding	4	1	4	6
Ground Failure	2	1	2	8
Hazardous Materials Event	2	8	16	2
Landslide	1	1	1	12
Levee Failure	2	1	2	10
Thunderstorm	4	1	4	5
Tornado	4	1	4	4
Wildfire	2	1	2	9
Winter Storm/Ice Storm	3	1	3	7

Murphysboro CUSD #186, Dr. Andrea Evers

Hazard	Probability *{1-4}*	Severity *{1,2,4, or 8}*	Risk Index *{P*I}*	Rank
Earthquake	2	2		
Epidemic	4	8		
Extreme Heat	4	2		
Flooding	2	2		
Ground Failure	2	2		
Hazardous Material Event	2	2		
Levee Failure	2	2		
Thunderstorm	4	2		
Tornado	3	2		
Winter Storm	4	1		

City of Murphysboro, Brian Manwaring

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Tornado	3	8	24	2
Severe Thunderstorm	4	4	16	4
River Flooding	4	2	8	5
Flash Flooding	4	2	8	5
Earthquake	3	8	24	3
Mine Subsidence	2	1	2	8
Haz Mat	2	1	2	7
Winter Storm	4	1	4	6
Epidemic	4	8	32	1

City of Murphysboro, Steve McBride

Hazard	Probability *{1-4)*	Severity *{1,2,4, or 8)*	Risk Index *{P*I)*	Rank
Earthquake	2	4		
Epidemic	1	2		
Extreme Heat	2	2		
Flooding	3	2		
Ground Failure	2	1		
Hazmat	3	1		
Levee Failure	2	1		
Terrorism	2	2		
Thunderstorm	4	2		
Tornado	4	4		
Winter Storm	3	2		

Grand Tower Levee Commission, Shawn McMahan

Hazard	Probability *(1-4}*	Severity *{1,2,4, or 8)*	Risk Index *{P*I}*	Rank
flooding	2			
levee failure		7		
storms			9	

Shawnee CUSD #84, Shelly Clover

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Flooding	3	4	12	2
Levee failure	2	8	16	1

Village of Vergennes, Patricia Sherman

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	1	8	8	5
Epidemic	3	3	9	3
Extreme Heat	1	1	1	10
Flooding	4	2	8	6
Ground Failure	1	1	1	11
Haz Mat event	3	2	6	8
Infestation	1	1	1	12
Invasive Species	1	1	1	13
Landslide	1	1	1	14
Meteor Impact	1	1	1	15
Terrorism	1	1	1	9
Thunderstorm	1	1	1	7
Tornado	1	4	12	1
Wildfire	1	1	1	16
Winter Storm/Ice storm	4	2	8	4
Utility Disruption	1	4	12	2
Cyber Attack	1	1	1	17
Active Shooter	1	1	1	18

Village of De Soto, Doug Hexamer

Hazard	Probability *(1-4)*	Severity *(1,2,4, or 8)*	Risk Index *(P*I)*	Rank
Earthquake	2	2	4	5
Epidemic	2	4	8	3
Extreme Heat	3	2	6	4
Hazardous Materials Event	2	2	4	5
Thunderstorm	3	2	6	4
Tornado	3	8	24	1
Winter storm/Ice storm	3	4	12	2

Appendix 4: Meeting Minute & Attendance

Jackson County Multi-Hazard Mitigation Plan
Meeting 1 Minutes

June 17, 2021 - 6:00 PM
County EMA Coordinator: Sheriff Robert Burns
County EMA Deputy Coordinator: Orval Rowe
Zoom (virtual) Meeting
Planning Team Attendance: 25

Tyler Carpenter (Greater Egypt) opened the meeting and introduced Orval Rowe, EMA Deputy Director of Jackson County. Orval gave opening remarks regarding the history of the Multi-hazard Mitigation Planning (MHMP) process and the importance of the planning team.

Tyler Carpenter reviewed the MHMP process which includes: hazard mitigation history and assistance, local MHMP process, and adoption of the plan. He explained the planning process involves forming a planning team to assist in identifying hazards, developing mitigation strategies, and match requirements. An emphasis was placed on participation in the plan and funding for jurisdictions.

Kelsey Bowe (Greater Egypt) presented historical hazards in Jackson County. She also identified hazards that have been included in previous plans for Jackson County. Kelsey introduced the critical facilities data. This dataset will need to be updated for the HAZUS models to be more accurate. The Planning Team will need to review the critical facilities map.

Ciara Nixon (Greater Egypt) explained the process to assess risk from hazards. The Planning Team will be required to complete the Hazard Ranking exercise for their jurisdiction. This utilizes the Risk Priority Index Equation. Planning partners were given time to complete the exercise. Partners will also be able to finish the exercise at outside of the meeting. Greater Egypt will provide assistance for the exercise. Meeting materials will be available at: http://greateregypt.org/hazard-mitigation-planning/.

Planning partners discussed the need for the plan to identify personnel available to assist during, or following a disaster. This includes the Army National Guard.

The meeting was adjourned.

Meeting Attendance
Meeting 1: June 17, 2021 6:00 PM
Name
Orval Rowe
Brian Manwaring
Eric Trimberger
Gene Basden
Jessica Grammer
Julie Peterson
Mark Kuhns
Kenton Schafer
Mitch Burdick
Rodney Anderson
Shelly Clover-Hill
Tatiana Sherill
Tim Moloney
Tina Shingleton
Tamiko Mueller
Doug Wilson
Stephanie Dillow
Shannon Clark
Jennifer Lindsey
Robert Burns
Tyler Carpenter
Ciara Nixon
Kelsey Bowe

Jackson County Multi-Hazard Mitigation Plan

Meeting 2 Minutes

Sept 28, 2021 - 10:00 AM
County EMA Coordinator: Sheriff Robert Burns
County EMA Deputy Coordinator: Orval Rowe
Zoom (virtual) Meeting
Planning Team Attendance: 39

Tyler Carpenter (Greater Egypt) opened the meeting and gave introductory remarks. Meeting attendees were encouraged to introduce themselves through the chat feature.

Mr. Carpenter reviewed the Planning Updates and the timeline of the MHMP. He explained the planning process involves collaboration within the jurisdictions in order to assist in identifying hazards, developing mitigation strategies, and match requirements. An emphasis was placed on participation in the plan and the match funding for officials in the jurisdictions. He also discussed what to expect leading up to the next MHMP meeting (match survey and strategies exercises).

Kelsey Bowe (Greater Egypt) presented requirements for Jackson County MHMP plans. She also identified hazards that have been included in previous plans for Jackson County. Different hazards and their damages were discussed for Jackson County. Ms. Bowe introduced the initial hazard models and the areas of impact within the Murphysboro and Carbondale areas. She also discussed the different cost of damages within a range of a modeled earthquake's 'epicenter' and the overall severity of earthquakes causing injury or death within surrounding areas. Possible mitigation strategies were discussed for the county. The Hazus model was discussed as a means to understand the development of the data for hazards.

Ms. Bowe explained the process to assess risk of hazards through the hazard ranking exercises and the mitigation strategies exercises. The Planning Team will be required to complete the Mitigations Strategies exercise for their jurisdiction. This document has been requested per jurisdiction, in order to meet the responsibilities of the planning team. Greater Egypt will provide assistance for the exercise. Meeting materials will be available at: http://greateregypt.org/hazard-mitigation-planning/.

The meeting was adjourned.

Meeting Attendance
Meeting 2: September 28, 2021 10:00 AM
Name
Tyler Carpenter
Kelsey Bowe
Gabrielle Reed
Aur Beck
Belinda Hill
Brian Manwaring
Michael Bilderback
Dylan Fairfield
Ethan Graham
Brandon Hendrix
Jana Fann
Jessica VanPelt
Karissa Howell
Kenton Schafer
Kevin Spain
Larry Lovel
Larry Sanders
Mark Kuhns
Mark Holt
Maureen Berkowitz
Mitch Burdick
Melinda Woker
James Schatte
Orval Rowe
Rita VanPelt
Shelly Clover-Hill
Tamara Caffey-Bey
Tatiana Sherrill
Trish Sherman
Mary Beth Goff
Doug Wilson
Will Stephens
Arien Herrmann
618-549-0721 (SIH)
Robert Burns
Leslie Yambert
Jennifer Lindsay

Tim Moloney
Dennis Howell

Jackson County Multi-Hazard Mitigation Plan

Meeting 3 Minutes

February 22, 2022- 10:00 AM
County EMA Coordinator: Sheriff Robert Burns
County EMA Deputy Coordinator: Orval Rowe
Zoom (virtual) Meeting
Planning Team Attendance: 22

Kelsey Bowe (Greater Egypt) opened the meeting and gave introductory remarks. Meeting attendees were encouraged to introduce themselves through the chat feature.

Ms. Bowe reviewed the Planning Updates and the timeline of the MHMP. She explained the planning process involves collaboration within the jurisdictions in order to assist in identifying hazards, developing mitigation strategies, and match requirements. An emphasis was placed on participation in the plan and the match funding for officials in the jurisdictions. She also discussed what to expect leading up to the next MHMP meeting (match survey and strategies exercises). Kelsey talked with meeting participants about the Match Survey that they can take if they have not yet already. Kelsey reviewed the hazard ranking list; with tornados, disease, and earthquakes as the top three most concerning hazards.

Kelsey acknowledged the partners who have aided in gathering information for hazard models. The Essential Facility datasets were discussed. Planning Partners checked information for accuracy and made notes on what other facilities can be considered as essential.

Ms. Bowe explained the goals of mitigation strategies and the importance of understanding that natural hazards are an ongoing issue. The Planning Team has been expected to complete the Mitigations Strategies exercise for their jurisdiction. Ms. Bowe presented the different hazards and their proposed mitigation strategies for Jackson County. The Planning Team discussed additional strategies they would like to add to the Plan before it is finalized. The forms for adding facility information and new strategies were discussed.

Meeting materials and forms will be available at: http://greateregypt.org/hazard-mitigation-planning/.

The meeting was adjourned.

Meeting Attendance
Meeting 3: February 22, 2022 10:00AM
Name
Kelsey Bowe
Gabrielle Reed
Mark Kuhns
Brian Manwaring
Jessica Grammer
Trish Sherman
Maureen Berkowitz
Shelly Clover-Hill
Tina Shingleton
Orval Rowe
Tim Moloney
Sheriff Robert Burns
Captain Jeff Whitbeck
Captain Jennifer Lindsey
Larry Lovel
Brandon Hendrix
Stephanie Dillow
Rita VanPelt
Mitch Burdick
Josh Cox
Tamara Caffey-Bey

Appendix 5: Public Meeting Announcements

The Southern Illinoisian, September 23, 2021

JACKSON COUNTY ANNOUNCEMENTS

Jackson County EMA and Greater Egypt will host a public meeting Tuesday, September 28 at 10:00 AM to provide information and receive public input on the update to the Jackson County Multi-Hazard Mitigation Plan. The meeting will be held through Zoom. You can find the meeting information by visiting greateregypt.org/hazard-mitigation-planning.
22692 9/23

Carbondale Times September 24, 2021

The Jackson County Emergency Management Agency and Greater Egypt will host a public meeting at 10 a.m. Tuesday, Sept. 28 to provide information and receive public input on the update to the Jackson County Multi-Hazard Mitigation Plan. The meeting will be held through Zoom. You can find the meeting information by visiting greateregypt.org/hazard-mitigation-planning.

Appendix 6: Mitigation Related Grant Opportunities

Below is a list of current federal and state grant programs related to various hazard mitigation topics. This list may not be exhaustive and planning partners are encouraged to conduct their own searches for grants to match a project idea. Please note these programs may not be active at all times of the year, and some programs may be cancelled during the 5-year cycle that this Plan is active. A detailed excel spreadsheet can be downloaded for free at https://greateregypt.org/hazard-mitigation-planning/

FEMA Grants

Program Name	Grants Available (if multiple)	Projects Covered	Who Can Apply
Hazard Mitigation Grant Program (HMGP)		Available after federally declared disasters, provides funding to rebuild structures in a way to mitigate future problems	state, local, tribal and territorial governments
Flood Mitigation Assistance (FMA) Grant		Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage, competitive grant, projects are chosen for cost effectiveness and eligibility	state, local, tribal and territorial governments that have FEMA approved hazard mitigation plans in place and are part of the NFIP
Building Resilient Infrastructure and Communities (BRIC)		variety of hazard mitigation projects can be approved under this program	state, local, tribal and territorial governments
Emergency Food and Shelter Program (EFSP)		funds projects to provide shelter, food, and supportive services to individuals and families who are experiencing, or at risk of experiencing, hunger and/or homelessness	funds dispersed to local nonprofit and governmental social service organizations through EFSP National Board allocations
Resilience Grants	National Dam Safety Program (NDSP) State Assistance		
	Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program		
	National Earthquake Technical Assistance Program (NETAP)		
	Multi-State and National Earthquake Assistance (MSNEA)		nonprofit organizations and institutions of higher education that possess the critical skills necessary to develop and implement regional (multi-state) and/or national earthquake risk mitigation activities.

FEMA Preparedness Grants

*In Illinois, IEMA must apply for these funds on behalf of state and local organizations

- Emergency Management Performance Grant
    - Enhancing and sustaining all-hazards emergency management capabilities.

- Tribal Homeland Security Grant
    - Preventing, preparing for, protecting against and responding to acts of terrorism.

- Transit Security Grant
    - Protecting critical public transportation systems (intra-city bus, ferries and all forms of passenger rail) from acts of terrorism.

- Intercity Passenger Rail Grant – Amtrak
    - Protecting Amtrak rail system from acts of terrorism.

- Homeland Security Grant
    - Preventing, preparing for, protecting against and responding to acts of terrorism.

- Nonprofit Security Grant
    - Fund physical security enhancements and activities for nonprofit organizations that are at high risk of a terrorist attack.

- Intercity Bus Security Grant
    - Protecting private operators of intercity over-the-road bus transportation systems from acts of terrorism.

- Port Security Grant
    - Protecting ports from acts of terrorism.

- Assistance to Firefighters Grants
    - Three grant programs focused on enhancing the safety of the public and firefighters in fire-related hazards.

- Presidential Residence Protection Assistance Grant
    - Reimbursements to state and local law enforcement agencies for costs incurred while protecting any non-governmental residence of the president being secured by the United States Secret Service.

- Regional Catastrophic Grant Program
    - Funding for local governments to encourage innovative regional solutions to catastrophic incidents.

- National Earthquake Hazards Reduction Program Grant
    - Funding to support the establishment of earthquake hazards reduction programming and implementation of earthquake safety, mitigation and resilience activities at the local level.

Other Federal Grants

Agency	Program Name	Grants Available (if multiple)	Projects Covered	Who Can Apply
U.S. Dept of Housing and Urban Development	Community Development Block Grant (CDBG) Program	Public Infrastructure, Housing Rehabilitation Program, Economic Development, Disaster Response	Community Based projects in communities that do not receive HUD allocations	Communities/Local government
U.S. Dept of Agriculture	USDA Direct Community Facility Loan & Grant Program	Loan and Grant programs offered for various projects	provides affordable funding to develop essential community facilities in rural areas	Public organizations, community-based non-profits, or federally recognized Tribes in rural areas (less than 20,000 residents
U.S. Dept of Agriculture	Rural Utilities Service Water and Environmental Programs (WEP)		construction of water and waste facilities in rural communities	rural communities with populations of 10,000 or less
U.S. Environmental Protection Agency	Brownfields Program	Brownfields Assessment Grants, Brownfields Revolving Loan Fund (RLF) Grants, Brownfields Cleanup Grants, Multipurpose (MP) Grants, Job Training (JT) Grants, Technical Assistance, Training, and Research Grants, State and Tribal Response Program Grants	Various projects related to assessment, outreach, cleanup and research of Brownfield sites impacted by hazardous materials	Varies by grant, check NOFOs, states, tribes, communities and stakeholders may be eligible
Delta Regional Authority	States' Economic Development Assistance Program (SEDAP)	provides direct investment into community-based and regional projects that address the DRA's congressionally mandated four funding categories	FUNDING PRIORITIES: basic public infrastructure, transportation infrastructure, business development & entrepreneurship, workforce development	Greater Egypt handles DRA applications for Franklin, Jackson, Williamson, and Perry counties *Jefferson County does not qualify for DRA funding
Delta Regional Authority	Community Infrastructure Fund (CIF)	This funding is set aside for physical infrastructure projects, may be used on construction projects for flood control, basic public infrastructure, and transportation infrastructure		Greater Egypt handles DRA applications for Franklin, Jackson, Williamson, and Perry counties *Jefferson County does not qualify for DRA funding
Delta Regional Authority	Public Works and Economic Adjustment Assistance (PWEAA) program.			Greater Egypt handles DRA applications for Franklin, Jackson, Williamson, and Perry counties *Jefferson County does not qualify for DRA funding

Agency	Program Name	Grants Available (if multiple)	Projects Covered	Who Can Apply
U.S. Dept of Transportation	Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants		Projects for RAISE funding will be evaluated based on merit criteria that include safety, environmental sustainability, quality of life, economic competitiveness, state of good repair, innovation, and partnership. Within these criteria, the Department will prioritize projects that can demonstrate improvements to racial equity, reduce impacts of climate change and create good-paying jobs.	regional and local governments
U.S. Dept of Transportation-pipeline and hazardous materials safety administration	Assistance for Local Emergency Response Training (ALERT)		hazmat response training for volunteer or remote emergency responders.	The ALERT grant is competitively awarded to non-profit organizations capable of delivering an established curriculum to emergency responders.
U.S. Dept of Transportation-pipeline and hazardous materials safety administration	Hazardous Materials Instructor Training (HMIT) Grant		train-the-trainer program that facilitates the training of hazmat instructors who then conduct training in Hazardous Materials Regulations (HMR) for hazmat employees.	competitively awarded to non-profit organizations that satisfy both of the following eligibility requirements: 1) expertise in conducting hazmat employee training programs and 2) capable of reaching a target population of hazmat employees and including them in the training program.
U.S. Dept of Transportation-pipeline and hazardous materials safety administration	Supplemental Public Sector Training (SPST) Grant		a train-the trainer program that facilitates the training of instructors who then conduct training in hazmat response for individuals with a statutory responsibility to respond to hazmat accidents and incidents.	competitively awarded to national non-profit fire service organizations
U.S. Dept of Transportation-pipeline and hazardous materials safety administration	Community Safety (CS) Grant		enhances the capability of communities to prepare for and respond to hazmat accidents and incidents and supports the training of state and local enforcement personnel who are responsible for enforcing the safe transportation of hazmat	competitively awarded to non-profit organizations
U.S. Dept of Transportation-pipeline and hazardous materials safety administration	State Damage Prevention Grants		establish comprehensive state programs designed to prevent damage to underground pipelines	state authority (or municipality with respect to intrastate gas transportation) that is or will be responsible for preventing damage to underground pipeline facilities is eligible as long as 1) the state participates in the oversight of pipeline transportation pursuant to an annual 49 U.S.C. §60105 certification or 49 U.S.C. §60106 agreement in effect with the Pipeline and Hazardous Materials Safety Administration, and 2) is designated by the state's governor, in writing, as the eligible recipient of the grant funding.

Illinois Specific Grants

Agency	Program Name	Grants Available (if multiple)	Projects Covered	Who Can Apply
Illinois Clean Energy Community Foundation	Energy Program	K-12 Solar and Wind Schools Grant, First Responders Resilience Pilot Program, PV for Nature/welcome centers, Solar Thermal, Biomass, Advancing Renewable Energy and Emerging Technology Grants, Net Zero Energy Wastewater Treatment Plant Grants	various, see website	various, see website
IEMA and Illinois Terrorism Task Force	Preparedness and Response (PAR) Grant Program		helps enhance statewide emergency preparedness and response	state agencies, public universities, units of local government, and statewide mutual aid organizations
IEMA	Hazardous Materials Emergency Preparedness (HMEP) - IEMA		funds projects designed to increase effectiveness in safely and efficiently handling hazardous materials incidents	state, territorial, tribal, and local governments that have IEMA approved LEPCs in place
Rebuild Illinois capital infrastructure plan of 2019, IDOT	Rebuild Illinois	Rebuild Illinois Transit Capital Grant Program, Rebuild Illinois for Distressed Communities Grant, Fast-Track Public Infrastructure (FTPI) component	$45 billion worth of investments in roads, bridges, railroads, universities, early childhood centers and state facilities over the next six years	Funding allocated to various groups as laid out in the bill, 3 Grant cycles will open to accept proposals for IDOT projects **cannot find a webpage that lays out all contents of bill with grant application info, some have expired and the new fiscal year openings are not online
IL American Water	ENVIRONMENTAL GRANT PROGRAM	funding for innovative, community-based environmental projects that improve, restore or protect the watersheds, surface water and groundwater supplies in our local communities.	Located within an American Water service area Completed between May and November of the grant funding year Be a new or innovative community initiative, or serve as significant expansion to an existing program.	Local, State, Federal government bodies. 501c certified non profit organizations

IEPA Grants

Agency	Program Name	Grants Available (if multiple)	Projects Covered	Who Can Apply
IEPA	Unsewered Communities	Planning Grant Program, Construction Grant Program	Project planning and construction for unsewered communities to develop and/or update wastewater treatment programs	Local government units
IEPA	Wastewater/Stormwater and Drinking Water Loans	Water Pollution Control Loan Program (WPCLP),Public Water Supply Loan Program (PWSLP)	Our programs provide financial assistance to eligible public or private applicants for the design and construction of a wide variety of projects that protect or improve the quality of Illinois' water resources. We assist applicants with projects that address human health and failing water infrastructure. Eligible projects include new drinking water or wastewater infrastructure construction; upgrading or rehabilitating existing infrastructure; storm water-related projects that benefit water quality; and a variety of other projects that protect or improve the quality of Illinois's rivers, streams, and lakes.	local government and private entities
IEPA	Energy Efficiency at Waste Water Treatment Plants	Public Water Infrastructure Energy Assessments, Waste Water Treatment Plant (WWTP) Energy Efficiency Grant	no-cost energy usage assessments to publicly owned water facilities. The final assessment reports break down recommendations for energy efficiency improvements at each facility and include upfront costs for equipment upgrades or retrofits, estimated time for return of investment, and savings resulting from upgrades and retrofits.	local governments, grant funds available only if municipality has completed an energy assessment within last 5 years
IEPA	Water Quality	Water Quality Management (604b), Nonpoint source Pollution (319), and green infrastructure grants	development of watershed-based plans, outreach/education related to water quality, develop preliminary management practices, implementation of BMPs; (stormwater management, flood control, pollution control, and other projects may be covered)	Greater Egypt applies for water quality grants on behalf of municipalities or other groups in our counties
IEPA	Low Income Residential Energy Efficiency Program	Energy Efficiency Trust Fund (EE Trust Fund)	Building Envelope insulation Window replacement Space heating and cooling equipment retrofit Heating and cooling distribution system retrofit Installation of efficient domestic hot water equipment Lighting upgrades (indoor and/or outdoor) High-efficiency appliance installation/replacement Programmable thermostats installation Energy metering changes	local governments, public housing authorities, other non-profits

Appendix 7: Adopting Resolutions

Resolution #____2023-60

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, Jackson County, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, Jackson County participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that Jackson County, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 18th Day of April, 2023.

C. J. Calarco
County Commissioner, Chairperson

County Commissioner

County Commissioner

Attested by: County Clerk & Recorder

Resolution #____________

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Ava, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the City of Ava participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City of Ava, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 10th Day of April, 2023.

Candice J Cotter
Mayor

City Council Member

City Council Member

City Council Member

City Council Member

Attested by: City Clerk

Resolution # 23-01

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Campbell Hill, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Campbell Hill participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Campbell Hill, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 8th Day of May, 2023.

Kenneth E Lee
Village President

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Attested by: Village Clerk

RESOLUTION NO. 2023-R-60

A RESOLUTION ADOPTING AMENDMENTS TO THE JACKSON COUNTY DISASTER MITIGATION PLAN

WHEREAS, the City of Carbondale, Illinois, is a home rule unit of local government under the Illinois Constitution, 1970, Article VII, Section 6; and

WHEREAS, pursuant to Article VII, Section 6(a), of the Illinois Constitution, 1970, the City of Carbondale may exercise any power and perform any function pertaining to its government and affairs including, but not limited to, the power to regulate for the protection of the public health, safety, morals, and welfare; and

WHEREAS, the City of Carbondale recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted hazard mitigation plan is required as a condition for future grant funding for mitigation projects; and

WHEREAS, the City of Carbondale participated jointly in the planning process with the other local units of government within the County to prepare a hazard mitigation plan.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF CARBONDALE, ILLINOIS AS FOLLOWS:

SECTION 1. The City Council finds and declares that it is in the best interest of the citizens of the City of Carbondale, subject to the Carbondale Revised Code, to adopt the 2023 Amendment to the Jackson County Hazard Mitigation Plan as an official amendment to the plan, attached hereto as Exhibit A.

SECTION 2. That the Jackson County Emergency Management Agency will submit, on behalf of the participating municipalities, the adopted hazard mitigation plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

SECTION 3. That the City Manager of the City of Carbondale, Illinois be and is hereby authorized to take any and all reasonable, necessary, and proper action to carry out the intent and purpose of this Resolution.

SECTION 4. That this Resolution be spread at length upon the minute records of the City Council of the City of Carbondale, Illinois.

This Resolution is adopted at a regular meeting of the City Council of the City of Carbondale, Illinois on the 22nd day of August 2023.

APPROVED: Carolin Harvey
Carolin Harvey, Mayor

CARBONDALE ILLINOIS INCORPORATED 1873

ATTEST: Jennifer Sorrell
Jennifer R. Sorrell, City Clerk

Signed by Deputy City Clerk

FOR:	Doherty, Hill, Killman, Loos, Maxwell, Rye-Sanders, Harvey
AGAINST:	None
PASSED:	August 22, 2023
APPROVED:	August 22, 2023
RECORDED:	August 23, 2023
PUBLISHED:	August 23, 2023

Resolution # 2023-2

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of DeSoto, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of DeSoto participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of DeSoto, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 3rd Day of April, 2023.

Village President

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Attested by: Village Clerk

Resolution # 23-R-4

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Dowell, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Dowell participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Dowell, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 3rd Day of April, 2023.

Shannon Williams
Village President

Elizabeth Saunders
Village Trustee

Marilyn L Feaster
Village Trustee

Allen Covett
Village Trustee

Deborah Gresham
Village Trustee

Village Trustee

Village Trustee

Attested by: Village Clerk

Resolution # 023-R-003

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Elkville, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Elkville participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Elkville, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 13th Day of July, 2023.

Village President

Patsy Mitchell (yes)
Village Trustee

Dean Bullar (yes)
Village Trustee

Craig Briley (yes)
Village Trustee

Jack Jackson (yes)
Village Trustee

Brett Cobin (yes)
Village Trustee

Henry Stockton (yes)
Village Trustee

Attested by: Village Clerk

Resolution # 23.

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Gorham, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Gorham participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Gorham, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS APRIL Day of 3, 2023.

Village President

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Attested by: Village Clerk

Resolution #_____

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Grand Tower, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the City of Grand Tower participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City of Grand Tower, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 10 Day of April, 2023.

Mayor

City Council Member

Samantha Shepard
City Council Member

City Council Member

City Council Member

Attested by: City Clerk

Resolution # 2023-1

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Makanda, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Makanda participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Makanda, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 11th Day of April, 2023.

Tina Shrufton
Village President

Janet Dalton
Village Trustee

Cliff Hilliard
Village Trustee

Village Trustee

Village Trustee

Village Trustee

Elaine Ross
Village Trustee

Leslie Yambert
Attested by: Village Clerk

CITY OF

MURPHYSBORO, ILLINOIS

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618-684-4961

Home of General John A. Logan Memorial Day Founder

RESOLUTION NO. – 2023- 01

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Murphysboro, Illinois recognizes the threat that natural hazards post to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Murphysboro participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City of Murphysboro, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

This Resolution adopted at a regular meeting of the City Council of the City of Murphysboro on this 28th day of March, 2023.

Will Stephens, Mayor

Attested by:

Gina Hunziker, City Clerk

Resolution # 5-8-2

ADOPTING THE JACKSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Vergennes, Illinois recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Vergennes participated jointly in the planning process with the other local units of government within the County to update the 2015 Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Vergennes, Illinois hereby adopts the updated Jackson County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Jackson County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 8th Day of May, 2023.

Village President

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Village Trustee

Attested by: Village Clerk