5:4 Risk Assessment

All Components of this Risk Assessment were developed using the best available data in the Purchase Region. GIS resources and public input were used to identify which hazards, of those listed below, affect the Purchase Region. The Purchase Area Development District (PADD) staff compiled this information to identify hazards and the Jackson Purchase Hazard Mitigation Council (JPHMC) reviewed the definitions and discussed their occurrence in and impact on the region. This review identified all hazards to the region and consequently all hazards that affect Fulton County.

For this revision, the Fulton County Mitigation Planning Team (MPT) reviewed and revised the prioritization of Hazards from their 2018 Plan using updated climatic/event data, revised flood zones, local events occurring since the previous plan, 2020 Census data and 2020 American Community Survey. These provided a higher resolution for the resulting Hazard re-prioritization and revised risk assessments. The resulting prioritization and risk assessments are contained in this county update.

5:4.1 Identifying Hazards

FEMA recognizes many forms of natural hazards. Major natural hazards that may occur include:

- Geologic hazards
  - Tsunami
  - Volcano
  - Earthquake
  - Land Subsidence/Karst Topography
  - Landslide
- Weather generated hazards.
  - Avalanche
  - Hurricane
  - Severe Thunderstorm
  - Hailstorm
  - Windstorm/Microburst
  - Severe Winter storm
  - Tornado
- Wildfire
- Flooding
  - Flashfloods
  - General Flooding
  - Coastal
  - Riverine
- Urban
- Climatological
  - Drought
  - Extreme Heat
- Failure of Man-made structures from the impact of natural forces
  - Dam Failure
  - Levee/flood Wall Failure

Natural Hazards Addressed by the Regional Plan
The regional planning process identified hazards that significantly impact the entire Purchase Region and eliminated from consideration those natural hazards that do not. Natural hazards where a historical record of damage to people and property exists, or the potential for such damage to occur, are addressed in the plan. This determination does not preclude the plan from including more hazards in future updates. The Fulton County MPT agreed that the identification process

was sufficiently thorough to serve all the signatory counties of the plan and will not be repeated for the Fulton County Annex. Table 5.1 summarizes why these hazards were identified.

Table 5.1 Hazards Identified and Reasons for Identification

Hazard	How Identified	Why Identified
Tornado	* Review of past disaster damage * Review of FEMA hazard maps * Public Input	* Several past occurrences * Hazard maps show all jurisdictions affected
Flood **Flash Flood River Erosion**	* Review of past disaster damage (FEMA & National Climatic Data Center) * Local Emergency Management * Public Input * Review of FIRM maps	* Affects the region frequently. * Maps show many floods prone areas. * Public identified several regions not mapped affected by flooding * Repetitive flooding has led to the deposit of enormous amounts of silt in Kentucky's Mississippi River ports
Thunderstorm Wind Hail	* Review of past disaster damage * Public Input * Review of past occurrences from National Climatic Data Center	* Many events in the past * Widespread: affects all jurisdictions * High wind zone
Earthquake	* Review of Ground Motion Maps * Review of the New Madrid and Wabash Seismic Zone Maps * Public Input	* Proximity to New Madrid/Wabash Seismic Zones * Historic accounts of 1812 disaster. * Potential for destructive impact in some jurisdictions
Winter Storm / Ice Storm	* Review of past disaster damage * Review of past occurrences from National Climatic Data Center * Public Input * Local DES/KYTC	* Several past occurrences * Variety of events including snow/ ice * Can affect all jurisdictions
Excessive Heat / Drought	* Review of past disaster damage * Public Input * Review of Palmer Drought Severity Index	* Losses have occurred in past. * Large impact of agriculture on the region
Dam Failure	* Review of High-Risk Dams in the region * Corps of Engineers Input	*Potential for flooding *Number of High-Risk dams in region
Wildfire	* Review of State Mitigation Plan * Public Input	*Potential for loss at Wildland/urban interface, * Increased fuel supply due to ice storm damage

5:4.2 Hazard Profiles

The Fulton County MPT reviewed the previously profiled hazards based on; historical evidence gathered from the National Centers for Environmental Information (NCEI), Kentucky State Climatology Center, FEMA's Hazard Mapping website, the Kentucky State Hazard Mitigation Plan and the Kentucky Geological Survey. The PADD staff gathered GIS information and historical data to provide to the MPT. All components of this Risk Assessment were revised using the best available data in the Purchase Region. GIS resources and public input were used to identify which hazards, of those listed below, affect the Purchase Region. The JPHMC reviewed the definitions and discussed their occurrence in and impact on the region. This review identified all hazards to the region and consequently all hazards that affect Fulton County.

Summary of Hazard Profiles

Several conclusions can be drawn from the information gathered in the Hazard Profiles. Based on historical frequency and past disaster damages, several hazards identified in the regional plan stand out as more significant threats to Fulton County, while several others appear to be less significant.

According to frequency and damage figures Thunderstorm Wind, Hail, Flood / Flash Flood, and Tornado stand out as the most significant threats to Fulton County. Earthquake is a hazard rated by committee members as one of the biggest potential threats, there is no historical data on actual earthquake damages in Fulton County to analyze the threat, and considerable debate as to the severity of the resultant damage even for the "worst case scenario". Therefore, the committee regarded it as a Moderate Risk Hazard, along with winter storms and river erosion.

The county's western border is the flood prone Mississippi River. Most of the property assets of the county lie outside the flood prone areas, which are mostly agricultural lands. But, the bluffs of the Mississippi River also constitute a potential landslide/river erosion problem, making Fulton County one of four counties in the Purchase Region with a landslide threat. Both Landslide and Wildfire are deemed hazards, but Low Risk Hazards.

Table 5.2 is a summary of past Declared Disasters as provided by FEMA for the Fulton County. Throughout our annex, we will refer to this table as we profile our hazard events. This table is limited to providing information only related to declared disasters on the county level and does not list each jurisdiction.

Table 5.2 Presidential Disaster Declarations that Affected PADD Counties

DR#	Declaration Date	Disaster Type	Total Declared Counties	Declared Counties	Counties Declared for Public Assistance and Individual Assistance	Counties Declared for Public Assistance Only	County	DH Approved Funding	IFG Approved
381	5/11/1973	Severe Storms, Flooding	5	Ballard, Carlisle, Fulton, Hickman, McCracken	Ballard, Carlisle, Fulton, Hickman, McCracken	0			
461	3/29/1975	Severe Storms, Flooding	17	Ballard, Calloway, Fulton, Graves, Hickman, Marshall, McCracken	Ballard, Calloway, Fulton, Graves, Hickman, Marshall, McCracken	0			
821	2/24/1989	Severe Storms, Flooding	67	Ballard, Carlisle, Graves, Hickman, Marshall, McCracken	Ballard, Carlisle, Graves, Hickman, Marshall, McCracken	0			
1089	1/13/1996	Blizzard	120	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
1163	3/4/1997	Flooding	101	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	Ballard, Carlisle, Fulton, Hickman, Marshall, McCracken	Calloway	McCracken	$137,084.85	$78,709.00
1802	10/9/2008	Severe Windstorm	36	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			

3302	1/28/2009	Severe Windstorm	114	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
1818	2/5/2009	Severe Winter Storm, Flooding	117	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
1976	5/4/2011	Severe Storms, Tornadoes, Flooding	22	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken		Calloway			
4057	3/6/2012	Severe Storms, Tornadoes, Straight-line Winds, Flooding	1	Ballard		Ballard			
4216	4/30/2015	Severe Winter Storms, Snowstorms, Flooding, Landslides, Mudslides	3	Ballard, Marshall, McCracken		Ballard, Marshall, McCracken			
4218	5/12/2015	Severe Winter Storms, Snowstorms, Flooding, Landslides, Mudslides	3	Calloway, Fulton, Marshall		Calloway, Fulton, Marshall			
4278	8/26/2016	Severe Storms, Tornadoes, Flooding, Landslides, Mudslides	2	Calloway, Marshall		Calloway, Marshall			
4358	4/12/2018	Severe Storms, Flooding, Landslides, and Mudslides	22	None		None			
4361	4/26/2018	Severe Storms, Tornadoes, Flooding,	35	Carlisle, Graves, Hickman, Fulton, McCracken		Carlisle, Graves, Hickman,			

		Landslides and Mudslides				Fulton, McCracken			
4428	4/17/2019	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	60	Ballard, Carlisle, Fulton, Hickman, Marshall, McCracken		Ballard, Carlisle, Fulton, Hickman, Marshall, McCracken			
3469	3/13/2020	Covid-19	120	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken		Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken			
4497	3/28/2020	Covid-19 Pandemic	120	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken				
4540	4/24/2020	Severe Storms, Flooding, Landslides, and Mudslides	27	Hickman, McCracken		Hickman, McCracken			
4592	3/31/2021	Severe Winter Storms, Landslides, and Mudslides	45	None		None			
4595	4/23/2021	Severe Storms, Flooding, Landslides, and Mudslides	44	Ballard, Graves, Calloway		Ballard, Graves, Calloway			
3575	12/11/2021	Severe Storms, Straight-line Winds, Flooding and Tornadoes	16	Fulton, Graves, Hickman, Marshall					
4630	12/12/2021	Severe Storms, Straight-line Winds, Flooding and Tornadoes	23	Fulton, Graves, Hickman, Marshall	Fulton, Graves, Hickman, Marshall				
4643	2/27/2022	Severe Storms, Straight-line Winds, Tornadoes, Flooding, Landslides	13	None		None			

Source:https://www.fema.gov/disasters?field_state_tid_selective=49&field_disaster_type_term_tid=All&field_disaster_declaration_type_value=All&items_per_page=20&=GO

According to State Department of Emergency Management records, Fulton County was eligible for Public Assistance as a result of the above declarations. For this revision, the Fulton County MPT reviewed and revised the prioritization of Hazards from their 2018 Plan using updated climatic/event data, revised flood zones, local events occurring since the previous plan, and 2020 census data and 2020 American Community Survey. These provided a higher resolution for the resulting Hazard re-prioritization and revised risk assessments. All the following discussions of risk and risk assessment are in the order of these revised priorities.

Table 5.3 Fulton County Hazard Summary Table

PLAN VERSION	2022	2017
HIGH RISK HAZARDS	THUNDERSTORM WIND HAIL FLOOD TORNADO EARTHQUAKE	THUNDERSTORM WIND HAIL FLOOD TORNADO
MODERATE RISK HAZARDS	WINTER STORM RIVER EROSION / DEPOSITION	EARTHQUAKE WINTER STORM RIVER EROSION / DEPOSITION
LOW RISK HAZARDS	LANDSLIDE WILDFIRE	LANDSLIDE WILDFIRE

Source: Fulton County MPT 2022

The storm events database for the NCEI, formerly the National Climatic Data Center, will be the source utilized for the best available data for the Purchase Region. Please see the NCEI contact page if you have questions. https://www.ncdc.noaa.gov/customer-support

Table 5.4 represents a summary of the hazard events identified by the MPT that are recorded in the NCEI Storm Events Database for Fulton County for the period 01/01/1950 through 03/31/2022. Data is available as early as 1950, but depending on reporting for events, the first event on record may come at a much later time. The detailed, disaggregated listing of these events is included in Appendix 1.

Table 5.4 Summary of Hazard Previous Occurrences and Impacts
January 1, 1950 – March 31, 2022

Event	Events	Death	Injury	Property Damage ($)	Crop Damage ($)
Tornado	13	1	7	1.768M	0.00K
Thunderstorm Wind	78	0	2	780.05K	10.00K
Winter Storm	21	1	0	0.00K	0.00K
Ice Storm	4	0	0	10.200M	0.00K
Flood	35	1	0	1.165M	20.00K
Flash Flood	25	0	0	1.429M	10.00K
Hail	45	0	0	54.00K	0.00K
Excessive Heat	11	0	0	0.00K	0.00K
Drought	32	0	0	0.00K	9.200M
Wildfire	1	0	0	0.00K	0.00K
Dam Failure	No History				
1 class A structure = no loss of life anticipated, only damage to dam owner's property					
2 class B structures = loss of life not probable, some economic loss & environmental damage					

Source: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

For this update to the 2023 Jackson Purchase Hazard Mitigation (JPHM) Plan, the events from April 1, 2017, to March 31, 2022, will be reviewed. This provides 5 years of recent data covering the current period for this cycle of the JPHM Plan update. For a complete listing of all events, please refer to Appendix 1.

Thunderstorm / Wind

A thunderstorm is formed from a combination of moisture, rapidly rising, warm air, or a force capable of lifting air, such as the meeting of a warm and cold front, a sea breeze, or a mountain. Thunderstorms can produce tornadoes, large hail and heavy rain which can cause flash flooding.

The National Weather Service considers a thunderstorm as severe if it develops ¾ inch hail or 58 mph winds. Straight line winds during thunderstorms can exceed 100 miles per hour and are responsible for wind damage associated with thunderstorms. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

Thunderstorms affect relatively small areas when compared with winter storms, as the average storm is 15 miles in diameter and lasts an average of 30 minutes. All thunderstorms are dangerous and capable of threatening life and property in localized areas. Every thunderstorm produces lightning, which results from the buildup and discharge of electrical energy between positively and negatively charged areas.

Thunderstorms are quite frequent in Fulton County. They may produce damage, injuries, or fatalities. Numerous severe thunderstorms have been recorded that produce high winds, lightning, and hail, in the county. Many of these thunderstorms have caused property or crop damage. These storms, although relatively short in duration when compared to other weather events, are often long lived enough to track across the entire county before dissipating their energy or exiting the region.

Table 5.5 Thunderstorm Wind Events and Impacts in Fulton County
April 1, 2017 – March 31, 2022

Location	Date	Time	Time Zone	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
CRUTCHFIELD	4/26/2017	18:05	CST-6	56 kts. EG	0	0	2.00K	0.00K
FULTON ARPT	5/3/2020	13:34	CST-6	56 kts. EG	0	0	35.00K	0.00K
CAYCE	2/22/2022	6:31	CST-6	61 kts. EG	0	0	30.00K	0.00K
HICKMAN	2/22/2022	6:35	CST-6	50 kts. MG	0	0	0.00K	0.00K
TOTALS					**0**	**0**	**67.00K**	**0.00K**

Wind Magnitude Definitions:
Measured Gust:'MG', Estimated Gust:'EG', Measured Sustained:'MS', Estimated Sustained:'ES' *Source: Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database* https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following descriptions are typical of thunderstorm wind experienced in Fulton County

- On March 5, 2020, Numerous reports of wind damage accompanied a squall line of thunderstorms that moved rapidly east-southeast. The wind damage was mainly along and south of a line from Clinton to Murray. The atmosphere was moderately unstable, with cape values on the order of 1500 to 2000 J/kg. The relatively compact but organized and vigorous convective system-maintained intensity as it progressed east of the Mississippi River. A mesoscale convective vortex which turned eastward along the Kentucky/Tennessee border helped sustain the storms. Several large tree limbs were down several miles west of Fulton. In Fulton, numerous trees were down in a residential neighborhood just east of downtown. At least one of the trees landed on a vehicle.

- On February 22, 2022, A broken line of thunderstorms moved rapidly east northeastward during the early morning hours. A few damaging wind events and a weak tornado accompanied the storms. A low amplitude mid-level shortwave trough over the southern Plains ejected northeast into the Ohio Valley, providing support for the broken line of storms. A surface low tracked northeast across Missouri and Illinois. Within the warm sector of this low-pressure system, buoyancy was very weak but adequate for thunderstorms. An intense low-level jet over 70 knots translated northeast from Arkansas into Kentucky. The very strong winds near the surface contributed to the tornado and wind damage. Pockets of flooding occurred where the most intense storms passed through, mainly in Hickman and Carlisle Counties. One barn was destroyed, and others were damaged. This wind damage occurred in close proximity to the weak tornado just southwest of Cayce.

SUMMARY AND CONCLUSIONS OF THUNDERSTORM WIND PROFILE

From April 1, 2017, through March 31, 2022, there have been six occurrences of Severe Storms in Fulton County reported by the National Climate Data Center. These occurrences totaled $67,000 in reported personal property damage with no injuries or deaths reported.

The number of Thunderstorm Wind events were combined to look at the frequency of occurrence. Fulton County experienced four reported events over the 5-year update period, which divides out to .8 reported events per year, a more than 80% probability that such an event will occur in any given year. For Fulton County the cost of a Thunderstorm Wind Event could be calculated as:

- $67,000 in damages / 4 events = $16,750 per event on average.
- $16,750 damage per event x .8 events per year = $20,937.5 average damage per year.

Of critical concern to the Fulton County MPT and the main contributing factor in their consideration of risks and vulnerability, is the human cost of Severe Storm Events.

Hail

Hail is one of four types of precipitation that falls from the sky. It's also the most dangerous, damaging type, occurring during severe storms. If hail measuring larger than ¾ inches in diameter falls during a thunderstorm, it is classified as severe weather. Sometimes damaging winds accompany this type of storm as well. According to the National Oceanic and Atmospheric Administration, hail causes over one billion dollars of damage in the United States each year.

Generally, hail must be 1 ¼ inches in diameter (Half-Dollar size) before it causes damage to heavy composite shingles or wood shake shingles. Lightweight composite shingles may show damage after being struck by 1-inch diameter (Quarter size) hail. Only deteriorated composite shingles will show hail damage due to hail less than 1 inch in diameter, and the hail generally must be more than ¾ inch in diameter (Dime size).

TORRO Hailstorm Intensity Scale

The Torro Hailstorm Intensity Scale was introduced by Jonathan Webb of Oxford, England, in 1986 as a means of categorizing hailstorms. The scale extends from H0 to H10 (See Table 5.6) with its increments of intensity or damage potential related to hail size, texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind.

An indication of equivalent hail kinetic energy ranges (in joules per square meter) has now been added to the first six increments on the scale, and this may be derived from radar reflectivity or from hail pads. The International Hailstorm Intensity Scale recognizes that hail size alone is insufficient to accurately categorize the intensity and damage potential of a hailstorm, especially towards the lower end of the scale. For example, without additional information, an event in which hail of up to walnut size is reported (hail size code 3: hail diameter of 21-30 mm) would be graded as a hailstorm with a minimum intensity of H2-3. Additional information, such as the ground wind speed or the nature of the damage the hail caused, would help to clarify the intensity of the event. For example, a fall of walnut-sized hail with little or no wind may scar fruit and sever the stems of crops but would not break vertical glass and so would be ranked H2-3. However, if accompanied by strong winds, the same hail may smash many windows in a house and dent the bodywork of a car, and so be graded an intensity as high as H5.

However, evidence indicates that maximum hailstone size is the most important parameter relating to structural damage, especially towards the more severe end of the scale. It must be noted that hailstone shapes are also an important feature, especially as the "effective" diameter of non-spheroidal specimens should ideally be an average of the co-ordinates. Spiked or jagged hail can also increase some aspects of damage.

Table 5.6

Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented; brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Size codes are presented in Table 5.7. The Size Code is the maximum reported size code accepted as consistent with other reports and evidence.

Table 5.7

Hail size and diameter in relation to TORRO Hailstorm Intensity Scale.		
Size code	**Maximum Diameter mm**	**Description**
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

From April 1, 2017, through March 31, 2022, there has been six occurrences of a reported Hail Event in Fulton County by the NCEI. There were no reported injuries and no reported property or crop damage associated with this event.

Table 5.8 Hail Events and Impacts in Fulton County
April 1, 2017 – March 31, 2022

Location	Date	Time	Time Zone	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
CAYCE	7/20/2018	18:16	CST-6	1.00 in.	0	0	0.00K	0.00K
CRUTCHFIELD	5/2/2019	19:10	CST-6	0.88 in.	0	0	0.00K	0.00K
HICKMAN	3/3/2020	1:45	CST-6	1.00 in.	0	0	0.00K	0.00K
FULTON	4/29/2020	15:02	CST-6	0.75 in.	0	0	0.00K	0.00K
CRUTCHFIELD	5/4/2021	0:50	CST-6	0.75 in.	0	0	0.00K	0.00K
HICKMAN	12/10/2021	20:55	CST-6	1.75 in.	0	0	0.00K	0.00K
TOTALS					**0**	**0**	**0.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following describes a typical hail event in Fulton County:

- On March 3, 2020, severe thunderstorms moved across the region on the evening of March 2. A long-track supercell thunderstorm crossed the Mississippi River from the Cairo, IL area. This storm proceeded east across Paducah and the Kentucky Lake region, where it produced a microburst and accumulating large hail. As the storm crossed the Pennyrile region, it produced an EF-1 tornado just south of Crofton, KY, in Christian County. Later on, in the evening and overnight, disorganized clusters of thunderstorms produced a few isolated severe weather reports. This outbreak of storms occurred in a strong west-southwest flow ahead of a 500 mb shortwave over the Plains states. A southwest wind flow up to 30 knots at 850 mb provided some moisture for the storms. At the surface, a low-pressure center moved east-northeast from the Ozarks to the lower Ohio Valley. A frontal boundary extending east-northeast from the low provided a focus for the storms.

SUMMARY AND CONCLUSIONS FOR HAIL PROFILE

There were six hail events during the 5-year update planning period. On average, this means that approximately 1.2 hail event occurs in Fulton County on any given year. While no hail damage was recorded during this update period, small events are not uncommon. The primary hazard associated with such events is typically property damage in the form of vehicle and crop damage. As there were no hail damages reported for the update period, the annualized cost could not be calculated.

A historical account of Hail Events recorded in Fulton County by NCEI can be found in Appendix 1.

Flash Flood / Flood

As can be seen in Table 5.9, Long-Term Flooding is the most common (9/10) form of flooding in Fulton County. This is usually a temporary condition of partial or complete inundation of two or more acres of normally dry land area of two or more properties from overflow of water. This slow drainage is often exacerbated by stream blockages of tree limbs and trunks, which form effective check dams and barrages.

River basin flooding is common among Kentucky's major streams and bodies of water during the winter and early spring months. The major bodies of water in Fulton County are the Mississippi River Obion Creek, and the Bayou du Chien. These rivers delivered catastrophic flooding to the area in the past, most memorably in 1937, but have since been contained, if not controlled by levees, floodwalls and dams. The potential failure of these structures is of more concern to the County than the direct effects of flooding. Of major concern during the most recent flooding event (DR-1976) was the development of sand boils in numerous locations on the land side of the flood wall and levee system.

Periodic flooding of land adjacent to rivers, streams and shorelines is natural and can be expected to take place at regular intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. 100 Year Flood: as determined by the Federal Emergency Management Agency (FEMA), is a flood event of a magnitude expected to be equaled or exceeded once on the average during any 100-year period. The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood is also used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance.

Between April 1, 2017, to March 31, 2022, there was one flash flood and nine river basin floods recorded in Fulton County (see table 5.9 below). There was one death and no injuries and $210,000 in property damage and no crop damage. Long term flooding events were responsible for $135,000 in property damage and $75,000 in property damage for flash floods.

Table 5.9 Flash Flood / Flood Events and Impacts in Fulton County
April 1, 2017 – March 31, 2022

Location	Date	Time	Time Zone	Event Type	Deaths	Injuries	Property Damage	Crop Damage
HICKMAN	2/24/2018	16:00	CST-6	Flood	0	0	0.00K	0.00K
HICKMAN	3/1/2018	0:00	CST-6	Flood	1	0	100.00K	0.00K
HICKMAN	11/1/2018	2:45	CST-6	Flood	0	0	0.00K	0.00K
HICKMAN	2/11/2019	14:00	CST-6	Flood	0	0	20.00K	0.00K
HICKMAN	2/20/2019	12:00	CST-6	Flood	0	0	15.00K	0.00K
HICKMAN	3/1/2019	0:00	CST-6	Flood	0	0	0.00K	0.00K
ANNA LYNNE	1/11/2020	12:00	CST-6	Flood	0	0	0.00K	0.00K
FULTON	7/1/2020	14:35	CST-6	Flood	0	0	0.00K	0.00K
FULTON	2/28/2021	8:00	CST-6	Flash Flood	0	0	75.00K	0.00K
CAYCE	12/18/2021	3:00	CST-6	Flood	0	0	0.00K	0.00K
TOTALS:					**1**	**0**	**210.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information Storm Events Database: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following event descriptions are typical of the type of flooding experienced in Fulton County:

- On March 1, 2018, large mainstem rivers remained well above flood stage following several rounds of heavy rain in late February. February monthly precipitation was 4 to 7 inches above normal, with monthly totals of 8 to 10 inches common. Mainstem rivers such as the Ohio and Mississippi crested early in March, and then fell below flood stage around mid-month. Moderate flooding continued in the Mississippi River from late February. At New Madrid, Missouri, the river crested at 41.4 feet on March 5, well above the flood stage of 34 feet. One community member perished. Floodgates were raised at Hickman to protect the city. However, bottomland roads and cropland outside the floodwall were submerged. The cropland was mostly dormant this early in the season. Kentucky Highway 94 was closed in the bottomlands west of Hickman, along with several other state roads.

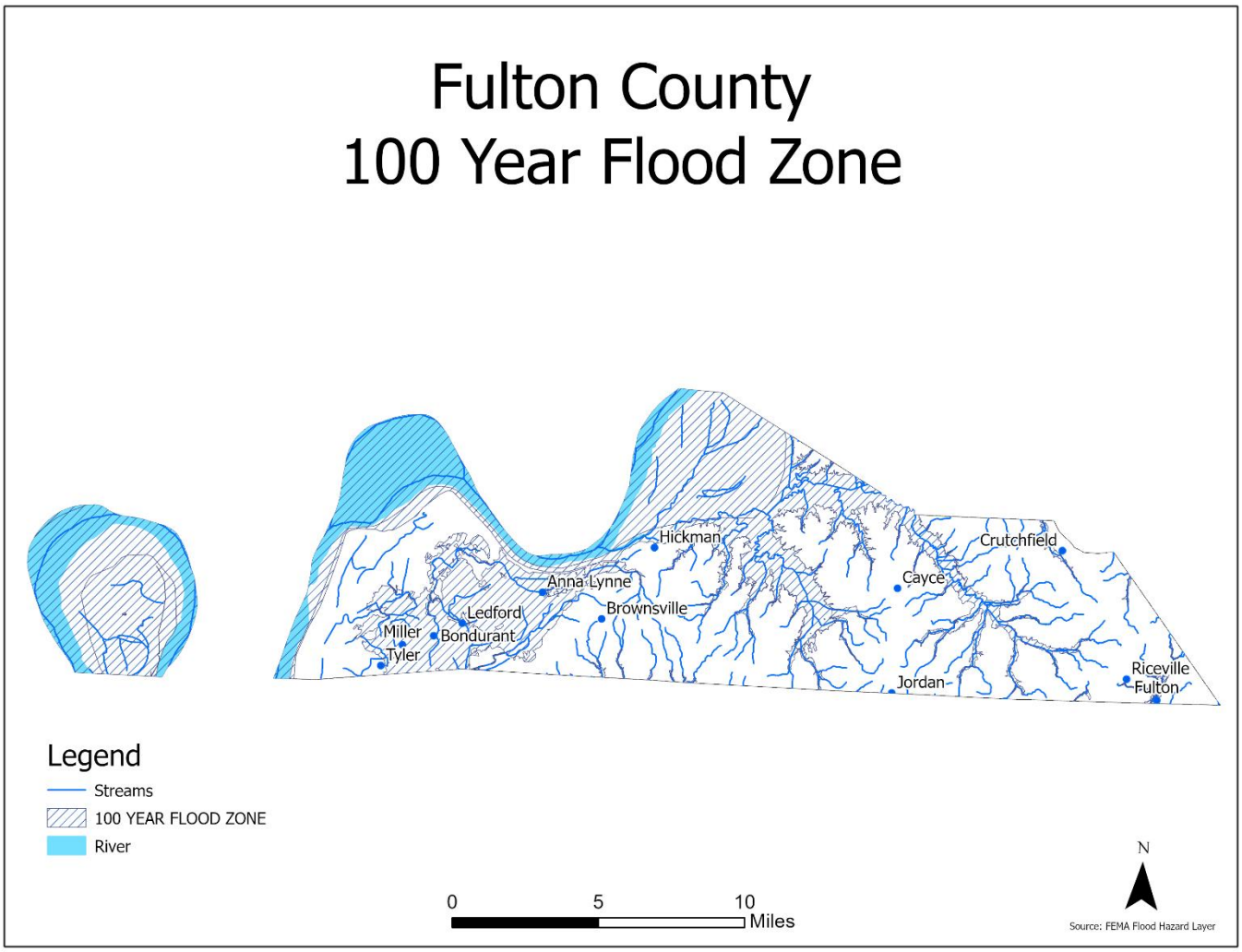
- On February 20, 2019, A warm front moved slowly northward from the Gulf Coast states on the night of the 19th, reaching the lower Ohio Valley on the morning of the 20th. This warm front brought the third widespread heavy rainfall event so far in February. Rainfall totals over a 24-hour period were from 2 to 3 inches in much of western Kentucky, with locally up to 3.5 inches west of Kentucky Lake. This rainfall fell on moist ground, causing many creeks and smaller rivers to flood. The flooding was exacerbated by very high levels on the Ohio and Mississippi Rivers, which caused tributary rivers and creeks to back up into western Kentucky. A mudslide resulting from heavy rainfall and flooding compromised a building at a church campus in Hickman. One unoccupied building was damaged. The mayor declared a State of Emergency.

The following event descriptions are typical of the type of flash flooding experienced in Fulton County:

- On February 28, 2021, major flash flooding occurred in the Tennessee border counties from Fulton east to Elkton. Ahead of a northward moving warm front, rain moved northeastward across the region during the late afternoon and evening hours on February 27. Waves of moderate to heavy rain with embedded thunderstorms continued through the night and into the day on the 28th. The heaviest rain occurred across southern portions of western Kentucky during the morning and afternoon hours on the 28th. This heavy rain was associated with a cold front that trailed from a low-pressure system. Low-lying roads and underpasses were submerged and impassable. Some homes and businesses were affected.

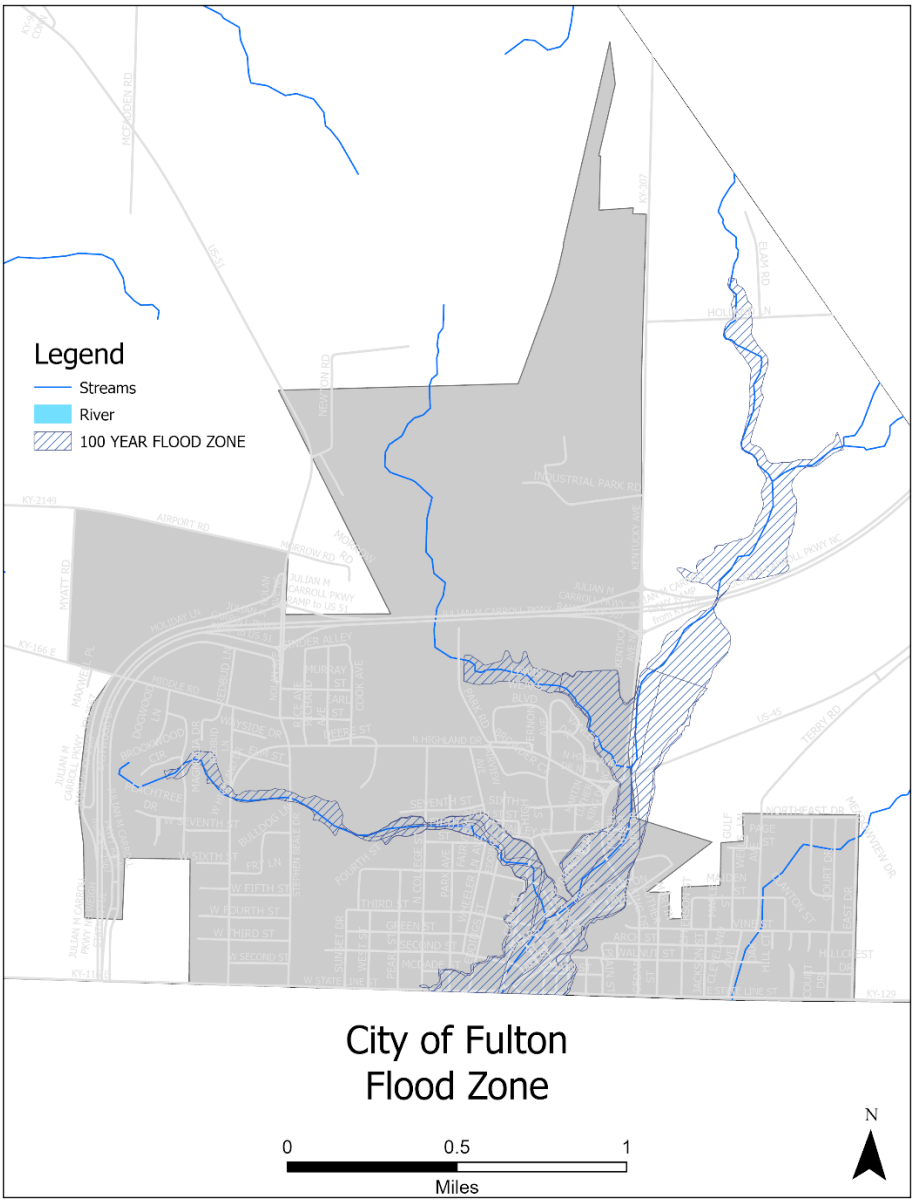
Figure 5.1 represents the flood zone in Fulton County. Figures 5.2 and 5.3 represent the flood zone in the city of Fulton and the city of Hickman.

Figure 5.1 Fulton County 100 Year Floodplain



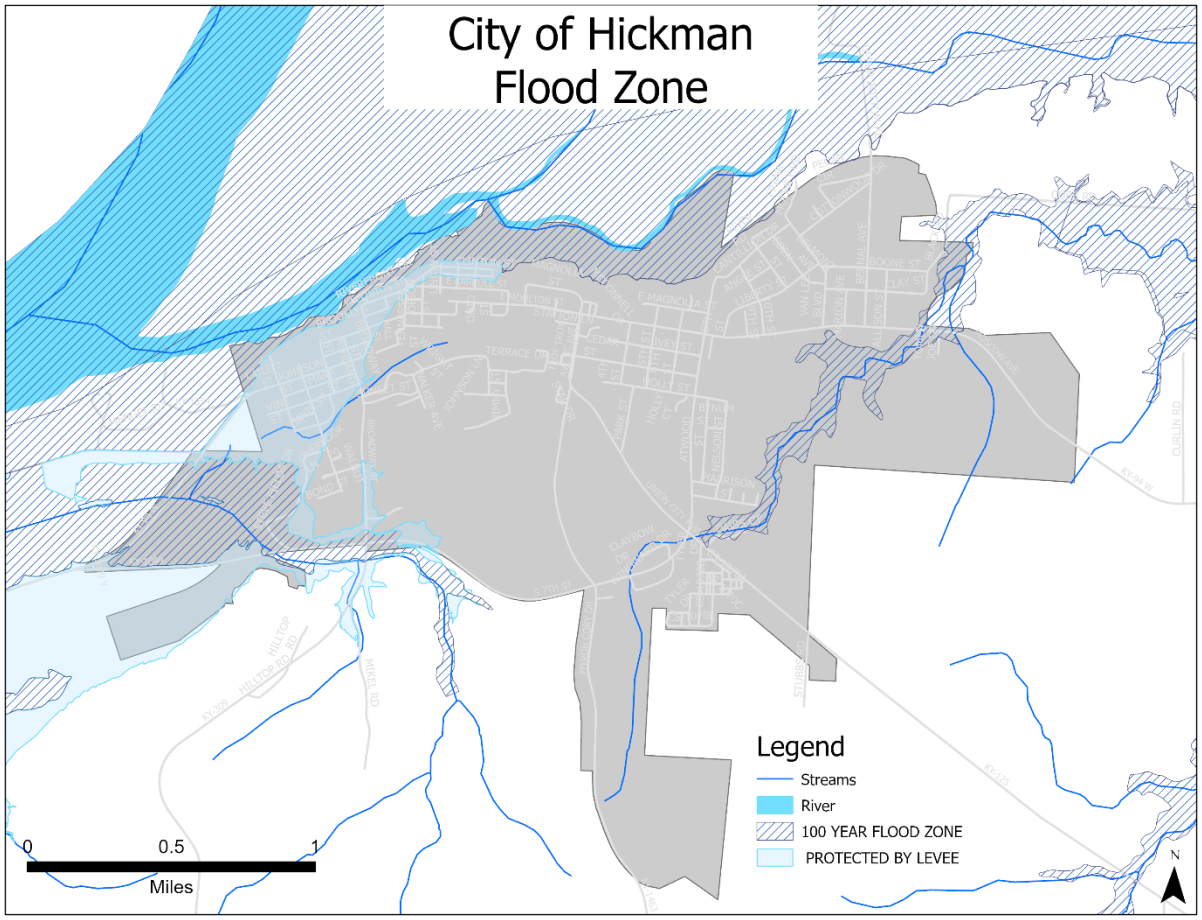
Source: FEMA Flood Hazard Layer, PADD GIS

Figure 5.2 City of Fulton Flood Hazard Zone



Source: FEMA Flood Hazard Layer, PADD GIS

Figure 5.3 City of Hickman Flood Hazard Areas



Source: FEMA Flood Hazard Layer, PADD GIS

Table 5.10 represents the National Flood Insurance Program Participation by Jurisdiction with Fulton County and incorporated cities highlighted. All are members of the NFIP.

Table 5.10 National Flood Insurance Program Participation by Jurisdiction

Jurisdiction	Floodplain Management Ordinance	SFHA in Jurisdictional Limits	Comments	City Class
Ballard County	X	X		
City of Barlow			No mapped SFHA	6
City of Kevil			No mapped SFHA	6
City of La Center		X	SFHA mapped in 2009, NFIP under consideration	5
City of Wickliffe	X	X		5
Calloway County	X	X		
City of Murray	X	X		3
City of Hazel			No mapped SFHA	6
Carlisle County	X	X		
City of Bardwell	X	X		5
City of Arlington	X	X		6
Fulton County	**X**	**X**		
City of Fulton	**X**	**X**		**4**
City of Hickman	**X**	**X**		**4**
Graves County	X	X		
City of Mayfield	X	X		3
City of Wingo		X		6
Hickman County		X	Mapped SFHA, non-participant	
City of Clinton	X	X		5
City of Columbus			No mapped SFHA	5
Marshall County	X	X		
City of Benton	X	X		4
City of Calvert City	X	X		4
City of Hardin	X	X		5
McCracken County	X	X		
City of Paducah	X	X		2

Information from the FEMA Community Status Book as of 03/17/2022

SUMMARY AND CONCLUSIONS OF FLOODING PROFILE

Information from the above tables and maps related to flooding can be used to define the frequency of Flood Events and the impact of these events. Data on flood event magnitude was not available. The frequency of occurrence that can be derived from this data is ten Flood Events in 5 years, which divides out to 2.0 reported Flooding Events per year, or a probability greater than 100% for the occurrence of a Flood Event in any given year.

Based on recorded events and reported damages in Fulton County, the cost of a Flood Event could be calculated as:

- $210,000 divided by 10 events = $21,000 per event.
- $21,000 times 2.0 events/year = $10,500 per year

Tornado

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. It is most often generated by a thunderstorm when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly and upper-level winds, especially the jet stream runs at an angle relative to the prevailing surface winds. These conditions occur with regularity over the Purchase Region in the spring, but as evidenced recently, can occur at any time of the year. Tornadoes are often accompanied by large hail and damage is most often the result of the high wind velocity and wind-blown debris. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction. They have the power to uproot trees, structures, and turn harmless objects into deadly flying debris.

Most tornadoes aren't very wide and touch down only briefly. However, a highly destructive tornado may carve a path over a mile wide and several miles long. Tornadoes typically cause the most damage to lightly or poorly built structures, such as residential homes. An average of 800-1000 tornadoes are reported nationwide and they are more likely to occur during the spring and early summer months. Tornadoes can occur at any time of the day but are more likely to form in the late afternoon or early evening.

In 2007 the Enhanced Fujita (EF) Scale (see Table 5.11) was introduced to better reflect wind speed and the amount of damage produced by tornadoes. It replaced the Fujita-Pearson Scale that defined every tornado on record in the United States since 1950. EF rankings are assigned after a tornado event has occurred and the National Weather Service has inspected the damage.

Table 5.11 The Enhanced Fujita Tornado Measurement Scale

Scale	Estimated Wind Speed	Typical Damage
EF0	65-85 mph	Light Damage - Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; signboards damaged.
EF1	86 – 110 mph	Moderate Damage - Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
EF2	111 – 135 mph	Considerable Damage - Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light object missiles generated; cars lifted off ground and thrown.
EF3	136 – 165 mph	Severe Damage - Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
EF4	166 – 200 mph	Devastating Damage - Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
EF5	>200 mph	Incredible Damage - Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Table 5.12 Tornado Events and Impacts in Fulton County April 1, 2017 – March 31, 2022

Location	Date	Time	Time Zone	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
JORDAN	5/4/2021	2:33	CST-6	EF2	0	0	310.00K	0.00K
STATE LINE	12/10/2021	20:56	CST-6	EF4	1	5	0.00K	0.00K
CAYCE	2/22/2022	6:28	CST-6	EF0	0	0	50.00K	0.00K
Totals					**1**	**5**	**360.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

Below is information on the historic December 10, 2021, tornado that impacted Fulton County, Hickman County, Graves County and Marshall County:

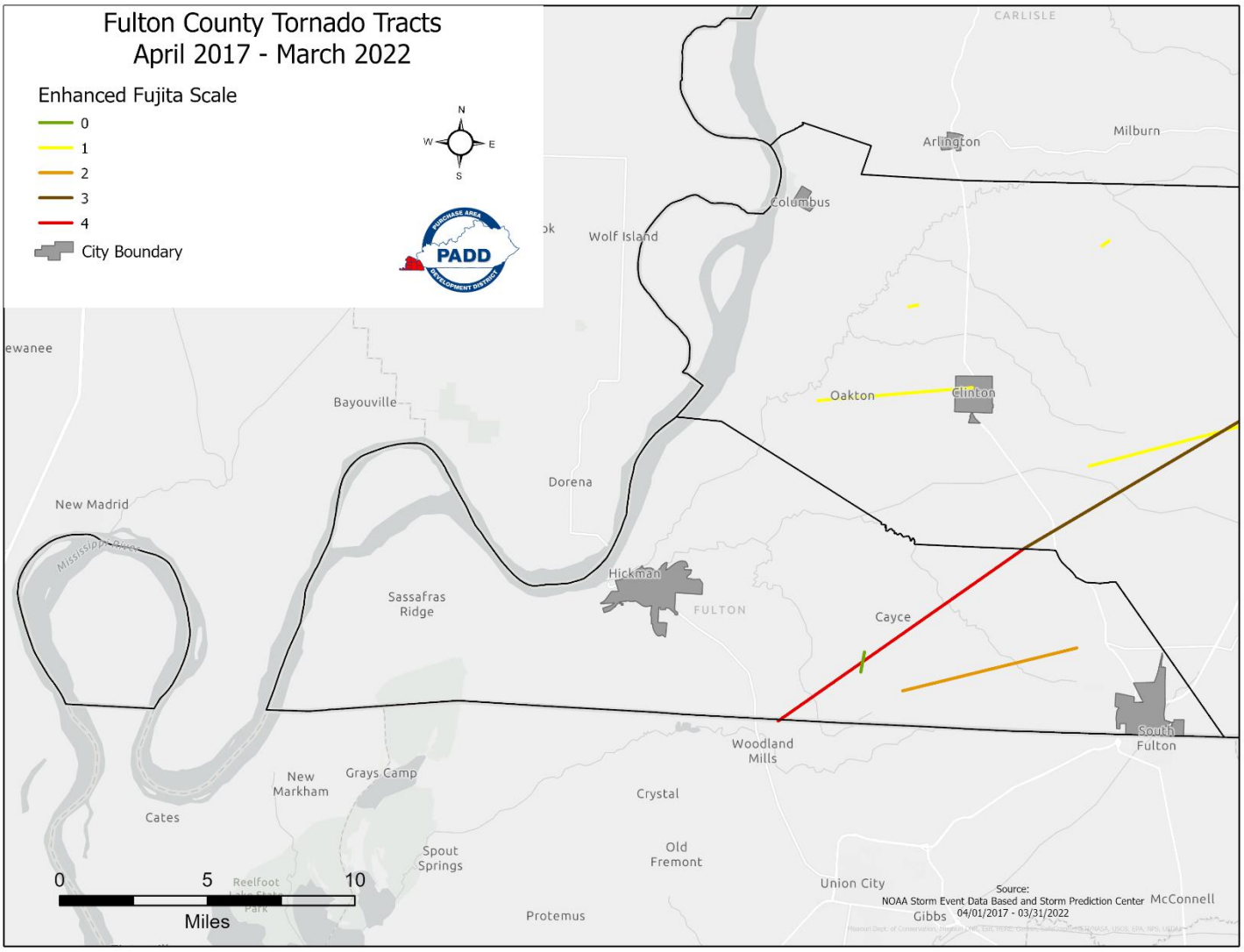
On December 10, 2021, four of the Purchase Region counties were impacted by the Quad State Tornado three of those counties were impacted by an EF 4 tornado causing substantial damage that is not currently available on NECI Strom Event website. The town of Cayce was the primary impact in Fulton County. The tornado widened to over a mile long and winds up to 170 mph destroying anything in its path impacting 61 structures which includes Cayce Fire Department and taking the life of one community member.

Below is an example of a tornado event in Fulton County:

- On May 4, 2021, a cluster of storms, followed by a bowing line of thunderstorms, organized and accelerated east northeastward during the overnight and wee morning hours. Several tornadoes accompanied mesovortices along the bowing line of storms. In addition, a particularly strong microburst was associated with the line. One home was destroyed, with the roof removed. Multiple outbuildings collapsed. Multiple large trees were snapped and uprooted. Peak winds were estimated near 125 mph.

Figure 5.4 provides a map of the tornado tracks for Fulton County during the April 1, 2017, to March 31, 2022, update period.

Figure 5.4 Vulnerability to Tornados through Identification of Tornado Tracks April 1, 2017 – March 31, 2022



Source: NOAA Event Database, PADD GIS

SUMMARY AND CONCLUSIONS OF TORNADO PROFILE

During the period covered by the update (04/01/2017 – 03/31/2022) there have been three occurrences of a Tornado Events in Fulton County recorded by the NCEI. For two of the tornado events there are no reported injuries or fatalities and the Events resulted in $360.00K in personal property damage. While the December 10, 2021, tornado resulted in one death and five injuries, and the accurate amount of damage was not available.

Information from Table 5.12 and Figure 5.4 related to Tornadoes can be used to define the frequency of tornado events and the impact of these events. Data on tornado event magnitude is provided in the form of the Enhanced Fujita Scale as shown on the map.

Fulton County experienced three events over a 5 -year period, which divides out to .6 Reported Tornado Events per year, or a 60% probability that such an event will occur in any given year. Based on recorded events and reported damages, the cost of a Tornado Event could be calculated as:

- $360,000 divided by 3 events = $120,000 per event.
- $120,000 times .6 events/year = $72,000 per year.

Any area in the county is as vulnerable as another and tornado events are completely random and unpredictable. Of critical concern to the Fulton County MPT, and the main contributing factor in their consideration of risks and vulnerability, is the potential human cost of Tornado Events.

Earthquake

An earthquake is a geologic event that involves movement or shaking of the earth's crust. Earthquakes are usually caused by the release of stresses accumulated as a result of the rupture of rocks along borders of the earth's ten tectonic plates. Earthquakes can affect hundreds of thousands of square kilometers, causing damage to property, resulting in loss of life and injury, and disrupting the social and economic functioning of the affected area.

According to the New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project Volume 1 all Purchase Region counties will be severely impacted:

"The largest number of damaged buildings occurs in McCracken County where 24,100 structures are damaged. Graves and Marshall Counties also incur substantial building damage at 9,000 and 5,100 buildings, respectively. Conversely, over 90% of all buildings in Ballard and Hickman Counties are expected to experience damage. Additionally, 80% to 90% of buildings in McCracken and Carlisle Counties are damaged."

Based on the scenario conducted in the study

"Various modes of transportation are also compromised in western Kentucky following the NMSZ scenario event. Over 250 bridges are damaged; numerous bridges along US-51, US-60 and US-45 are heavily damaged and likely impassible the day after the earthquake. Additionally, damage to major river bridges during the event severely limits traffic between Kentucky and Illinois, Tennessee and Missouri."

To review more information regarding this study, refer to appendix 3.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends on the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site and regional geology. Earthquakes may also cause landslides and liquefaction. Landslides are the down-slope movement of soil and rock in mountainous regions and along hillsides. Liquefaction occurs when the ground soil loses the ability to resist shear and flows much like quicksand. When liquefaction occurs, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Each unit increase in magnitude on the Richter Scale corresponds to a ten-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale. It is a twelve-level scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, with an "I" corresponding to imperceptible

(instrumental) events, “IV” corresponding to moderate (felt by people awake), to “XII” for catastrophic (total destruction).

Table 5.13 provides the Mercalli Intensity scale for earthquake compared to the Richter Scale.

Table 5.13 Modified Mercalli Intensity Scale for Earthquakes Compared to the Richter Scale

Scale	Intensity	Description of Effects	Maximum Acceleration (mm/sec)	Richter Scale
I	Instrumental	Detected only on seismographs	<10	
II	Feeble	Some people feel it	<25	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	<50	
IV	Moderate	Felt by people walking	<100	
V	Slightly Strong	Sleepers awake; church bells ring	<250	<4.8
VI	Strong	Trees sway: suspended objects swing, objects fall off shelves	<500	<5.4
VII	Very Strong	Mild alarm: walls crack; plaster falls	<1000	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	<2500	
IX	Ruinous	Some houses collapse; ground cracks; pipes break	<5000	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7500	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards	<9800	<8.1
XII	Catastrophic	Total Destruction: trees fall; ground rises and falls in waves	>9800	>8.1

The New Madrid Seismic Zone is located in southeastern Missouri, northeastern Arkansas, Western Tennessee, Western Kentucky and Southern Illinois. This area is the most active seismic area east of the Rocky Mountains.

Every Year hundreds of small earthquakes occur in the New Madrid Seismic Zone but are typically too small to be felt by humans and can only be detected by sensitive instruments. The last major earthquake in the state of Kentucky was in 1812. The probability of a large magnitude earthquake impacting the Purchase Region is about 10% based on 50 years of research. Though Earthquakes

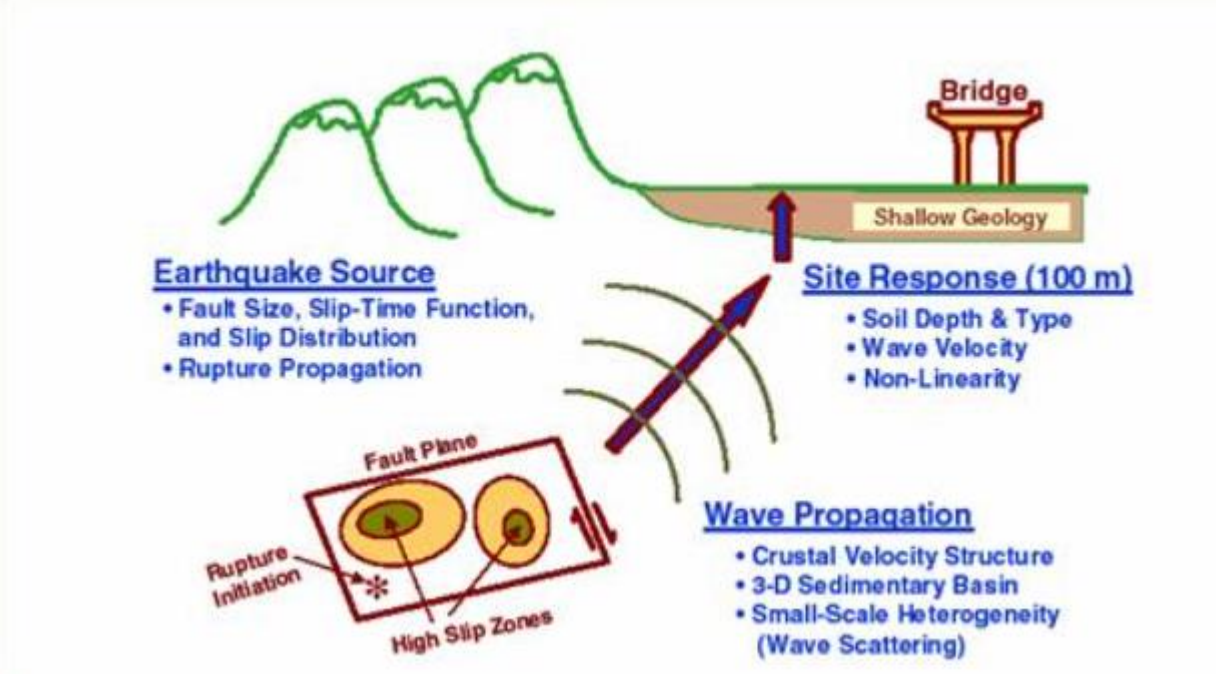
are hard to predict, and scientists are taking great strides to understand the New Madrid Seismic Zone.

Due to the nature of the bedrock that is present in the New Madrid Seismic Zone the geographic impact in the asking of the ground and be 20 times larger than the earthquakes that impact California. If a large magnitude Earthquake is to occur in the Purchase Region area the damages will be significant.

The primary cause for damage and injuries during an earthquake is because of the destruction of manmade structures. These structures are particularly susceptible 1. Tall Structures (Buildings, Bridges, Dams), 2. Large Open Structures, 3. Brittle Structures, 4. Complex Structures with odd shapes and lots of corners, and 5. Unanchored building contents. Damage will vary depending on the magnitude, zone location, geologic nature of material and degree of urbanization. More information can be found on the Missouri Department of Natural Resources facts page of the New Madrid Seismic Zone https://dnr.mo.gov/land-geology/hazards/earthquakes/science/facts-new-madrid-seismic-zone.

Figure 5.5 collected from the Kentucky Geological Survey interprets ground motion.

Figure 5.5 Kentucky Geological Survey Ground Motion

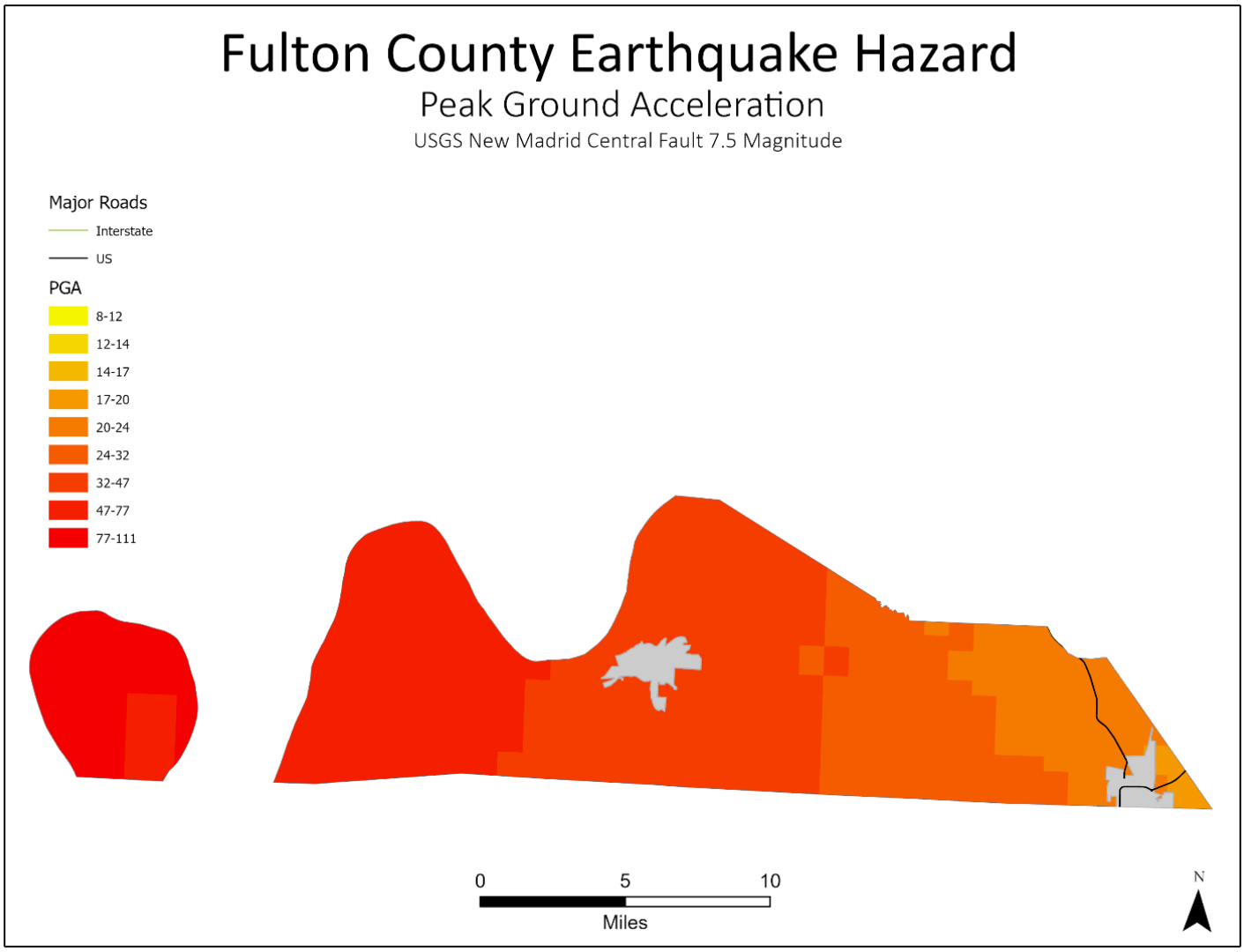


Source: Kentucky Geological Survey

While Figure 5.6 shows the Peak Ground Acceleration for Fulton County based on the USGS Shake map simulator at an earthquake of 7.5 magnitude. Figure 5.7 shows the Peak Ground

Velocity for Fulton County based on the USGS Sake Map simulator for an earthquake of 7.5 magnitude.

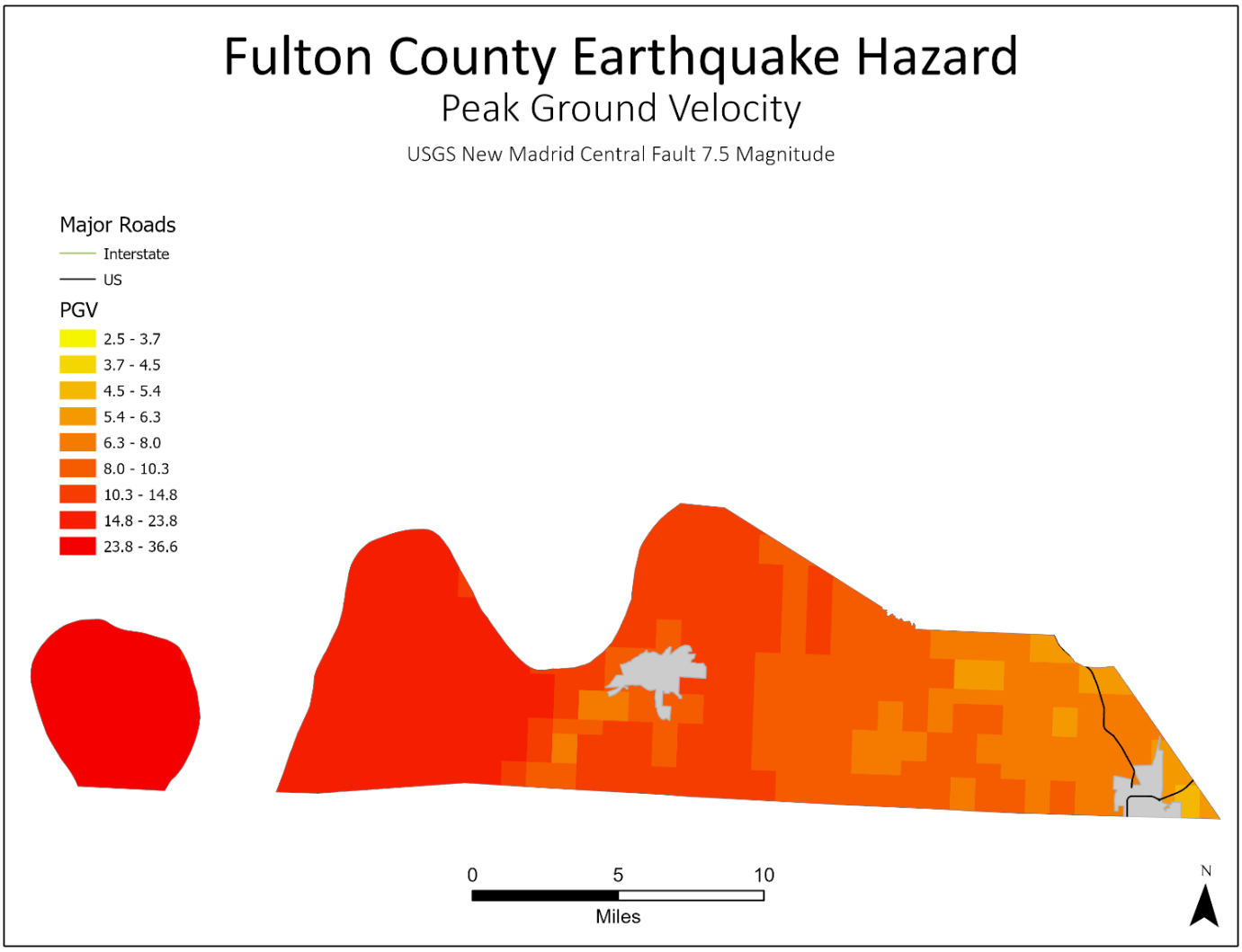
Figure 5.6 USGS New Madrid Central Fault 7.5 Magnitude Peak Ground Acceleration



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	*<0.02*	*0.1*	*1.4*	*4.7*	*9.6*	*20*	*41*	*86*	*>178*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

Figure 5.7 USGS New Madrid Central Fault 7.5 Magnitude Peak Ground Velocity



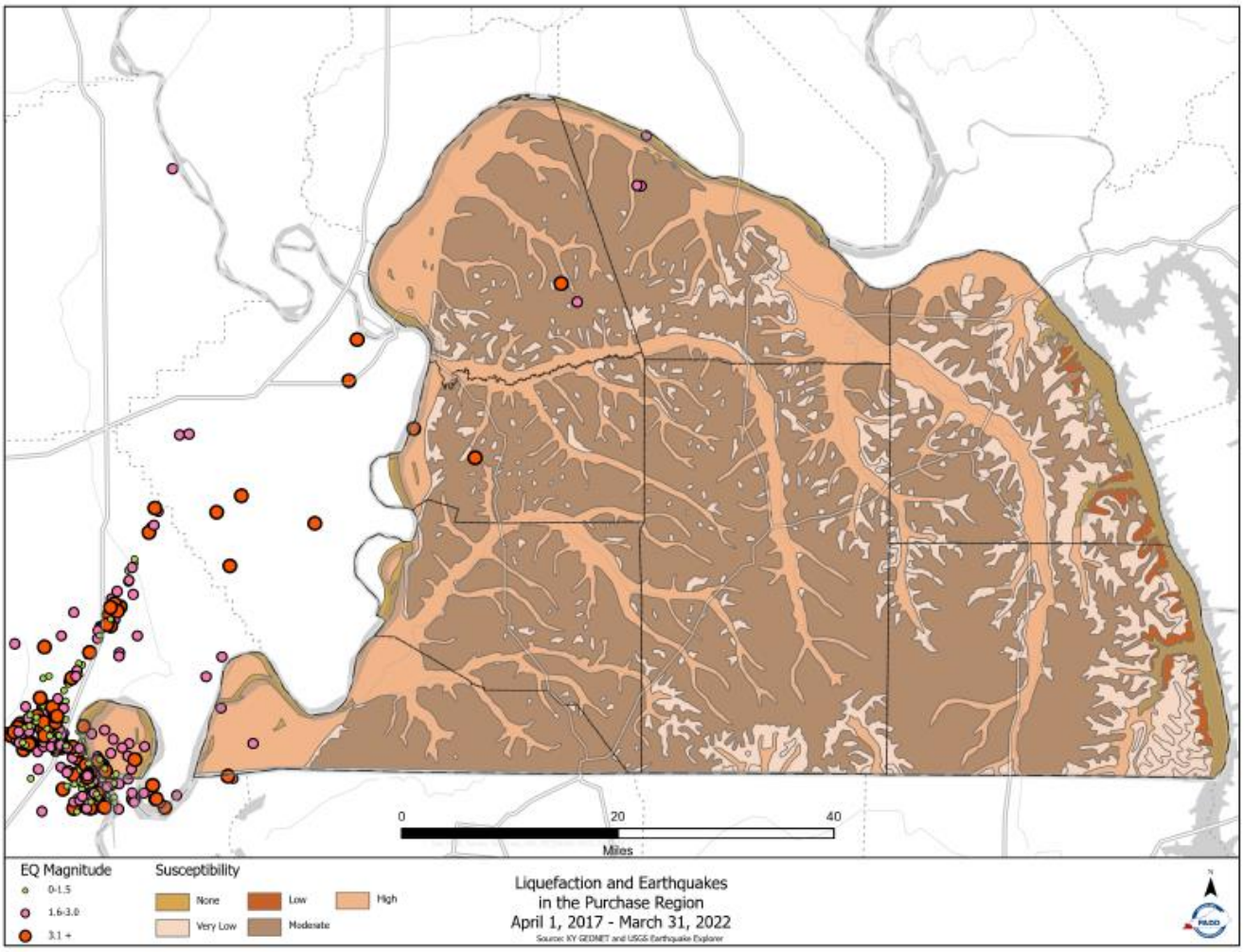
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	*<0.02*	*0.1*	*1.4*	*4.7*	*9.6*	*20*	*41*	*86*	*>178*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends on the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site and regional geology. Earthquakes may also cause liquefaction. Liquefaction occurs when the ground soil loses the ability to resist shear and flows, much like quicksand. When liquefaction occurs, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

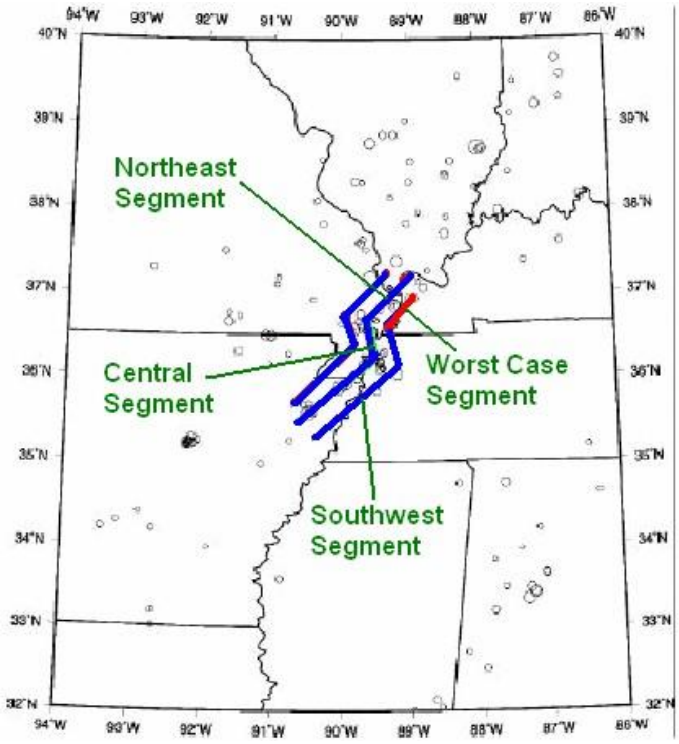
Figure 5.8 illustrates the underlying soil structure for Fulton County. It indicates that virtually the entire county is underlain by beds of sediment, not bedrock. This increases the potential for ground shaking and liquefaction.

Figure 5.8 Generalized Liquefaction Susceptibility & Earthquake Magnitude of the Purchase Region



Source: USGS Map was derived from the USGS Earthquake Catalog, Available at: https://earthquake.usgs.gov/earthquakes/search/

Figure 5.9 Scenario Fault Location for the State of Kentucky



SUMMARY AND CONCLUSIONS OF EARTHQUAKE HAZARD PROFILE

Low magnitude earthquakes occur constantly in the New Madrid Seismic Zone. Depending on the depth and magnitude, some of the stronger tremblors, 3 and above, are felt throughout the entire region. Damages amount to the rare instance of a picture being knocked off a wall or items shaken from shelves.

The potential for an earthquake of catastrophic proportions is not open to debate. Historic and geologic evidence are proof. However, the probability of such an event in any given time frame is open to interpretation and the effects are still a matter of discussion. In or around Fulton County experienced 10+ earthquakes between April 1, 2017 – March 31, 2022. Most of the earthquakes that occurred were near or in Fulton County. A full figure of earthquake occurrences will be found in the appropriate county annex.

Winter Storm

Winter Storms can produce an array of hazardous weather conditions that include heavy snow, freezing rain and sleet, high winds and extreme cold. Winter storms are fueled by strong temperature gradients and an active upper-level cold jet stream. Winter storms can paralyze a community by shutting down normal everyday operations. Accumulating snow and ice can result in downed trees and power lines and may block transportation routes or make them hazardous. Heavy snow can also lead to the collapse of weak roofs or unstable structures. Often, the loss of electricity results in the loss of heat in some homes and buildings. This presents a threat to human life, especially the elderly population.

The level of impact Winter Storms have on a community is greatly determined by their ability to manage and control the affect it has on the community, for example the rapid mobilization of snow removal equipment. Because severe winter storms are sporadic in western Kentucky, many communities cannot afford the expensive equipment and maintenance of snow removal equipment. This increases the potential damage a severe winter storm may cause. If more than a half-inch of ice accumulation occurs and damage is widespread, it can take a while to remove trees and repair power lines. This can result in a loss of electricity and heat for several days.
During the planning period for this update there have been seven Winter Storms recorded in Fulton County. No Damages or injuries were reported in these events, but there was one fatality caused by hypothermia.

Table 5.14 Winter Storm Events and Impacts in Fulton County, April 1, 2017 – March 31, 2022

Location	Date	Time	Time Zone	Deaths	Injuries	Property Damage	Crop Damage
FULTON (ZONE)	1/12/2018	2:00	CST-6	0	0	0.00K	0.00K
FULTON (ZONE)	2/15/2019	18:00	CST-6	0	0	0.00K	0.00K
FULTON (ZONE)	2/10/2021	1:00	CST-6	0	0	0.00K	0.00K
FULTON (ZONE)	2/14/2021	20:00	CST-6	0	0	0.00K	0.00K
FULTON (ZONE)	2/2/2022	20:00	CST-6	0	0	0.00K	0.00K
TOTALS				**0**	**0**	**0.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following event is an example of a Winter Strom Event in Fulton County:

- On February 11, 2021, A wintry mix of precipitation impacted the region resulting in icy roads, numerous accidents, road closures, and scattered power outages. About 3,000 customers in the Owensboro area were without power. The event started in the early morning hours of February 10th and continued into February 11th. Icy roads on the morning of February 10th resulted in one vehicle fatality (indirect fatality) in Trigg County on Highway 80 at the Trace Highway in Land-Between-The-Lakes National Recreation Area. Numerous accidents occurred from the morning hours of the 10th into the 11th. This resulted in lengthy road closures on the Audubon Parkway west of Owensboro, as well as sections of I-24 between Calvert City and Hopkinsville. Ice accumulations ranging from 0.1 to 0.25 were commonplace across western Kentucky. A narrow zone of higher ice amounts, ranging from 0.25 to 0.5, occurred from Shawneetown, IL eastward into the Henderson and Owensboro areas. Scattered power outages and downed tree limbs were primarily focused in this zone of higher accumulations as well. Most areas received at least minor accumulations of sleet along the Ohio River, but the heaviest swath of sleet amounts ranging from 0.5 to 1.5 occurred north of the Ohio River. The winter storm was the result of a moist southwest 500 mb flow and an embedded low-amplitude impulse. An inverted surface trough developing in the general vicinity of Arkansas brought another swath of precipitation. As the inverted trough pulled away to the east, colder air was drawn southward and changed the freezing rain to sleet.

SUMMARY AND CONCLUSIONS OF WINTER STORMS PROFILE

From April 1,2017 through March 31, 2022, there have been seven occurrences of Winter Storms in Fulton County reported by the NCEI. There were no recorded monetary damages reported with these occurrences. Likewise, there were no injuries but there was one fatality recorded because of hypothermia.

The five reported Winter Storm Events over the 5-year plan update period, divides out to 1.33 Reported Winter Storm Events per year, or a more than 100% probability that such an event will occur in any given year. The annual cost of a Winter Storm Event could not be calculated based on recorded events for the planning update period.

River Erosion and Deposition

Erosion causes changes to the Earth's surface. There are several causes for erosion such as flowing water, waves, wind, ice and gravity. For most instances of River Erosion, it is undercutting and bank erosion that are the major issues. For Fulton County and the City of Hickman, the periodic flooding of the Mississippi causes some erosion. The potential for River Erosion is high along the numerous streams, sloughs and bayous of Fulton County. However, there is currently no data set to support a record of damages caused by River Erosion. Of greatest concern to the Fulton County MPT is the threat of erosion to the levees that protect the county's low-lying areas. If those levees are breached, water inundates the areas behind the levees, and gets trapped there increasing the duration of the flood event.

It is the tremendous load of silt the river carries in flood stage that generates the hazard. The hundreds of tons of silt deposited by the river translates to several feet of shoaling for the Hickman-Fulton County Riverport and chokes its accessibility.

> "$1.9 million for harbor dredging". The article quotes Congressman (Ed) Whitfield "I am pleased to have received confirmation .... that some of the money made available from disaster relief legislation passed in December will be used to dredge the harbor. The money was designated for harbor repairs that are required as a result of flooding in early 2011, which caused several harbors to receive heavy deposits of silt and threatened the continued operation of Hickman port. $1.9 million will be available for the work at the Elvis Star Harbor ".
>
> Dredging is thus an action taken to not only recover from the effects of multiple deposition events, but to mitigate the future impacts of similar events by deepening the existing harbor and approaches. The cost of this Hazard event is captured in the cost of the dredging operation as detailed above: $1,900,000.
>
> From *The Hickman Courier*

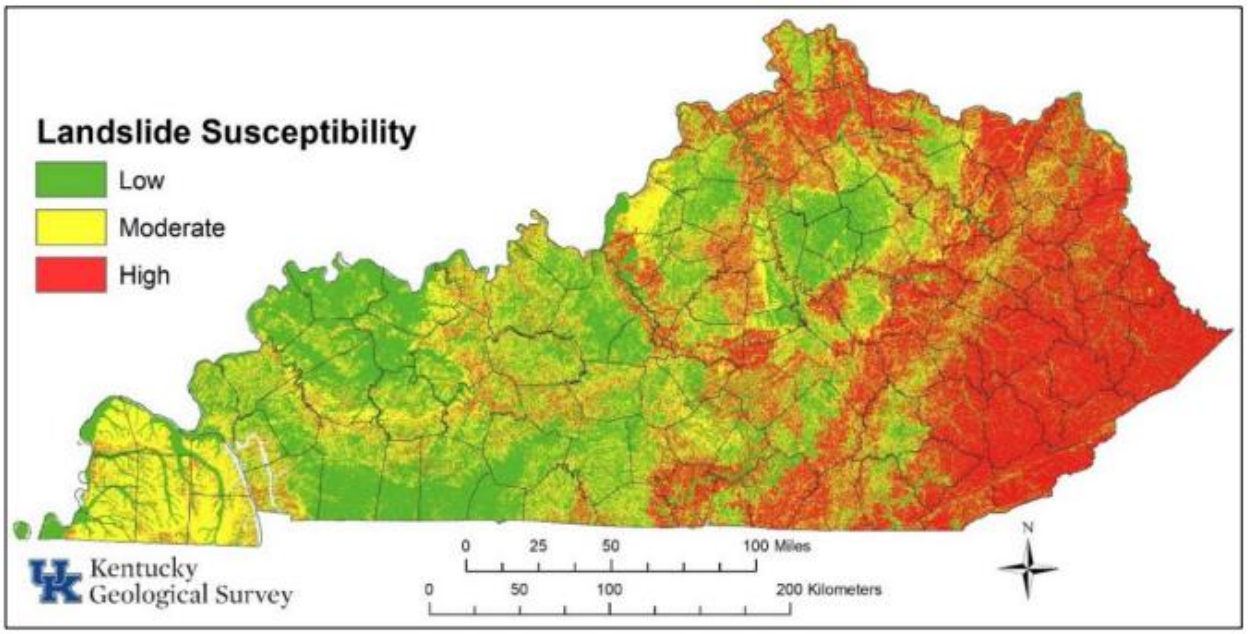
Landslides

Landslides most often happen in correlation with other natural disasters such as earthquakes and flooding. In western Kentucky, there are many large landslides along the bluffs of the Mississippi River. These slides usually occur within the thick loess deposits (mostly silt with some sand, gravel and clay) that cover the bluffs. Groundwater seeps through more permeable sands and gravels down to impermeable silts and clays. Continual seepage or heavy rains can contribute to slides. The series of New Madrid earthquakes in 1811-1812 also caused several of the larger landslides along the bluff.

The Fulton County MPT had a concern for the threat posed by the Landslide Hazards, especially in the City of Hickman. Several residential areas in the city are within a few feet of the bluff's edge. During the flooding in 2011 the U.S. Army Corps of Engineers had to blow the levee at Blue Bird Point along the Mississippi River to relive flood waters from overtaking the City of Cairo, Illinois. Fulton County MPT members mentioned that the percussion from the blast generated some small landslides along the bluffs in and near Hickman.

In the 2018 Kentucky State Hazard Mitigation Plan, Fulton County received a high susceptibility, moderate incidence rating. Figure 5.10 provides a map created by the Kentucky Geological Survey depicting Landslide Susceptibility.

Figure 5.10 Landslide Susceptibility Map



Source: Kentucky Geological Survey; Kentucky Hazard Mitigation Plan

During the 5-year update period a landslide occurred in the City of Hickman. A after several consecutive days of rainy weather the soils became unstable and led to a landslide occurring on Febraury 21, 2019. A landslide occurred in the area of Buchanan and Church Street led the Mayor

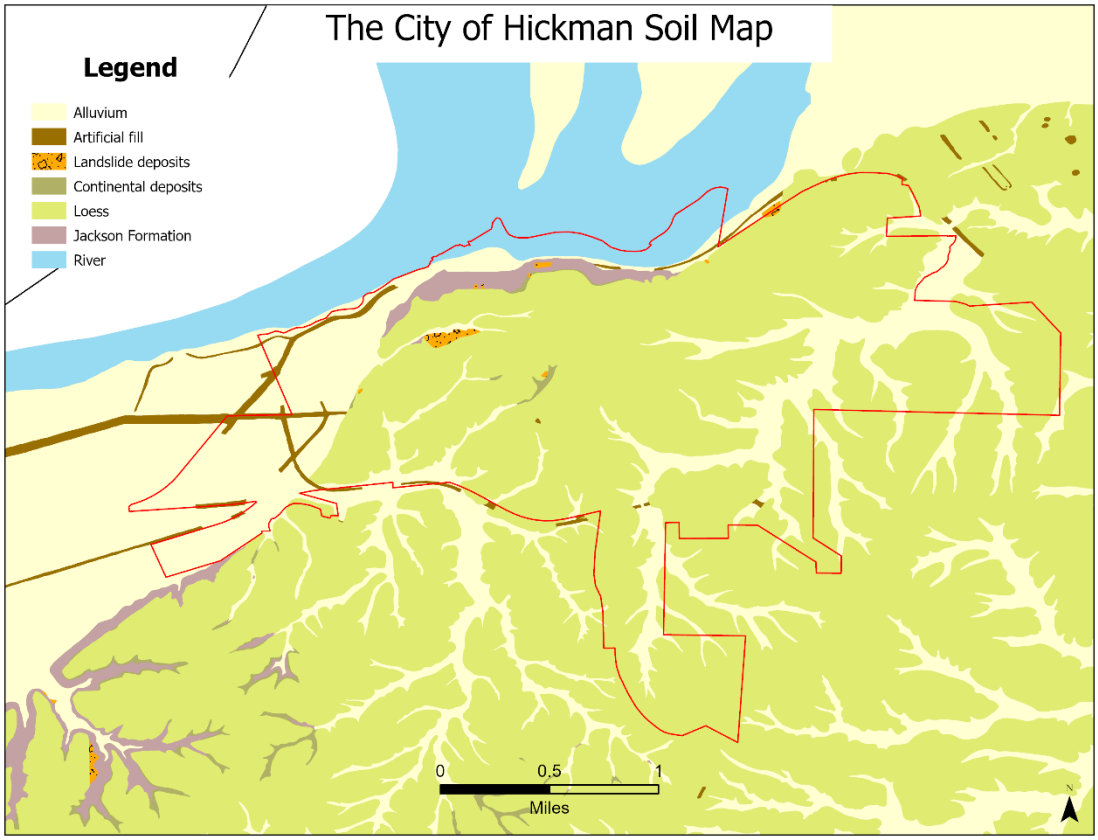
to decalre a local state emergency. All local agencies worked with Fulton County Emergency Management. Figure 5.11 is a photograph and depicts the lannslide that occurred and published by local news.

Figure 5.11 City of Hickman Landslide

Source: David Thomas and KFVS 12 News; https://www.kfvs12.com/2019/02/21/heavy-rain-causes-landslide-hickman-ky/

Figure 5.9 provides the soils present in the City of Hickman and Table 5.15 provides detailed information on the materials present in each soil.

Figure 5.15 City of Hickman Soil Map



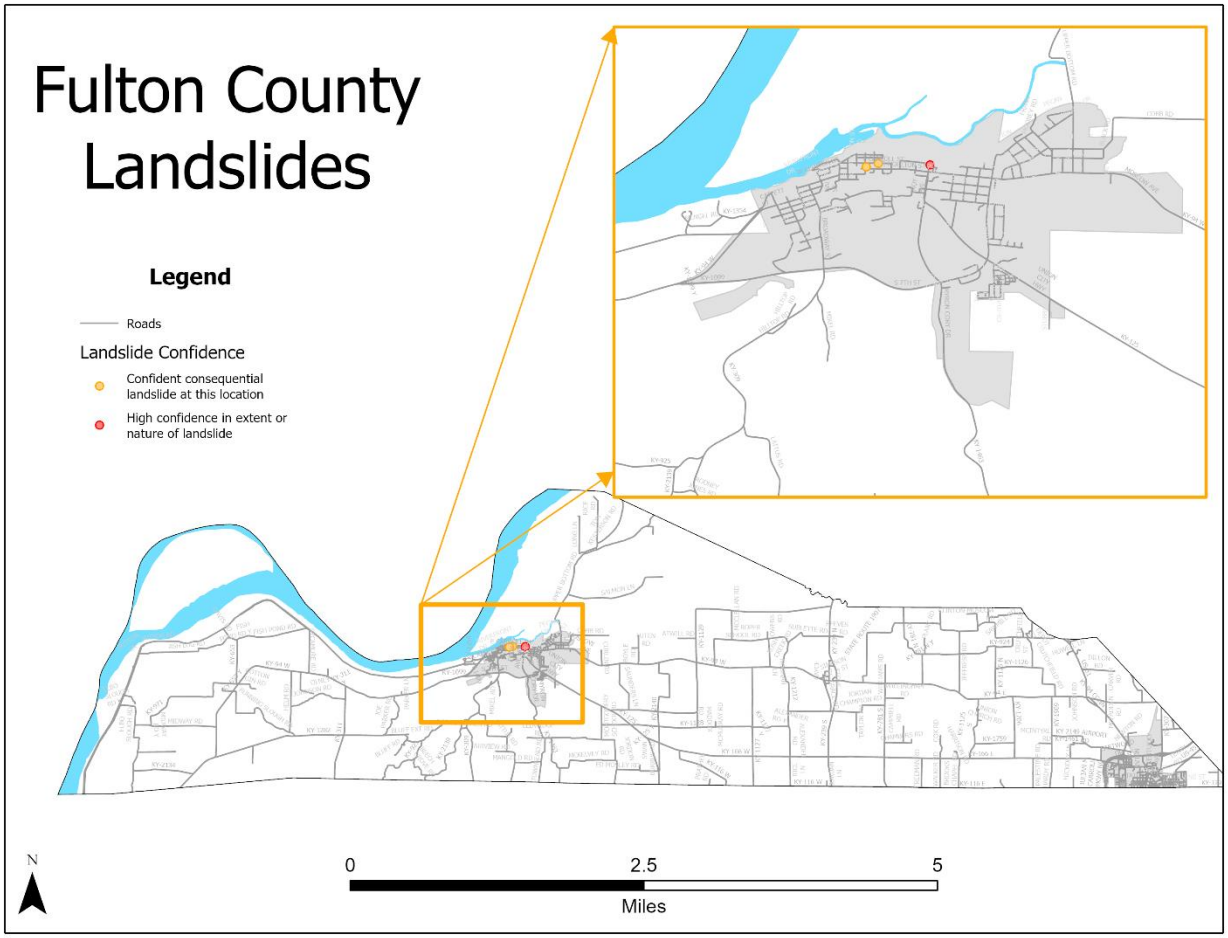
Source: Kentucky Geological Survey

Table 5.15 Soil Type and Definition

Soil l Name	Materials
Alluvium	Silt, Sand, Clay and Gravel and often contains a good deal of organic matter
Artificial Fill	Land created by piling up soil, mud, rocks, rubble and dirt
Landslide Deposits	Clay and Silt (muddy) sediment; most unstable material that can make up a bluff.
Continental Deposits	Mainly consist mainly of basal gravel grading upward into sand with interbedded silt and clay
Loess	Consist of windblown silts
Jackson Formation	A geological formation preserving fossils. Primary Rock is sand.

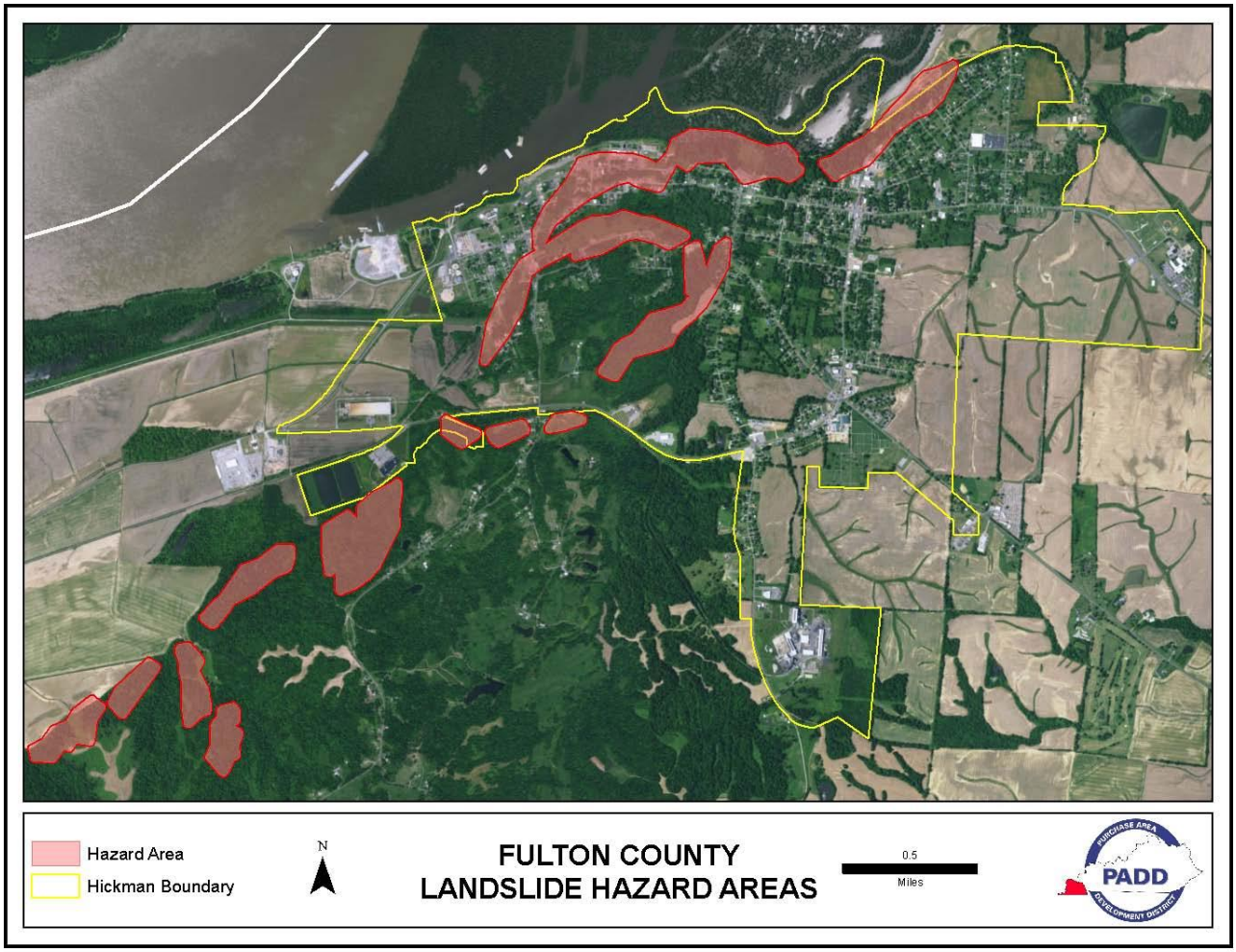
Figure 5.16 shows the landslide confidence level at specific locations in Fulton County. 5.17 represents Fulton County landslide hazard areas in the City of Hickman.

Figure 5.16 Fulton County Landslides



Source: Kentucky Geological Survey

Figure 5.17 Fulton County Landslide Hazard Areas



Source: Kentucky Geological Survey

SUMMARY AND CONCLUSIONS OF LANDSLIDE PROFILE

The City of Hickman has suffered historically from landslides on the Mississippi Bluffs. However, there is no specific data on occurrences that would allow a Hazard Profile including periodicity and monetary damages to be developed. This shortcoming may be addressed as one of the mitigation measures, and data collected as events occur.

After research PADD staff determined that during this update period one landslide was recorded no injuries or deaths occurred and there is no data provide on the damage cost. The Kentucky State Hazard Mitigation Plan estimated the potential loss in Fulton County to landslides would be $277,810,192.00.

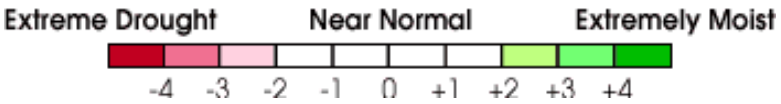
Excessive Heat / Drought

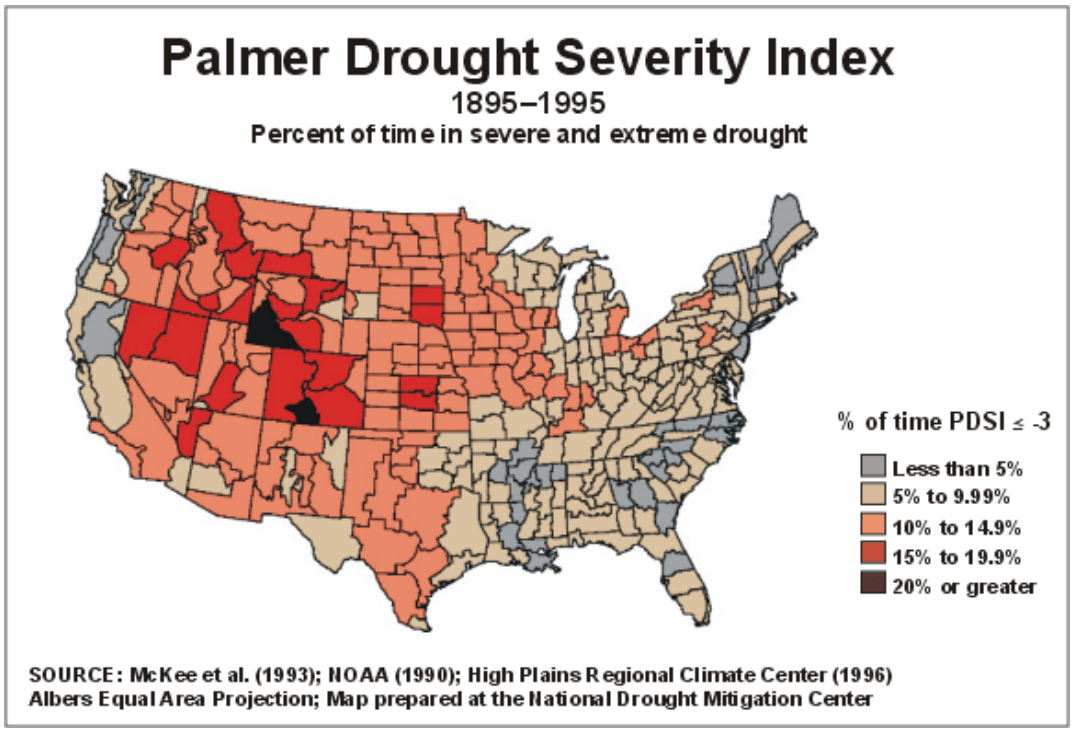
Excessive Heat is defined as temperatures that hover 10 degrees or more above the average high temperatures for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility.

Droughts occur when a long period passes without substantial rainfall. Drought conditions can cause significant crop damage, but there is little property damage from excessive heat. Due to the historical occurrences of drought and excessive heat in the Purchase Region, these hazards present a threat not only to the agriculture of the region, but to the aged, and chronically ill population.

The Palmer Drought Severity Index (PDSI) is used to show the relative dryness or wetness in an area and indicates prolonged and abnormal moisture deficiency or excess. The PDSI is used for evaluating the scope, severity and frequency of prolonged periods of abnormally wet or dry weather (Figure 5.18). The PDSI scale follows below.

Figure 5.18 Palmer Drought Severity Index





During the planning period for this update there have been a combined total of four events recorded in Fulton County. Of those four events, four have been Excessive Heat and zero Drought. There were no injuries / fatalities or damage (property or crop) recorded during these events.

Table 5.16 Excessive Heat / Drought Events and Impacts in Fulton County, April 1, 2017 – March 31, 2022

Location	Date	Time	Time Zone	Event Type	Deaths	Injuries	Property Damage	Crop Damage
FULTON (ZONE)	7/21/2017	11:00	CST-6	Excessive Heat	0	0	0.00K	0.00K
FULTON (ZONE)	7/5/2018	10:00	CST-6	Excessive Heat	0	0	0.00K	0.00K
FULTON (ZONE)	7/14/2018	10:00	CST-6	Excessive Heat	0	0	0.00K	0.00K
FULTON (ZONE)	8/12/2019	10:00	CST-6	Excessive Heat	0	0	0.00K	0.00K
Totals:					**0**	**0**	**0.00K**	**0.00K**

Data Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

Below is an excessive heat event that occurred in Fulton County during the update period:

- On July 21, 2017, a large upper-level high resulted in two to three days of dangerously high heat indices from 105 to 115 degrees. The large high in the upper levels of the atmosphere expanded over much of the southern two-thirds of the United States for a few days. The center of the high gradually shifted east from the southern Plains on the 20th to the middle Mississippi Valley on the 22nd. The high then weakened and shrank on the 23rd. The daily peak heat indices at Paducah during the hot weather were 109 degrees on the 21st and 107 degrees on the 22nd. At Hopkinsville, the peak heat index was 106 on the 21st, 107 on the 22nd, and about 105 on the 23rd. A number of Kentucky mesonet sites and automated airport sites reported peak heat indices from 110 to 115 on the 21st and 22nd. Actual air temperatures reached the mid to upper 90's on both afternoons. Overnight lows were in the mid to upper 70's. Cooling centers were opened in Marshall County to accommodate residents needing help.

SUMMARY AND CONCLUSIONS OF EXCESSIVE HEAT / DROUGHT PROFILE

Combined there have been four heat related events in the county during the 5-year planning period. This divides out to roughly one event every other year. Common sense would dictate that the conditions that generated a heat type event in one county could have generated a heat type event in another. One in every ten events could prove deadly and almost four heat injuries result from every event. From a county perspective the cost of an Excessive Heat Event is difficult to assess as there are no monetary damages available. Of critical concern to the Fulton County MPT was the potential for human casualties in the form of heat stroke and heat exhaustion causing injury and even deaths.

Information from the above table can be used to define the frequency of Drought Events and the impact of these events throughout the region. Fulton County experienced zero droughts over the 5-year update period. Drought is mainly a threat to the agricultural segment of the county economy, but it is also having a significant impact on water and wastewater systems.

Based on historic records, there have been no deaths or injuries attributed to excessive heat in Fulton County. Likewise, there has been no drought impact recorded for individuals or property over this same period. As there are no reported damages or injuries for the planning update period, the annualized cost of a heat related event could not be calculated.

Wildfire

A wildfire is an uncontrollable burning of grasslands, brush or woodlands. The potential for wildfire depends on surface fuel characteristics, weather conditions, recent climate conditions, and topography and fire behavior. There are three different types of wildfire classes:

- *Surface fires* are the most common type. These fires burn along the forest floor moving slowly and will damage and kill trees.
- *Ground fires* are usually started by lightning. These fires burn on or below the forest floor.
- *Crown fires* spread quickly by wind. These fires will move quickly by jumping along treetops.
  - *Spotting* can be produced by crown fires as well as wind and topography conditions. Large burning embers are thrown ahead of the main fire. Once spotting begins, the fire will be very difficult to control.

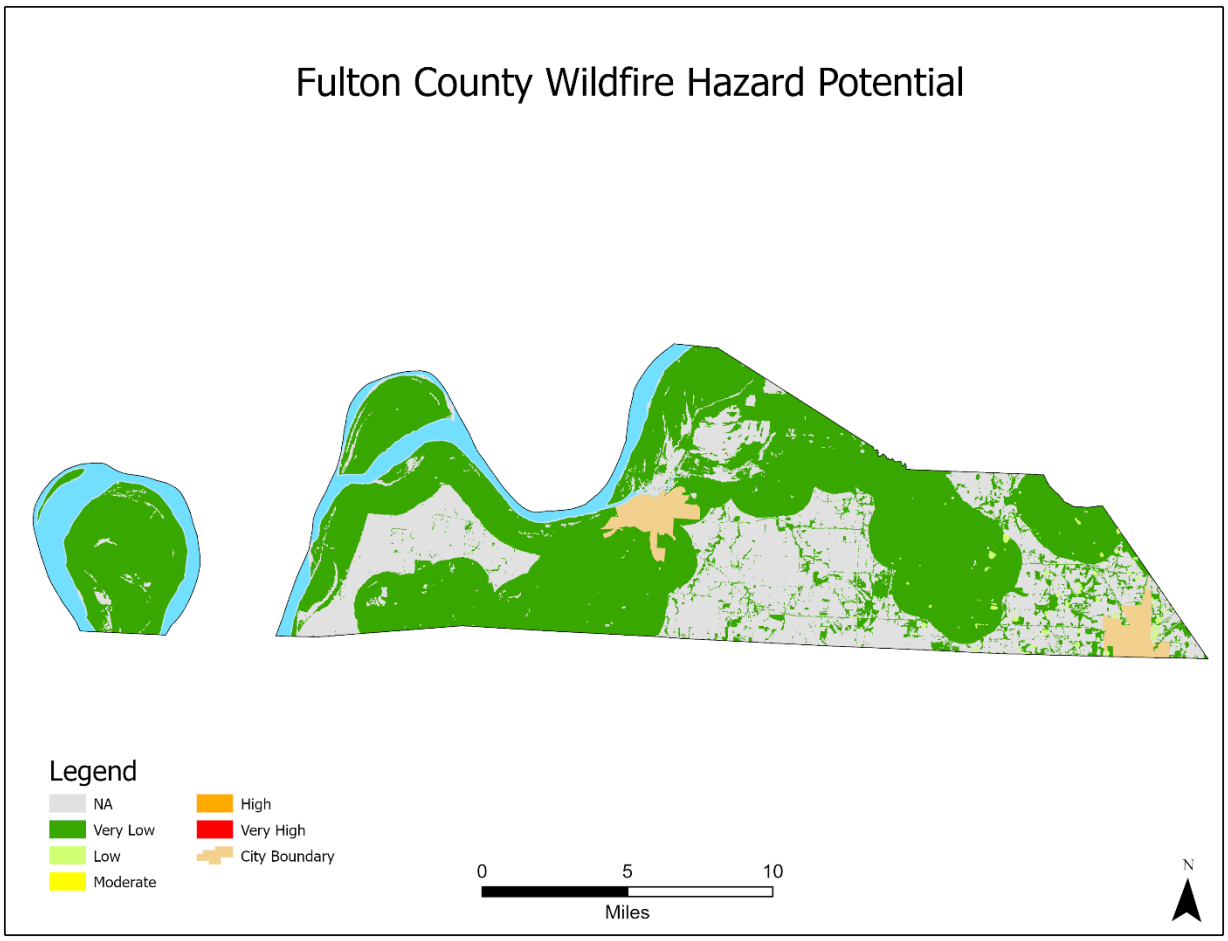
Kentucky has two defined wildfire seasons: in the spring, February 15 – April 30 and in the fall, October 1 – December 16. These two seasons are separated by periods of higher moisture and colder, less conducive fire weather. When leaves begin to fall from deciduous hardwood trees a thick litter layer forms in wooded areas creating a fuel source for rapidly expanding wildfires. Also, during the fall season, or periods of drought, tall grasses can become very flammable. It is possible for wildfires to occur outside the defined fire seasons during prolonged periods of drought.

Specific outdoor burning laws have been established to lessen the wildfire occurrence during these fire seasons. Kentucky Revised Statute 149.400 prohibits outdoor burning during the defined fire seasons between 6 am and 6 pm unless at a distance of at least 150 feet from woodlands or brushland. In Kentucky, wildfire risks are compounded by the state's extremely high arson rate. Sixty-two percent of Kentucky's wildfires are deliberately set by arsonists.

In the State Hazard Mitigation Plan, the Purchase Region is shown as having a moderate fire danger class, but there are no significant historical occurrences. Wildfires have not been a threat to the Purchase Region as a whole. Nowhere in the region is there higher than "Low" Wildfire danger.

The United State Department of Agriculture and United States Forestry service has a database providing access of the possible impacts wildfires can have on a community. Figure 5.19 represents the wildfire probability for Fulton County based on this database.

Figure 5.19 Fulton County Wildfires

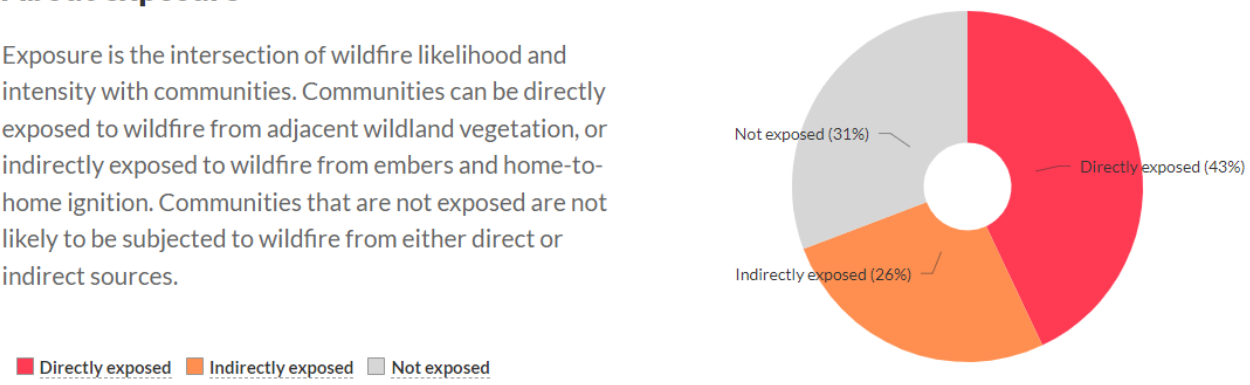


Source: USDA and US Forestry Service Wildfire Risk to Communities

The United States Department of Agriculture, United States Forestry Service data indicates that Fulton County has a low wildfire probability threat. This is supported by the fact that there are no significant historical occurrences. Wildfires have not been a threat to the Purchase Region as a whole. Nowhere in the region is there higher than "Low" Wildfire danger.

Fulton County has a low risk of wildfires in the county lower risk than 83% of counties in the United States. Figure 5.20 represents the wildfire exposure Fulton County communities face.

Figure 5.20 Fulton County Community Wildfire Exposure



Source : https://wildfirerisk.org/explore/exposure-type/21/21075/

SUMMARY AND CONCLUSIONS OF WILDFIRE PROFILE

From April 1, 2017, through March 31, 2022, there have been zero occurrences of Wildfire Events reported in Fulton County by the NCEI and likewise zero events for the entire Purchase Region. In a search of the NCEI Storm Events Database there are only 11 reported events for the entire region. These occurred between February 1996 and January 2006.

With no historic data for damages to support wildfire as a hazard in Fulton County, does not mean that there have not been instances of brush fires that had or will have the potential to grow out of control, especially during periods of drought events. It is therefore included as a Hazard in the risk assessment, albeit a low risk, but a risk that needs to be continually assessed and planned for and perhaps anticipated.

The ice storm of 2009 generated massive amounts of fuel, in the form of fallen limbs, and that this risk is greatly diminished at this time. It is likely that there were some number of small field fires during this period however that expense was not documented. According to information found in the 2018 State Hazard Mitigation Plan, Fulton County has an estimated loss of $277,810,169.00.

5:4.3 Assessing Vulnerability: Identifying Assets Overall Summary Vulnerability

The vulnerability of structures to Severe Weather and Earthquake Hazards in Fulton County is equal to the total structure value of the county. These hazards are not limited to a particular geographic region. All critical facilities in the county were determined to be vulnerable to Severe Weather and Earthquake Hazards.

Fulton County's vulnerability to flooding was determined by GIS analysis. A GPS derived database of Critical Facilities, and the Kentucky Infrastructure Authority database for Water and Wastewater facilities were brought in. FEMA revised Flood Hazard Areas were added as an overlay and where the data intersected those structures/facilities were deemed vulnerable to a 100-year flood. The vulnerability of county structures was determined by a similar method, laying the Flood Hazard Areas over imagery, to determine which structures were in the flood plain.

Impact & Frequency

The impact and frequency of each hazard is identified in each hazard profile in the previous section through maps frequency tables and graphs. Impact is addressed further in the charts and narrative discussions found in the following asset identification and vulnerability sections of this plan.

Identification of Assets

This section of the plan identifies what can be affected in each jurisdiction by the different hazard events that occur in the Purchase Region. The information to complete this section was collected from a variety of sources including local jurisdictions, HAZUS 4.0 Kentucky Data, the NOAA NCEI, the 2020 Census, U.S Census Bureau 2020 American Community Survey 5 Year Estimates and the Kentucky Revenue Cabinet. The information was collected, mapped, and summarized by the PADD staff and reviewed and analyzed by the Fulton County MPT.

This section was prepared using the best available data for identifying the number of buildings, infrastructure and critical facilities and costs associated with them. Point data for flood vulnerability and critical facility locations were developed by the PADD. For this version of the plan, PADD GIS staff analyzed data from flood prone areas of the county and extracted points of critical facilities within the hazard areas. Location data of community structures facilities was collected from the United States Building Blueprint though the structures collected are a combination of commercial and residential properties. Critical Facility data was collected from HAZUS and reviewed by local mitigation planning teams and mapped by PADD GIS staff.

Fulton County MPT members reviewed the following information to determine the vulnerability in each community. Tables were created by the PADD staff to estimate the numbers of existing buildings located in mapped Flood Hazard, Landslide and Wildfire Hazard areas. For the other identified hazards, tornados, thunderstorm wind, earthquakes, and winter storms, MPT members were not able to identify specific hazard areas for those hazards which were determined to

potentially affect anything within Fulton County. These hazards and their occurrence are not limited to any particular area based on past historical events and documentation as provided in the hazard profiles for the hazards.

Critical Facilities and Infrastructure

For the purpose of this plan, the JPHMC adopted the definitions of the FEMA HAZUS Loss Estimation Model according to FEMA publication 386-1, version 4.0, pages 3-9 that state the following definitions of critical facilities and infrastructure. HAZUS separates critical facilities into five categories based on their loss potential.

For the purpose of this plan, all of the following elements are considered critical facilities except Hazardous Materials Facilities. It was determined by the regional council that Hazardous Materials Facilities would not be addressed as critical facilities. Rationale: Hazardous Materials facilities are addressed in existing Emergency Operations Plans at the Facility and jurisdictional level, which are deemed by the Committee as being both sufficient and beyond the expertise of the committee.

FEMA Critical Facilities Definitions

- Transportation Facilities include airways – airports, heliports; highways – bridges, tunnels, roadbeds, overpasses, transfer centers; railways – track segments, tunnels, bridges, rail yards, depots; waterways – canals, locks, seaports, ferries, harbors, docks, and piers.

- Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power and communication systems.

- Essential Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Consider not only their structural integrity and content value, but also the effects on the interruption of their functions because the vulnerability is based on the service, they provide rather than simply their physical aspects. Essential Facilities include hospitals and other medical facilities, police and fire stations, emergency operations systems, evacuation shelters, schools, and health and human services to the PADD.

- High Potential Loss Facilities are facilities that would have a high loss associated with them, both physical and economical, such as nuclear power plants, dams, and military installations.

- Hazardous Materials Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins. (Note: Not considered in this Plan)

Critical Facilities Estimated Replacement Value Methodology

Due to a software compatibility problem between FEMA's HAZUS Program, ESRI's Arc and MS Windows, PADD staff was unable to generate complete critical facilities values for the region. FEMA and KYEM have acknowledged this issue and have committed to resolving this problem however this process will not be complete before the region plan expires.

As a result, staff has supplemented updated HAZUS information when available with local data to establish the estimated value of critical facilities. As a last result, data generated during the 2018 update cycle has been utilized to complete tables. For purposes of the update to the 2023 JPHM Plan, this combination of data sources constitutes the best data available.

PADD staff used a combination of GIS data sources and local GIS data layers to build a map of the critical facilities and infrastructure for each jurisdiction found in the hazard area. Estimates were done on a county basis.

Types and Numbers of Buildings for Severe Weather and Earthquake Hazards

Severe Weather Hazards and Earthquakes have been determined to potentially affect anything within each jurisdiction depending on the path of the hazard event. These hazards and their occurrences are not limited to any particular area based on past historical events and documentation is provided in the hazard profiles. They constitute four of the top five priority risks identified by the Fulton County MPT.

Table 5.17 lists the total number of structures vulnerable to Severe Weather Hazards and Earthquakes. This table represents county structures derived from Microsoft United States Building Footprints. Due to data limitations, the types of structures were not available. Future updates of the plan should include numbers of other types of structures as data becomes available.

Table 5.17 Severe Weather/Earthquake Hazard Vulnerable Assets

County	Number of Structures		
	Structures in County	Structures in Hazard Area	% In Hazard Area
Ballard	7,041	7,041	100%
Calloway	22,328	22,328	100%
Carlisle	4,476	4,476	100%
Fulton	**4,091**	**4,091**	**100%**
Graves	25,720	25,720	100%
Hickman	3,777	3,777	100%
Marshall	24,216	24,216	100%
McCracken	36,549	36,549	100%
Total	**128,198**	**128,198**	**100%**

Sources: https://github.com/Microsoft/USBuildingFootprints, PADD GIS

Critical Facilities and Infrastructure at Risk to Severe Weather and Earthquake Hazards

Using the HAZUS MH definition for critical facilities and infrastructure, the PADD staff identified types and numbers of critical facilities and infrastructure that are vulnerable to tornados, thunderstorm wind, winter storm, and earthquakes in Fulton County.

Table 5.18 shows the number of critical facilities vulnerable to severe storms and earthquakes in Fulton County. Due to the unpredictability of severe storms and earthquakes all critical facilities are at risk during hazardous events.

Table 5.18 Fulton County Critical Facilities & Infrastructure Storm, Tornado, Earthquake Vulnerability

Type of Facility	# Of Existing Buildings	Current Replacement Value	# In Hazard Area
County EOC	1	$184,100	1
Communication-Radio	3	$580,791	3
Fire Stations	4	$4,977,824	4
Police Stations	4	$9,955,648	4
Railways		$2,663,000	
Government Buildings	19	$43,937,082	19
Hospitals			
Electric Power Plants			
Package Treatment Plant	1	$233,000	1
Sewage Plants	2	253,062,333.2	2
Water Plants	2	253,062,333.2	2
Pumping Stations	1		1
Lift Stations	16	$5,804,065	16
Flood Control Pump Station			
Wells	5		5
Storage Tanks	8	$1,200,000	8
Schools	4	$13,279,352	4
Airport	1	$4,424,166.7	1
Natural Gas Facilities		N/A	
Dams			
Warming Center	4		4
Bridges	15	$7,729,854.1	15
TOTAL	**87**	**$373,337,449.2**	**87**

Sources: When available local data was used, and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System and the costs were calculated based on standard planning costs.
*** If values were not provided the best estimate was given based on other facilities in Fulton, and the HAZUS Program.*
*** Cost replacement values left blank were hard to determine due to many factors involved*

Critical Facilities and Infrastructure at Risk to Flooding

The PADD GIS staff produced tables which provide an accurate estimate of the number of structures that are vulnerable to flooding. PADD GIS staff collect Purchase Region Structure Blueprints from US Building Blueprints on Microsoft for the state of Kentucky and clipped out the structures for the Purchase Region. GPS structure points, overlain with the Flood Hazard Areas were the primary source of at-risk data, and for all counties the PADD's data and Water Information System database were used to determine at risk Critical Facilities.

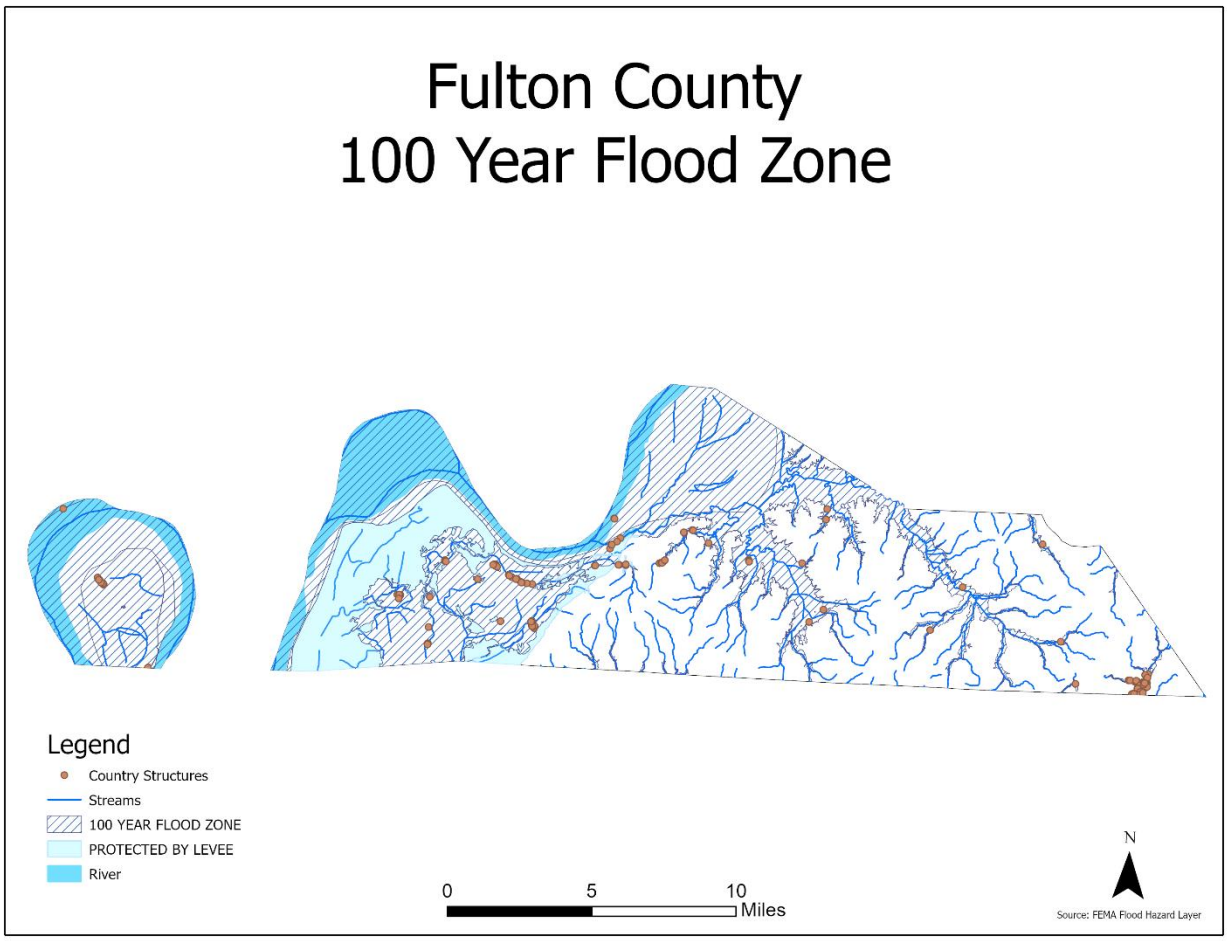
Table 5.19 summarizes the numbers of structures in the Flood Hazard area for each county. The highlighted areas indicate the data for Fulton County.

Table 5.19 Flood Hazard Vulnerable Assets

County	Estimated Number of Structures in Flood Hazard Areas		
	Number of Structures in County	Percentage of Structures in Flood	Number of Structures in Flood Hazard Zone
Ballard	7,041	4.6%	327
Calloway	22,328	1.6%	359
Carlisle	4,476	2.4%	108
Fulton	**4,091**	**4.7%**	**193**
Graves	25,720	1.6%	404
Hickman	3,777	2.3%	85
Marshall	24,216	6.7%	1624
McCracken	36,549	4.3%	1586
Total	**128,198**	**3.7%**	**4,686**

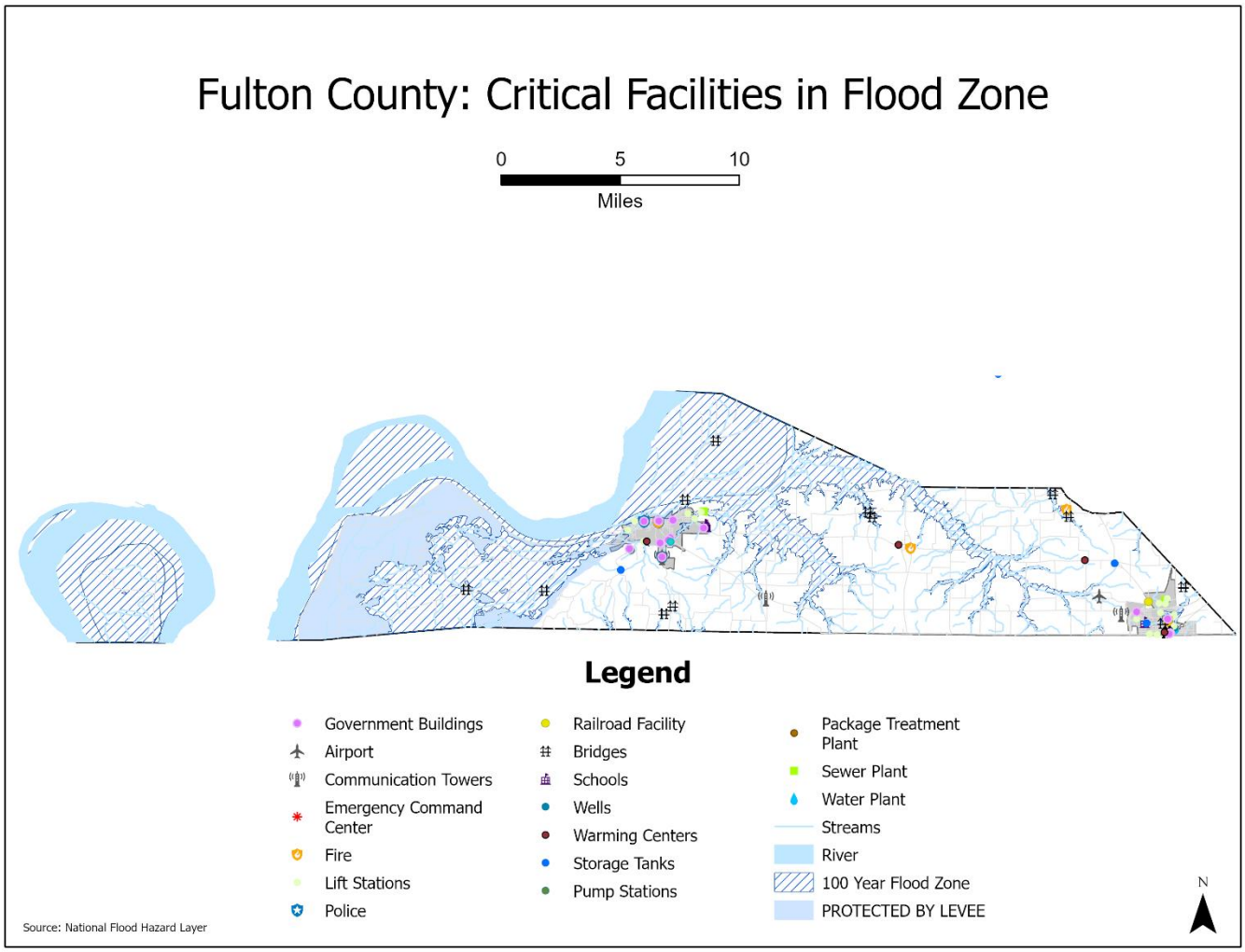
Figure 5.21 depicts the location of structures in the Flood Hazard area. Figures 5.22, 5.23 and 5.24 indicate the location of critical facilities in each jurisdiction relative to the Flood Hazard areas. These maps were presented to the JPHMC for public comment for review during the identification of vulnerable assets for each jurisdiction.

Figure 5.21 Fulton County Flood Zones and Structures



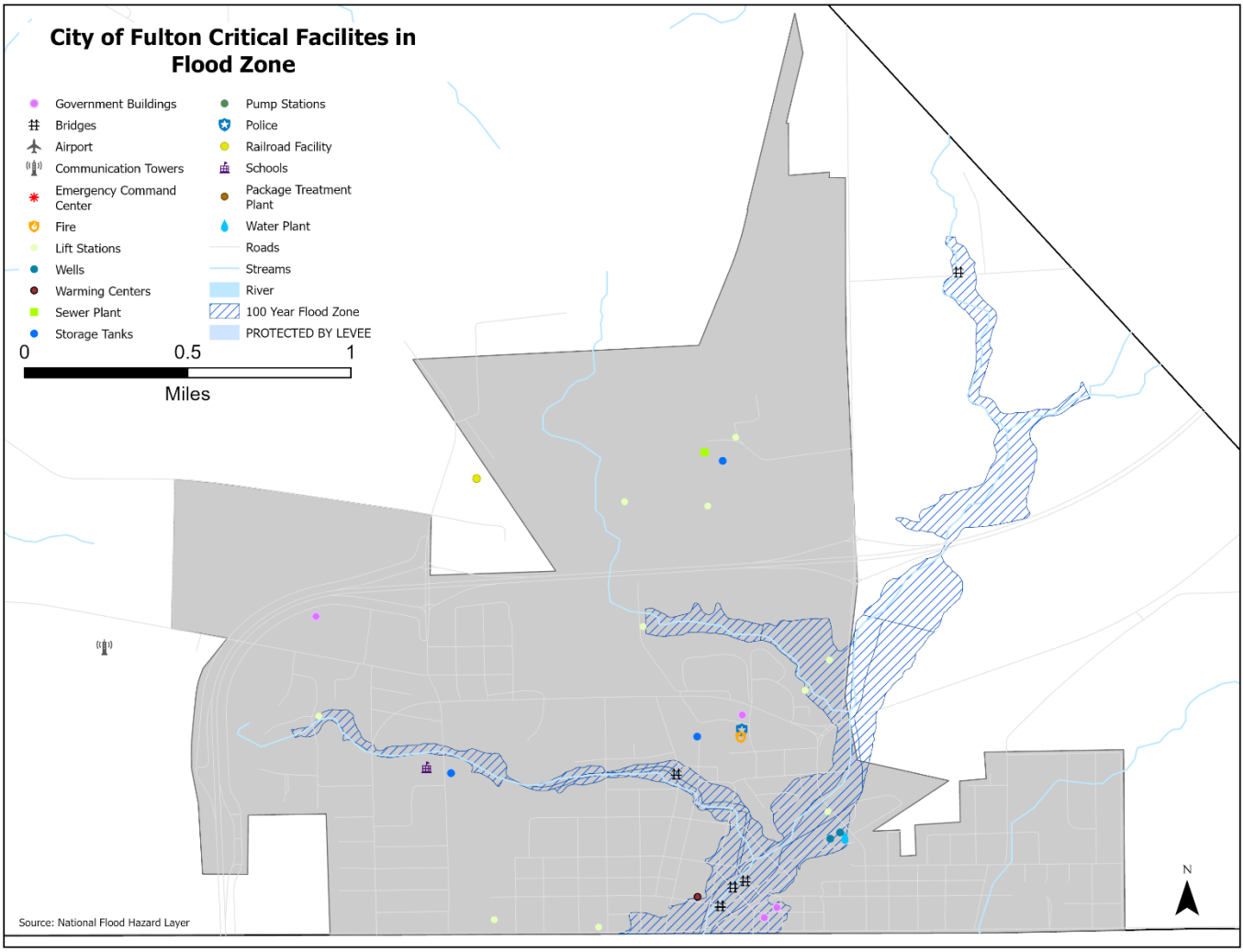
Source: FEMA Flood Hazard Layer, PADD GIS

Figure 5.22 Fulton County Flood Zone Including Critical Facilities



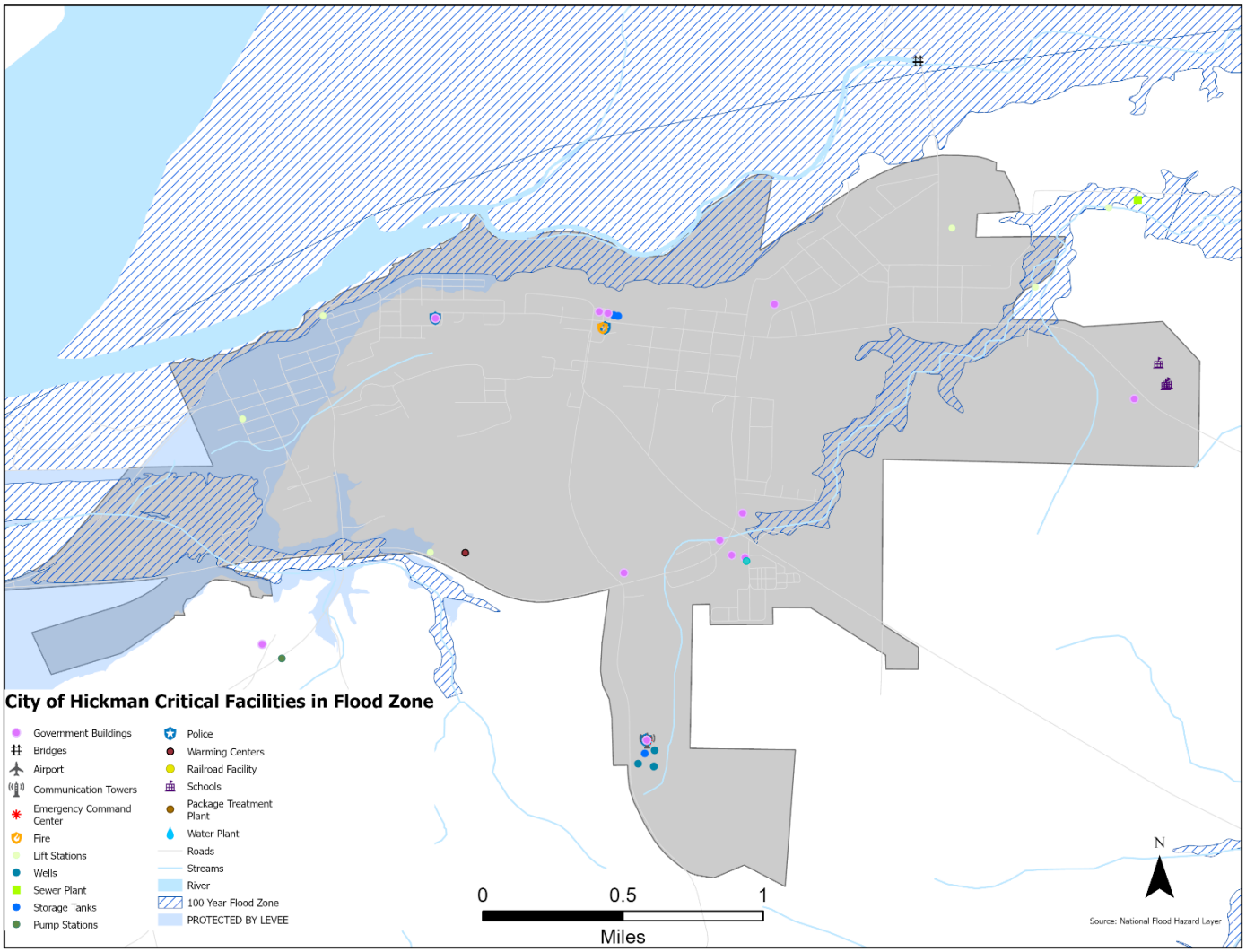
Source: FEMA Flood Hazard Layer, PADD GIS

Figure 5.23 City of Fulton 100 Year Flood Zone Including Critical Facilities



Source: FEMA Flood Hazard Layer, PADD GIS

Figure 5.24 City of Hickman 100 Year Flood Zone Including Critical Facilities



Source: FEMA Flood Hazard Layer, PADD GIS

Table 5.20 summarizes the types and number of critical facilities and infrastructure in the identified flood hazard areas. Ownership issues provided some limitation in distinguishing what critical facilities belonged to a particular jurisdiction; therefore, asset vulnerability was determined on a county level.

Table 5.20 Fulton County Flood Vulnerability: Critical Facilities and Infrastructure

Type of Facility	# Of Existing Buildings	Current Replacement Value	# In Hazard Area
County EOC	1	$184,100	0
Communication-Radio	3	$580,791	0
Fire Stations	4	$4,977,824	0
Police Stations	4	$9,955,648	0
Railways		$2,663,000	0
Government Buildings	19	$43,937,082	2
Hospitals			
Electric Power Plants			
Package Treatment Plant	1	$233,000	0
Sewage Plants	2	253,062,333.2	1
Water Plants	2	253,062,333.2	1
Pumping Stations	1		0
Lift Stations	16	$5,804,065	5
Flood Control Pump Station			
Wells	5		2
Storage Tanks	8	$1,200,000	0
Schools	4	$13,279,352	0
Airport	1	$4,424,166.7	0
Natural Gas Facilities		N/A	
Dams			
Warming Centers	4		0
Bridges	15	$7,729,854.1	15
TOTAL	**87**	**$373,337,449.2**	**26**

Sources: When available local data was used, and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System and the costs were calculated based on standard planning costs.
*** If values were not provided the best estimate was given based on other facilities in Fulton, and the HAZUS Program.*
*** Cost replacement values left blank were hard to determine due to many factors involved*

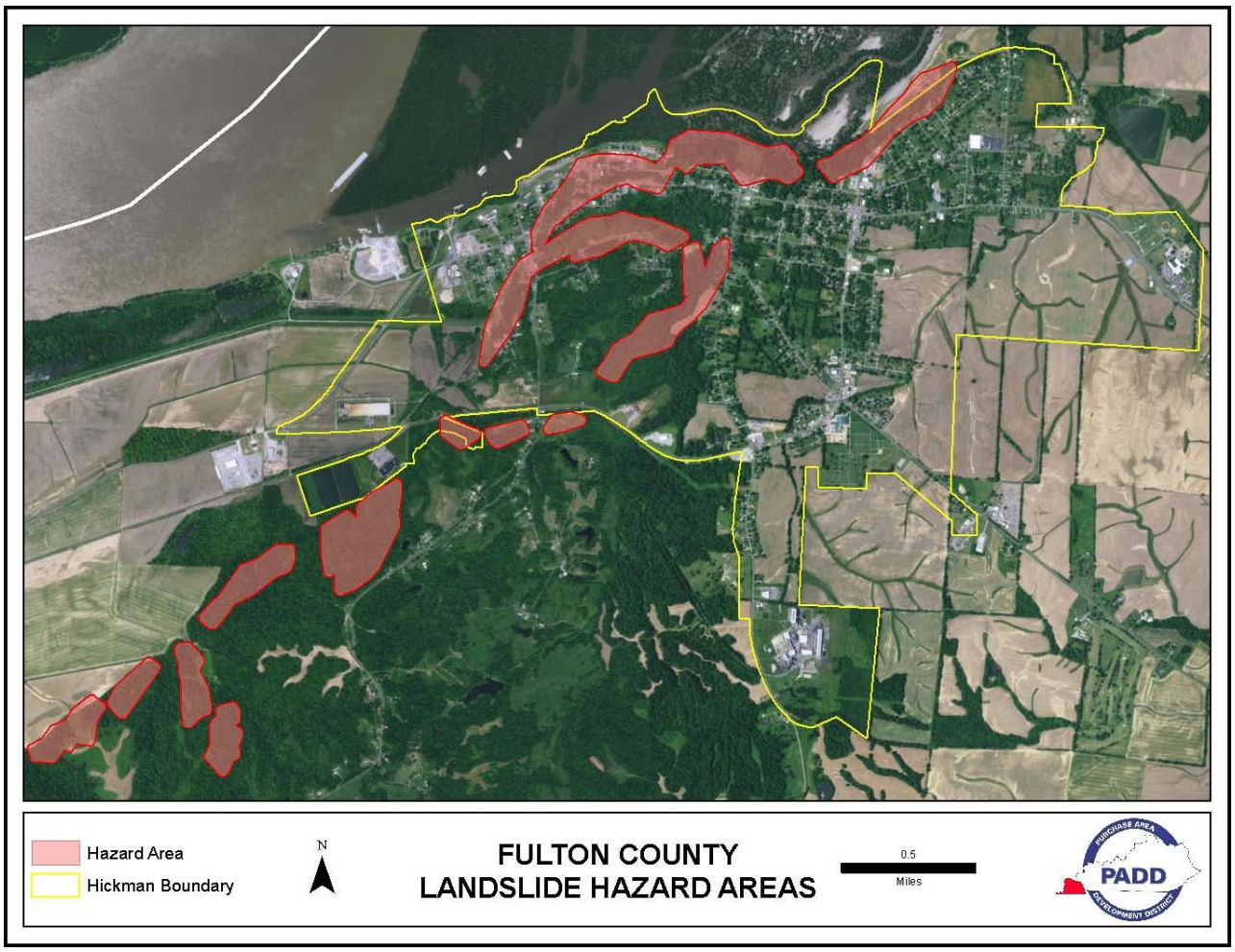
Fulton County and the Cities of Fulton and Hickman are members of the NFIP. Each entity has a Flood Plain Management Ordinance in accordance with the appropriate State Revised Statues. Therefore, development is not likely to occur in flood regions identified by the FIRMS and by the flood data used in the plan.

Critical Facilities and Infrastructure at Risk to Landslides

Types and numbers of buildings

The area's most at risk would appear to be the bluff areas in the City of Hickman Figure 5.25 indicates the landslide hazard areas in the City of Hickman, the critical facilities from the critical facilities list that would be most at risk to landslides would be those critical to the City of Hickman.

Figure 5.25 Fulton County Landslide Hazard Areas



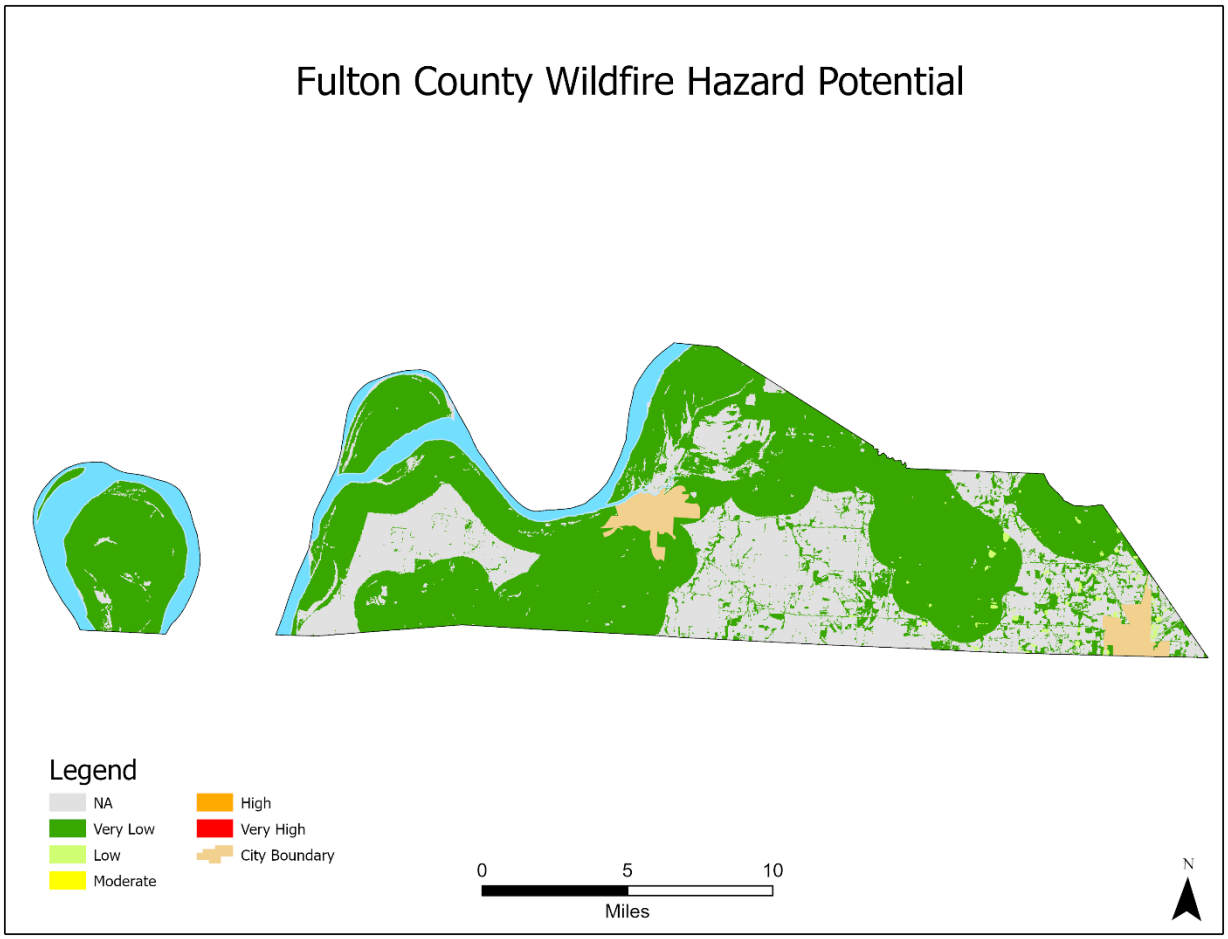
Source: Kentucky Geological Survey

Wildfire

Types and Numbers of Buildings for Wildfire Hazard

Wildfires were rated by the Fulton County MPT as a Low-Risk Hazard. Portions of the county are heavily forested. These areas are being encroached upon by urban growth, creating a danger area known as the Wildland/Urban Interface. In the image below, the probability of an event is shown.

Figure 5.26 Wildfire Probability and Impacts in Fulton County



Source: United States Department of Agriculture, United States Forestry Service, **https://www.fs.usda.gov/rds/archive/Catalog/RDS-2020-0016**

Table 5.21 identifies the structures only within the wildfire potential areas in Fulton County was derived from U.S. Building Blueprint shapefile. Due to data limitations, the types of building structures were not available at the time of this plan.

Table 5.21 Fulton County Wildland/Urban Interface Wildfire Risk:

County	Structures in County	Structures in None to Very Low	Structures in Low	Structures in Moderate	Structures in High
Ballard	7,041	7,041	0	0	0
Calloway	22,328	22,175	153	0	0
Carlisle	4,476	4,476	0	0	0
Fulton	**4,091**	**4,060**	**31**	**0**	**0**
Graves	25,720	25,522	198	0	0
Hickman	3,777	3,764	13	0	0
Marshall	24,216	24,214	2	0	0
McCracken	36,549	36,549	0	0	0
Purchase	128,198	127,801	397	0	0

Sources: USDA Wildfire Hazard Potential and PADD GIS Staff

Critical Facilities and Infrastructure at Risk in the Wildland/Urban Interface

Using the HAZUS MH definition for critical facilities and infrastructure, the PADD staff identified types and numbers of critical facilities and infrastructure that are in or adjacent to the Wildland/Urban interface, and consequently at risk to wildfires.

Table 5.22 Fulton County Wildfire Vulnerability: Critical Facilities

Type of Facility	# Of Existing Buildings	Current Replacement Value	# In None to Very Low Hazard Area	# In Low Hazard Area
County EOC	1	$184,100	1	
Communication-Radio	3	$580,791	3	
Fire Stations	4	$4,977,824	4	
Police Stations	4	$9,955,648	4	
Railways		$2,663,000		
Government Buildings	19	$43,937,082	3	
Hospitals				
Electric Power Plants				
Package Treatment Plant	1	$233,000	1	
Sewage Plants	2	253,062,333.2	1	
Water Plants	2	253,062,333.2	2	
Pumping Stations	1		1	
Lift Stations	16	$5,804,065	16	
Flood Control Pump Station				
Wells	5		5	
Storage Tanks	8	$1,200,000	8	
Schools	4	$13,279,352	4	
Airport	1	$4,424,166.7	1	
Natural Gas Facilities		N/A		
Dams				
Warming Centers	4		4	
Bridges	15	$7,729,854.1	15	
TOTAL	**87**	**$373,337,449.2**	**87**	

Sources: When available local data was used, and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System and the costs were calculated based on standard planning costs.
*** If values were not provided the best estimate was given based on other facilities in Fulton, and HAZUS Program.*
*** Cost replacement values left blank were hard to determine due to many factors involved*

Drought poses a considerable hazard to the agricultural sector of the economy and while its effects cannot be mitigated except by irrigation the impact is mitigated by crop insurance programs. Extreme heat poses a health risk, but not a structural risk to residences or Critical Facilities. Infrastructure at risk to Excessive Heat/Drought consists of in ground water and wastewater systems that rely on cast iron pipe. This type of pipe is prone to radial fracture caused by soil shrinkage.

Future Development: Types and Numbers of Future Buildings, Critical Facilities, and Infrastructure

Fulton County is not expected to grow in population over the next ten years and in fact may decrease in population based on projections generated by the Kentucky State Data Center. As a result, there will likely be a decrease in the number of occupied residential structures while critical facilities and infrastructure are expected to remain the same. The Flood Plain Management Ordinance will restrict the building of residential structures in mapped flood prone areas.

Table 5.23 Population Projections for the Purchase Region of Kentucky

County	Census 2000	Census 2010	Census 2020	Census Projections		
				2030	2040	2050
Kentucky	4,041,769	4,339,367	4,505,836	4,461,150	4,721,118	4,785,233
Ballard	8,286	8,249	7,728	7,180	6,558	5,979
Calloway	34,177	37,191	37,103	38,298	38,626	38,424
Carlisle	5,351	4,874	4,826	4,445	4,090	3,765
Fulton	**7,752**	**6,238**	**6,515**	**6,132**	**5,697**	**5,349**
Graves	37,028	37,421	36,649	36,582	36,163	35,758
Hickman	5,262	4,612	4,521	4,094	3,621	3,139
Marshall	30,125	31,101	31,659	31,430	30,794	30,218
McCracken	65,514	65,018	67,875	69,450	70,529	71,761
Purchase	**193,495**	**195,819**	**196,876**	**197,611**		

Source: Kentucky State Data Center Projection Report for 2022 http://ksdc.louisville.edu/

There are no significant changes in land use anticipated for Fulton County. Should land use changes occur, they will be included in future updates of the plan where applicable. The lack of significant growth in the county should also result in a corresponding lack of increase in landslide vulnerability. The area most vulnerable are those areas with steep slopes and are not conducive to construction.

County Structures – Tornado, Earthquake, Severe Thunderstorm, Severe Winter Storm

The PADD staff used the Kentucky Data Center Household Projections to estimate future residential structure growth for each Purchase Region County. Table 5.24 shows the Kentucky Data Center Household Projects. These numbers would represent the approximate number of

future residential structures vulnerable to tornadoes, earthquakes, thunderstorm wind and winter storms.

Table 5.24 Household Projections

County	2010	2020	Projections		
			2030	2040	2050
Ballard	3,397	3,228	3,060	2,772	2,478
Calloway	15,530	15,108	16,126	16,569	16,616
Carlisle	2,116	2,003	1,845	1,681	1,532
Fulton	**2,864**	**2725**	**2,578**	**2,368**	**2,157**
Graves	14,978	14,742	14,697	14,396	14,180
Hickman	2,028	1,916	1,725	1,512	1,290
Marshall	13,073	13,359	13,301	13,003	12,693
McCracken	28,227	28,932	30,250	30,563	30,828
Purchase Region	**82,2213**	**82,013**	**83,582**	**82,864**	**81,774**

Source: Kentucky State Data Center
https://louisville.box.com/s/rh39adf5ou0cd0aduxe5dnodanj3ftf0

The PADD staff and Fulton County MPT members discussed the potential increase in numbers of vulnerable critical facilities, industry and infrastructure; however, there was no consensus for making a reliable calculation. In future updates, involvement from the local planning process may assist in estimating the increase of critical facilities and infrastructure based on projected population growth.

5:4.4 Assessing Vulnerability: Estimating Potential Losses

Tornado, Earthquake, Thunderstorm Wind, Winter Storm

The total valuation of adjusted property as provided by the Kentucky Department of Revenue was used to estimate the potential dollar loss for all vulnerable structures for the following hazards: Tornado, Thunderstorm Wind including Hail, Winter Storm, and Earthquake.

Table 5.25 summarizes the total value of adjusted property as provided by the Kentucky Department of Revenue, and the population for each county as provided by 2020 American Community Survey. These values were used to determine potential dollar losses and the number of people at risk in a county and all its jurisdictions, for those hazards that have no defined area: Winter Storm, Thunderstorm Wind, Tornado, and Earthquake. The figures for Fulton County are highlighted.

Table 5.25 Total Value of Adjusted Property for the Purchase Region

County	County Square Miles	Population 2020 Census	Total Property Value 2021($)
Ballard	246.7	7,728	$562,799,918
Calloway	385.0	37,103	$2,670,699,673
Carlisle	189.4	4,826	$268,513,078
Fulton	**205.9**	**6,515**	**$285,685,821**
Graves	551.8	36,649	$2,221,703,207
Hickman	242.3	4,521	$295,853,256
Marshall	301.3	31,659	$2,801,935,108
McCracken	248.7	67,875	$5,629,613,526
Purchase Region	**2,371.1**	**196,876**	**$14,736,803,587**

Source: United States Census Bureau County Summary, 2020 Census Data, Kentucky Revenue Cabinet, Year Estimate, Kentucky Revenue Cabinet, https://revenue.ky.gov/Property/Pages/default.aspx , Statewide Certified Property Values 2021

Table 5.26 Severe Weather/Earthquake Hazard Vulnerable Asset

County	Structures in County	Structures in Hazard Area	% In Hazard Area
Ballard	7,041	7,041	100%
Calloway	22,328	22,328	100%
Carlisle	4,476	4,476	100%
Fulton	**4,091**	**4,091**	**100%**
Graves	25,720	25,720	100%
Hickman	3,777	3,777	100%
Marshall	24,216	24,216	100%
McCracken	36,549	36,549	100%
Purchase Region	**128,198**	**128,198**	**100%**

Source: Microsoft U.S Building Blueprint

PADD staff and the Fulton County MPT determined that all 4,091 structures in the county are vulnerable to the "area" threats of weather and earthquake. According to the 2020 American Community Survey 5-Year Estimates, the median household income for Fulton County is $31,587.

Critical Facilities and Infrastructure for Severe Weather and Earthquakes

Table 5.27 summarizes vulnerable critical facilities and infrastructure to the non-geo specific hazards of Severe Weather and Earthquakes, as well as the potential dollar losses associated with structures in the high priority hazard areas. It was the determination of PADD staff that the best way to estimate the potential dollar loss associated with critical facilities and infrastructure was to use insurance replacement values, when available, for those structures provided by the jurisdictions, or default to values from the HAZUS tables.

Table 5.27 Fulton County Critical Facilities & Infrastructure Severe Weather and Earthquake

Type of Facility	# Of Existing Buildings	Current Replacement Value	# In Hazard Area
County EOC	1	$184,100	1
Communication-Radio	3	$580,791	3
Fire Stations	3	$4,977,824	3
Police Stations	3	$9,955,648	3
Railways	1	$2,663,000	1
Government Buildings	19	$43,937,082	19
Hospitals			
Electric Power Plants			
Package Treatment Plant	1	$233,000	1
Sewage Plants	2	253,062,333.2	2
Water Plants	2	253,062,333.2	2
Pumping Stations	4		4
Lift Stations	16	$5,804,065	16
Flood Control Pump Station			
Wells	5		5
Storage Tanks	8	$1,200,000	8
Schools	4	$13,279,352	4
Airport	1	$4,424,166.7	1
Natural Gas Facilities	1	N/A	1
Warming Centers			
Dams	4		4
Bridges	15	$7,729,854.1	15
TOTAL	**89**	**$373,337,449.2**	**89**

Sources: When available local data was used, and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System and the costs were calculated based on standard planning costs.
*** If values were not provided the best estimate was given based on other facilities in Fulton, and the HAZUS Program.*
*** Cost replacement values left blank were hard to determine due to many factors involved*

Flood

County Structures: After the vulnerability maps were created for the flood hazard areas, the cost associated with replacing those structures was evaluated. It was the determination of the PADD staff that the best way to estimate the potential dollar loss associated with the flood hazard areas was to use Total Property value in the county and the 4.7% of structures within the Hazard Area.

Table 5.28 summarizes the total number of structures in the county were determine by the Microsoft U.S. Building Blueprint. This value allowed us to determine 193 structures in the county were within the flooding hazard area. Table 5.28 shows the total property value for the Purchase Region counties from the Kentucky Revenue Cabinet and the property value within the flood Hazard Areas. Fulton County is highlighted.

Table 5.28 Flood Hazard Vulnerable Structures by County

County	Number of Structures			Total Property Value	
	Structures in County	Structures in Hazard Area	% In Hazard Area	Total Value in County	Value in Hazard Area
Ballard	7,041	327	4.6%	$562,799,918	$25,888,796
Calloway	22,328	359	1.6%	$2,670,699,673	$42,731,194
Carlisle	4,476	108	2.4%	$268,513,078	$6,444,313
Fulton	**4,091**	**193**	**4.7%**	**$285,685,821**	**$13,427,233**
Graves	25,720	404	1.6%	$2,221,703,207	$35,547,251
Hickman	3,777	85	2.3%	$295,853,256	$6,804,624
Marshall	24,216	1624	6.7%	$2,801,935,108	$187,729,652
McCracken	36,549	1586	4.3%	$5,629,613,526	$242,073,381
Total	**128,198**	**4686**	**3.7%**	**$14,736,803,587**	**$545,261,843**

Sources: Kentucky Revenue Cabinet, https://revenue.ky.gov/Property/Pages/default.aspx , Statewide Certified Property Values 2021 and Microsoft U.S. Building Blueprint

Table 5.29 summarizes the Fulton County Housing Characteristics based on the 2020 ACS 5-Year survey.

Table 5.29 2020 ACS Selected Housing Characteristics

Subject	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	Marshall	McCracken	Purchase Region
Total Housing Units	3,915	18,924	2,471	**3,336**	16,862	2,367	16,229	32,237	96,341
Occupied Housing Units	3,052	15,942	1,925	**2,550**	14,402	1,724	13,119	27,787	80,501
Vacant Housing Units	863	3,432	546	**786**	2,460	643	3,110	4,450	16,290
Mobile Homes	676	2,555	512	**164**	2,508	307	2,370	3,005	12,097
Owner- occupied	2,403	9,730	1,573	**1,680**	10,690	1,383	10,926	17,930	56,315
Renter- occupied	649	5,762	352	**870**	3,712	341	2,193	9,857	23,736
Household Size – Owner	2.60	2.44	2.45	**2.19**	2.56	2.34	2.39	2.46	2.43
Household Size– Renter	2.39	1.99	2.34	**2.24**	2.47	3.21	2.04	2.03	2.34
Median House Value -	$103,800	$141,200	$83,200	**$63,800**	$109,000	$85,000	$138,000	$145,200	$106,638

Source: U.S. Census Bureau 2020 ACS 5-Year Estimates Data Profile Table DP04

Critical Facilities and Infrastructure for Flooding

It was the determination of the PADD staff that the best way to estimate the potential dollar loss associated with critical facilities and infrastructure was to use the insurance replacement values for those structures provided by the jurisdictions to the maximum extent possible, or default to values from the HAZUS tables.
Table 5.30 tables summarize the potential dollar loss of vulnerable critical facilities and infrastructure in flood hazard areas by county.

Table 5.30 Fulton County Critical Facilities and Infrastructure Flood Vulnerability

Type of Facility	# Of Existing Buildings	Current Replacement Value	# In Hazard Area
County EOC	1	$184,100	0
Communication-Radio	3	$580,791	0
Fire Stations	3	$4,977,824	0
Police Stations	3	$9,955,648	0
Railways	1	$2,663,000	0
Government Buildings	19	$43,937,082	2
Hospitals			
Electric Power Plants			
Package Treatment Plant	1	$233,000	0
Sewage Plants	2	253,062,333.2	1
Water Plants	2	253,062,333.2	1
Pumping Stations	1		0
Lift Stations	16	$5,804,065	5
Flood Control Pump Station	2		1
Wells	5		2
Storage Tanks	8	$1,200,000	0
Schools	4	$13,279,352	0
Airport	1	$4,424,166.7	0
Natural Gas Facilities	1	N/A	N/A
Warming Centers			
Dams	4		4
Bridges	15	$7,729,854.1	15
TOTAL	**89**	**$373,337,449.2**	**27**

Sources: When available local data was used, and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System and the costs were calculated based on standard planning costs.
*** If values were not provided the best estimate was given based on other facilities in Fulton, and the HAZUS Program.*
*** Cost replacement values left blank were hard to determine due to many factors involved*

Wildfire

After determining the vulnerability of critical facilities to wildfire hazard the wildfire relative risk and exposure risk in Fulton County were collected from the USDA and US Forestry Service. Table 5.31 represents the wildfire risk Fulton County faces compared to the United States. Table 5.32 represent homes exposure percentage to wildfires in Fulton County compared to the United States.

Table 5.31 Fulton County Wildfire Risk

Relative Wildfire Risk	
Statewide Percentile Rank	
Risk to Homes	**13**
Wildfire Likely Hood	**18**
Nationwide Percentile Rank	
Risk to Homes	**17**
Wildfire Likely Hood	**18**

Source : https://wildfirerisk.org/explore/vulnerable-populations/21/21075/

Table 5.32 Fulton County Wildfire Exposure

Wildfire Exposure		
	Fulton County	**United State**
Percent Total		
Homes Directly Exposed	**43.0%**	**33.0%**
Homes Indirectly Exposed	**26.0%**	**30.0%**
Homes not Exposed	**31.0%**	**37.0%**

Source : https://wildfirerisk.org/explore/vulnerable-populations/21/21075/

Figure 5.27 Represents the Vulnerable Populations in Fulton County at risk if a wildfire hazard was to occur. Collected from the USDA and US Forestry Service wildfire risk to community's database.

Figure 5.27 Wildfire Hazard: Fulton County Vulnerable Population

Potentially Vulnerable Populations

Populations, 2021*	Fulton County, KY	United States
Families in poverty	˙281	7,181,779
Households with no car	˙382	10,349,174
Mobile Homes	˙131	6,509,758
People under 5	367	19,423,121
People over 65	1,367	52,888,621
People with disabilities	1,207	41,055,492
People with language barriers	˜11	12,736,062
Percent of Total**		
Families in poverty	20.5%	8.9%
Households with no car	16.5%	8.3%
Mobile Homes	5.7%	5.2%
People under 5	5.6%	5.9%
People over 65	21.0%	16.0%
People with disabilities	19.9%	12.6%
People with language barriers	0.2%	4.1%

High Reliability: Data with coefficients of variation (CVs) < 12% are in black to indicate that the sampling error is relatively small.
Medium Reliability: Data with CVs between 12 & 40% are in orange to indicate that the values should be interpreted with caution.
Low Reliability: Data with CVs > 40% are displayed in red to indicate that the estimate is considered very unreliable.

** Each measure on this page comes from a different subset of the overall population. For example, "poverty status" is not determined for all families. "Households with no car" is determined only for occupied households. "People with disabilities" includes only those people in civilian, noninstitutionalized settings. "Language barriers" is determined only for people five years or older.

5:4.5 Assessing Vulnerability: Analyzing Development Trends

The PADD grew 0.54% in population between 2010 and 2020 compared to a growth of 3.8% for the state of Kentucky. Fulton County is projected to decrease in population by 5.8% between 2020 and 2030.

Table 5.33 represents growth trends in the Purchase Region as reported by the Kentucky State Data Center using Census information.

Table 5.33 Population Projections for the Purchase Region

County	Census 2000	Census 2010	Census 2020	Census Projections		
				2030	2040	2050
Kentucky	4,041,769	4,339,367	4,505,836	4,641,150	4,721,118	4,785,233
Ballard	8,286	8,249	7,728	7,180	6,558	5,979
Calloway	34,177	37,191	37,103	38,298	38,626	38,424
Carlisle	5,351	4,874	4,826	4,445	4,090	3,765
Fulton	**7,752**	**6,238**	**6,515**	**6,132**	**5,697**	**5,349**
Graves	37,028	37,421	36,649	36,582	36,163	35,758
Hickman	5,262	4,612	4,521	4,094	3,621	3,139
Marshall	30,125	31,101	31,659	31,430	30,794	30,218
McCracken	65,514	65,018	67,875	69,450	70,529	71,761
Purchase	**193,495**	**195,819**	**196,876**	**197,611**	**196,078**	**194,393**

Source: Kentucky State Data Center Projection Report for 2022 http://ksdc.louisville.edu/

Land Use

Farmland is the principal land use in Fulton County. Land use for commercial purposes is primarily concentrated in or near the incorporated cities. Industrial development takes place primarily in the industrial parks. Fulton County also makes use of land for recreation and greenspace. Fulton County has both city and county parks for recreational purposes.

Economic and Social Growth Trends

The economy in the Purchase Region is experiencing trends like those of the state averages, both in growth and decline. There have been new businesses and industries opening in the region, but in turn there have been layoffs and closures within the market. Especially during the COVID-19 pandemic which is addressed in the 2022 – 2027 Comprehensive Economic Development Strategy (CEDS) where it was listed as a threat to the region, and the Disaster Resiliency Plan is supplement to that update. The CEDS update mentioned some of the impacts of COVID-19 on the Purchase Region communities while the Disaster Resiliency Plan goes into greater depth and addresses short-term and long-term approaches to rebuild resilient and sustainable communities throughout the Purchase Region. Data for this portion of plan was collected from the US Census and Purchase Region Community Economic Development Strategy.

Fulton County is known for its work ethic, friendliness, charitability and entrepreneurship. Fulton County is growing its wat out of economic challenges thorough the efforts of local community minded entrepreneurs and strategies designed to address housing shortages, workforce development, infrastructure enhancements and marketing tourism assets.

Table 5.34 Employment Rate for 2010 and 2020 for the Purchase Region

Employment Rate	2010	2020
Kentucky	55.3 %	55.90 %
Ballard	52.10 %	49.50 %
Calloway	57.30 %	55.10 %
Carlisle	47.30 %	46.50 %
Fulton	**47.30 %**	**46.50 %**
Graves	52.00 %	53.30 %
Hickman	45.9 %	44.50 %
Marshall	54.9 %	51.30 %
McCracken	53.8 %	55.90 %

Source: U.S. Census 2010 and 2020 Table DP03

Table 5.35 Fulton County Labor Force

FULTON COUNTY LABOR FORCE	
Labor Force	Unemployment Rate
2.083	4.6%

Source: Purchase Area CEDS 2022-2027

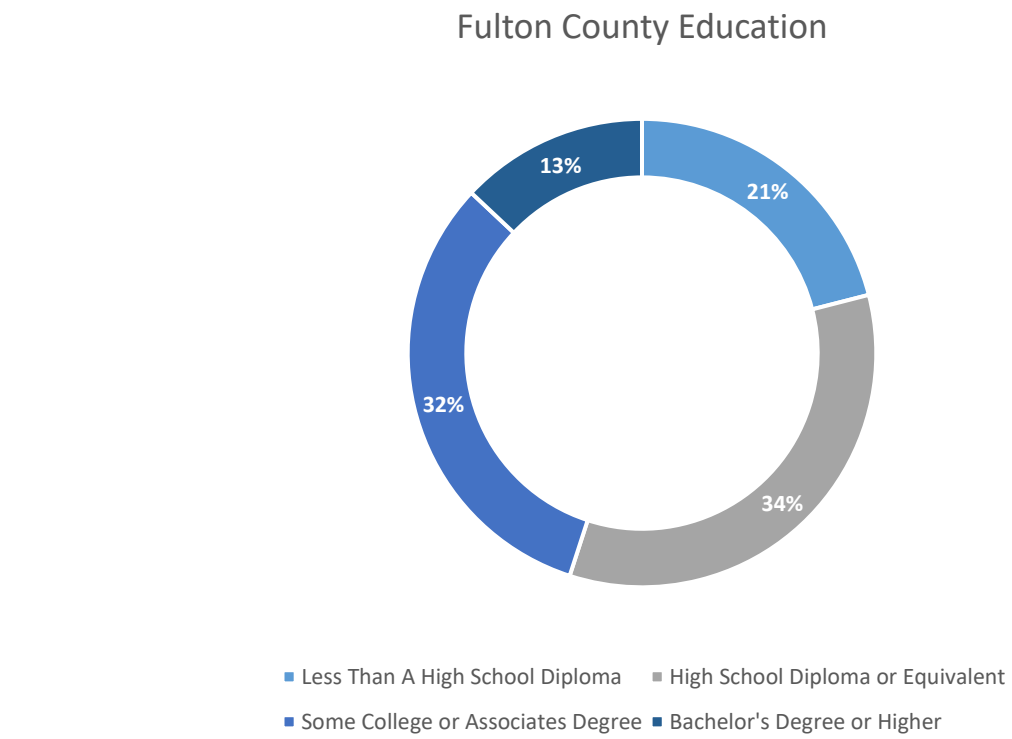
Table 5.36 Fulton County Income Data

INCOME	
Per Capita Income	$19,149
Median Household	$31,581
Poverty Rate	25.20%

Source: Purchase Area CEDS 2022-2027

Figure 5.28 Represents the level of education within Fulton County based on the Purchase Region 2020-2027 CEDS Plan.

Figure 5.28 Fulton County Education



Source: Purchase Area CEDS 2022-2027

Table 5.37 Top 5 Industries in Fulton County

Top 5 Industries	
Industries	**Percentage of Total Employment by Industry**
All Government (Including education)	24.0 %
Retail Trade	23.0%
Manufacturing	9.0%
Accommodation and Food Services	5.0%
Healthcare and Social Assistance	4.0%

Source: Purchase Area CEDS 2022-2027

While manufacturing and service sectors are important to the region's economy, agriculture proves to be a vital part of the economy. The changes, both hazards related, and non-hazard related, that affect farming greatly impact the Purchase Region. Hazards such as hail, flooding, tornadoes, and high wind damage crops and thus influence the economy of the region. As previously stated, farming is the most prevalent land use in Fulton County. Table 5.38 is a summary of the farmland located in the Purchase Region and the land use for those acres. This data was retrieved from the United States Department of Agriculture.

Table 5.38 Total Farmland Located in Purchase Region

County	Number of Farms	Land in Farms(acres)	Avg. Farm Size(acres)
Ballard	295	94,340	320
Calloway	710	135,521	191
Carlisle	273	88,015	322
Fulton	**146**	**97,615**	**669**
Graves	1,104	251,192	228
Hickman	246	118,474	482
Marshall	699	84,676	121
McCracken	318	62,082	195
Total	**3,791**	**931,915**	**2,528**

Source: U.S. Department of Agriculture, National Agricultural Statistics Service
2017 Census of Agriculture
https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Kentucky/

Social growth trends also play a key role in the economy of the Purchase Region. Median income and housing characteristics of the region are valuable tools in analyzing these growth trends. Tables 5.39 and 5.40 describe the median income and housing characteristics retrieved from the Kentucky State Data Center Census 2020 information.

Little to no population growth (0.4%) is expected to occur in the Purchase Region between 2020 and 2030. Fulton County is expected to decline by 5.8% during that same time. Development is not likely to occur in flood regions identified in each jurisdiction, because the threat of flooding is known and occurs on an annual basis. Industrial expansion that takes place will be in existing industrial parks. Fulton County is a Member of the NFIP and has implemented a Flood Plain Ordinance IAW the applicable paragraphs of the Kentucky Revised Statues.

Table 5.39 2010 Census and ACS 2020 Median Household Income

	Median Household Income		
Area	**2010 ACS**	**ACS 2020**	**Percent Change**
Kentucky	$41,476	$52,238	25.64
Ballard	$41,228	$45,517	10.40
Calloway	$39,194	$41,841	6.75
Carlisle	$33,909	$41,222	21.57
Fulton	**$31,965**	**$31,587**	**-1.18**
Graves	$35,277	$45,614	29.30
Hickman	$31,836	$44,063	38.41
Marshall	$43,326	$57,348	32.36
McCracken	$41,630	$47,011	12.93

*Source: Kentucky State Data Center; **U.S. Census Bureau, 2011-2015 American Community Survey 5 Year Estimate and 2020 ACS 5-year estimates*

Table 5.40 2010 Census: Selected Housing Characteristics for the Purchase Region

Subject	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	Marshall	McCracken
Total Housing Units*	3,915	18,924	2,471	3,336	16,862	2,367	16,229	32,237
Occupied Housing Units*	3,052	15,942	2,550	2,550	14,402	1,724	13,119	27,787
Vacant Housing Units*	863	3,432	546	786	2,460	643	3,110	4,450
Mobile Homes*	676	2,555	512	164	2,508	307	2,370	3,005
Owner- occupied*	2,403	9,730	1,573	1,680	10,690	1,383	10,926	17,930
Renter- occupied*	649	5,762	352	870	3,712	341	2,193	9,857
Household Size – Owner*	2.60	2.44	2.45	2.19	2.56	2.34	2.39	2.46
Household Size – Renter*	2.39	1.99	2.34	2.24	2.47	3.21	2.04	2.03
Median House Value – Owner Occupied*	$103,800	$141,200	$83,200	$63,800	$109,000	$85,000	$138,000	$145,200

Non-Ambulatory / Communal Living Facilities

During the update process PADD staff met with the JPMC and agreed upon recognizing Non-Ambulatory / Communal Living Facilities as vulnerable populations. The facilities under this category are important to communities during a disaster but do not fall under FEMA's definition of a critical facility.
While critical facilities keep the government functioning and benefit the community, Non-Ambulatory / Communal Living Facilities protect a percentage of the population that relies on assistance.
The facilities listed below are funded locally or by the state, no private entities were included. The list below includes nursing homes, non-urgent care medical facilities, senior centers, etc.

Table 5.41 Non-Ambulatory / Communal Living Facilities in Fulton County

Name of Facility	Type of Facility
Fulton County Senior Center	**Senior Center**

Climate Change and Kentucky
Kentucky's climate is changing. Although the average temperature did not change much during the 20th century, most of the commonwealth has warmed in the last 20 years. Average annual rainfall is increasing, and a rising percentage of that rain is falling on the four wettest days of the year. In the coming decades, the changing climate is likely to reduce crop yields and threaten some aquatic ecosystems. Floods may be more frequent, and droughts may be longer, which would increase the difficulty of meeting the competing demands for water in the Ohio, Tennessee, and Cumberland rivers. Our climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet by about one degree (F) during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others. Natural cycles and sulfates in the air prevented much of Kentucky from warming during the last century. Sulfates are air pollutants that reflect sunlight back into space. Now sulfate emissions are declining, and the factors that once prevented Kentucky from warming are unlikely to persist.

Kentucky Issues due to Climate Change

- Precipitation and Water Resources
    - Annual precipitation in Kentucky has increased approximately 5 percent since the first half of the 20th century. But rising temperatures increase evaporation, which dries the soil and decreases the amount of rain that runs off into rivers. Although rainfall during spring is likely to increase during the next 40 to 50 years, the total amount of water running off into rivers or recharging ground water each year is likely to decline 2.5 to 5 percent, as increased evaporation offsets the greater rainfall. Droughts are likely to be more severe because periods without rain will be longer and very hot days will be more frequent.

- Flooding
    - Flooding is becoming more severe in the Southeast. Since 1958, the amount of precipitation during heavy rainstorms has increased by 27 percent in the Southeast, and the trend toward increasingly heavy rainstorms is likely to continue. The Tennessee Valley Authority (TVA) and the U.S. Army Corps of Engineers operate Kentucky Dam, Wolf Creek Dam, and other dams to prevent serious floods on the Ohio, Tennessee, and Cumberland rivers. The agencies release water from the reservoirs behind these dams before the winter flood season. By lowering water levels, these releases provide greater capacity for the reservoirs behind those dams to prevent flooding. Nevertheless, dams and other flood control structures cannot prevent all floods. The Ohio River has flooded Louisville several times, for example, and flash floods have caused property destruction and deaths throughout Kentucky.

- Agriculture
    - Longer frost-free growing seasons and increased concentrations of atmospheric carbon dioxide tend to increase yields for many crops during an average year. But more severe droughts and more hot days are likely to reduce yields, especially in the western half of Kentucky, which in seventy years is likely to have 15 to 30 more days with temperatures above 95°F than it has today. Even on irrigated fields, higher temperatures are likely to reduce yields of corn, and possibly soybeans. Higher temperatures are also likely to reduce livestock productivity: hot weather causes cows to eat less, grow more slowly, and produce less milk, and it can threaten their health.

- Human Health
    - Hot days can be unhealthy—even dangerous. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular and nervous systems. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor. Higher temperatures can also increase the formation of ground-level ozone, a key component of smog. Ozone has a variety of health effects, aggravates lung diseases such as asthma, and increases the risk of premature death from heart or lung disease. EPA and the Kentucky Department for Environmental Protection have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will require even more reductions in the air pollutants that contribute to ozone.
    -

Actionable Climate Change responses, in the Purchase Region, for reducing the impacts of climate change.

- Restoration of natural systems, increases in the use of green infrastructure, and targeted conservation efforts, especially of groundwater aquifers, can help protect people and nature from climate change impacts.

- Improving urban storm water infrastructure to deal with the increase of flooding, as well as limiting nonporous surfaces. Using Green infrastructure is reducing some of the negative impacts by using plants and open space to absorb storm water.
- Improved basic health services and increased public health measures—including surveillance and monitoring of local trends—can prevent or reduce the impacts of the anticipated increased frequency and intensity of poor air quality days. Establishing cooling and heating stations through the year at a local level for extreme high temperature events.
- Integrating climate adaptation into planning Local processes offers an opportunity to better manage climate risks now. Developing knowledge for decision-making in cooperation with vulnerable communities will help to build adaptive capacity and increase resilience. Scaling unban development and Industrial farming that's sustainable for local aquifers

5:5 Mitigation Strategy

5:5.1 Capability Assessment

Mitigation strategies were developed in response to the hazard profiles and vulnerability of the assets in each jurisdiction. These strategies provide each jurisdiction with a blueprint for reducing potential losses identified in the risk assessment. These strategies are based on existing authorities, policies, programs, resources, and the ability to expand on and improve the existing tools.

The capability assessment has been divided into three sections:

(A) Existing Authorities, Policies, Programs, and Resources
(B) Existing Governmental Structure
(C) Existing Professional Staff Departments

The purpose of the capability assessment is to identify potential hazard mitigation opportunities available to each jurisdiction through daily operations as a local unit of government. This assessment will highlight the positive measures already in place in the jurisdiction as well as identify weaknesses that could increase vulnerability in a jurisdiction. Capability assessment serves as the foundation for an effective hazard mitigation strategy by establishing goals and objectives for jurisdictions.

(A) Existing Authorities, Policies, Programs, and Resources

The PADD, along with MPT members, evaluated existing authorities, policies, programs, and resources in each jurisdiction. Table 5.42 is a summary of each jurisdiction and the current status of these authorities. Local committee members evaluated this information to determine what goals, objectives, and actions would be necessary to effectively mitigate the vulnerability of a jurisdiction and what resources they currently have that can be used to implement the mitigation strategies identified in this plan.

Table 5.42 Existing Authorities, Policies, Programs, and Resources in the Purchase Region

Jurisdiction	Floodplain Management Ordinance	CRS & FMA Plans	Zoning Regulations	Subdivision Regulations	Land Development Plans	Fire Prevention Code	Comprehensive Plan	Capital Improvement Plan	Stormwater Management Plan	CERT Team	NWS Storm Ready Program	Local Economic Development	Regional Economic Development	City Class
Ballard County	X							X		X		X	X	
City of Barlow								X				X	X	6
City of Kevil								X				X	X	6
City of La Center					X		X	X				X	X	5
City of Wickliffe	X							X				X	X	5
Calloway County	X		X	X						X	X	X	X	
City of Murray	X		X	X	X		X		X			X	X	3
City of Hazel												X	X	6
Carlisle County	X									X	X	X	X	
City of Bardwell	X											X	X	5
City of Arlington	X											X	X	6
Fulton County	**X**									**X**	**X**	**X**	**X**	
City of Fulton	**X**		**X**	**X**	**X**		**X**	**X**				**X**	**X**	**4**
City of Hickman	**X**		**X**		**X**		**X**					**X**	**X**	**4**
Graves County	X									X		X	X	
City of Mayfield	X		X	X	X		X		X			X	X	3
City Wingo												X	X	6
Hickman County										X		X	X	
City of Clinton	X											X	X	5
City of Columbus													X	5
Marshall County	X				X	X				X	X	X	X	
City of Benton	X		X				X					X	X	4
City of Calvert City	X		X	X	X		X	X	X			X	X	4
City of Hardin	X											X	X	5
McCracken County	X		X	X	X	X	X			X	X	X	X	
City of Paducah	X		X	X	X		X	X	X			X	X	2

All jurisdictions are members of the PADD. Services are provided by the district in GIS/GPS, Economic Development, Community Development, Aging Services, Workforce Development, and Fiscal Management.

The existing authorities, policies, and programs are further explained in relation to the existing governmental structure and powers of the local jurisdiction. It is the responsibility of each local jurisdiction to develop, enact, and enforce the above referenced authorities and programs.

(B) Existing Governmental Structure

Tables 5.43 (county government) and 5.44 (city government) summarize the governmental structure for each jurisdiction in the PADD. Each jurisdiction is responsible for the implementation of mitigation strategies in their community. These governmental structures were reviewed by the JPHMC to determine the capability of implementing and enforcing existing and future authorities, policies, programs, and resources.

Table 5.43 County Government Structure in the Purchase Region

County	Type of Government
Ballard County	Judge/Executive and 5 magistrates
Calloway County	Judge/Executive and 4 magistrates
Carlisle County	Judge/Executive and 3 magistrates
Fulton County	**Judge/Executive and 4 magistrates**
Graves County	Judge/Executive and 3 commissioners
Hickman County	Judge/Executive and 3 magistrates
Marshall County	Judge/Executive and 3 commissioners
McCracken County	Judge/Executive and 3 commissioners

Table 5.44 Governmental Structure and Class of Incorporated Cities

City	Class	County	Type of Government
City of Barlow	6	Ballard	Mayor and 4 commissioners
City of Kevil	6	Ballard	Mayor and 6 council members
City of La Center	5	Ballard	Mayor and 4 commissioners
City of Wickliffe	5	Ballard	Mayor and 6 council members
City of Murray	3	Calloway	Mayor and 12 council members
City Hazel	6	Calloway	Mayor and 6 council members
City of Bardwell	5	Carlisle	Mayor and 6 council members
City of Arlington	6	Carlisle	Mayor and 4 commissioners
City of Hickman	**4**	**Fulton**	**Mayor and 4 commissioners**
City of Fulton	**4**	**Fulton**	**Mayor and 4 commissioners**
City of Mayfield	3	Graves	Mayor and 10 council members
City of Wingo	6	Graves	Mayor and 4 commissioners
City of Clinton	5	Hickman	Mayor and 6 council members
City of Columbus	5	Hickman	Mayor and 6 council members
City of Benton	4	Marshall	Mayor and 6 council members
City of Calvert City	4	Marshall	Mayor and 6 council members
City of Hardin	5	Marshall	Mayor and 6 council members

City of Paducah	2	McCracken	Mayor and 4 commissioners

Legal Authority of Local Jurisdictions

There are many tools available to local governments in Kentucky that may help them implement mitigation programs, policies and actions. Any hazard mitigation program can utilize any or all of the five types of government powers granted by the State of Kentucky: Regulation; Acquisition; Taxation; Spending, and Education.

Regulation

- Police Power: Local governments have been granted broad regulatory powers in their jurisdictions. Kentucky Revised Statutes grant the general police power to local governments, allowing them to enact and enforce ordinances and laws that define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety and welfare of the citizens of their jurisdiction. The general police power also has the ability to define and abate nuisance ordinances, including those related to public health.

- Jurisdictions can include hazard mitigation requirements in their ordinances as protection of public health, safety and welfare. They may also use this power to enforce nuisance ordinances identifying nuisances that threaten the general health and safety of the public.

- Building Codes and Inspection: The construction and rehabilitation of homes, business and other structures according to standards that will make the structures more resistant to the impact of natural hazards is a big part of mitigation activity in a jurisdiction. These standards can be enforced in a jurisdiction through building codes. Through the adoption and enforcement of building codes in each jurisdiction, it can be assured that mitigation strategies are in place for the planning area.

- Land Use: Local governments can control the use of land in the jurisdiction through regulatory powers granted to them by the State of Kentucky. Jurisdictions can control certain aspects of development under these powers. The amount and type of growth in a jurisdiction can greatly affect the vulnerability of the community in the event of a natural hazard. Land use powers include the power to enact and enforce zoning ordinances, floodplain ordinances, and subdivision controls, as well as the power to engage in planning.

  - Acquisition**:** The State of Kentucky Revised Statutes allows for jurisdictions to acquire property for public purpose. Acquisition can be a useful tool for mitigation goals in that property in hazard prone areas may be acquired so that future development is prohibited in a hazardous area.

  - Taxation**:** Local governments have been given the power to levy taxes and special assignments by the State of Kentucky. Taxation extends beyond the collection of revenue and can provide the means by which the community develops in the future.

- Spending**:** Local governments have also been given the power to make expenditures on behalf of the public in their interest. Hazard mitigation principles should be incorporated in the spending decisions made by the local government in a jurisdiction.

- Education**:** Although most residents in a jurisdiction have some knowledge of the natural hazards that potentially threaten their community, most of them have had little formal education about what they as individuals can do to reduce their vulnerability to a natural hazard event. Education involving mitigation strategies and potential vulnerability will be essential for all jurisdictions in the planning area.

(C) Existing Professional Staff Departments

Members of Fulton County MPT reviewed their existing Capabilities based on their current professional staff departments. During the public input meetings, participants determined that the implementation of Mitigation Strategies and Projects would depend on the capability of that department in each jurisdiction.

Table 5.45 Capabilities Assessment: Existing Professional Staff Departments

Jurisdiction	Board of Education	Building Inspectors	Court Clerk	Emergency Management	County/City Treasurer	Mayor /County Judge/Executive	Health Department	Road Department	Sheriff Department	City Police Department	PVA (Tax Assessment)	Social Services	Utilities Department	Churches	Fire Departments	Kentucky State Police
Ballard County	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Wickliffe				X	X	X							X	X	X	X
Barlow				X	X	X							X	X	X	X
Kevil				X	X	X							X	X	X	X
LaCenter				X	X	X							X	X	X	X
Calloway County	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Murray	X	X		X	X	X		X		X			X	X	X	X
Hazel				X	X	X			X				X	X	X	X
Carlisle County	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Bardwell		X		X	X	X		X		X			X	X	X	X
Arlington		X		X	X	X		X					X	X	X	X
Fulton County	**X**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**	**X**
Hickman				**X**	**X**	**X**		**X**		**X**			**X**	**X**	**X**	**X**
Fulton	**X**			**X**	**X**	**X**		**X**		**X**			**X**	**X**	**X**	**X**
Graves County	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Mayfield	X	X		X	X	X		X		X			X	X	X	X
Wingo				X	X	X							X	X	X	X
Hickman County	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Clinton				X	X	X				X			X	X	X	X
Columbus				X	X	X							X	X	X	X
Marshall County	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Benton		X		X	X	X		X		X			X	X	X	X
Calvert City		X		X	X	X		X		X			X	X	X	X
Hardin				X	X	X							X	X	X	X
McCracken County	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Paducah	X	X		X	X	X		X		X			X	X	X	X

The following definitions summarize the duties and responsibilities of the professional staff departments listed in Table 5.45.

The **Board of Education** maintains the operations of the county school system. This board is elected at large by the people of the community. County funds usually maintain the buildings and provide for other capital projects. State funds usually pay for salaries and the purchase of textbooks and supplies.

The **Building Inspectors** are responsible for enforcing the State Building Code, the NFIP, the Community Rating System, and other applicable local codes. These items are enforced through an inspection and permitting program.

The **PVA, Court Clerk,** and **Sheriff** are elected every four years by the citizens in the county. The PVA is responsible for the valuation of property for tax purposes. The Court Clerk is the custodian of the court system in each county. This office is financed through the State of Kentucky. The Sheriff operates on a budget approved annually by the magistrates (fiscal court) of each county and is responsible for the enforcement of state and local laws.

The **City Police Departments** are responsible for enforcing local and state laws in their designated jurisdiction.

The **Kentucky State Police** are responsible for enforcing local and state law in the entire state of Kentucky. State Police assist local police with investigations and emergencies that extend beyond the resources and jurisdictional boundaries of local agencies.

The **Road Departments** are responsible for the care and maintenance of the public roadways in their designated jurisdiction.

The **Utility Departments** are responsible for providing water, gas, electric and sewer services to the public.

The **Emergency Management Service** is responsible for the mitigation, preparedness, response and recovery operations for both natural and man-made disasters. The formation of an emergency management office in each county is mandated under the Kentucky Revised Statutes.

The **County/City Treasurers** are responsible for the management of the budget and fiscal programs for their jurisdiction. This also includes the administration of state and federal grants.

The **Mayor or County Judge/Executive** is responsible for overseeing the daily operations of County or City government in their respective jurisdictions. They are also responsible for the enforcement of County/City policies and regulations.

The **Health Departments** and **Social Services** have separate boards appointed by commissioners. Employment in these departments is approved by the commissioners with state personnel policies applying. These agencies protect and promote public health and provide social services for medical care and governmental social programs for displaced families.

The **Churches** provide shelters, food and water to community members. Provide locations for emeregcny response teams to set up, help with search and rescue, helped with clean up, etc. They are a fundamental part of the communities in the Purchase Region.

The **Emergency Management, Road Department, Building Inspectors, and Utilities Department** have been identified as the specific departments that will be responsible for carrying out mitigation activities. Each of these departments has been involved in the hazard mitigation planning process by participating in the JPHMC meetings.

It has been determined by the committee that each of these departments has limited available staff that are responsible for multiple duties within their departments. All jurisdictions have limited funding resources available to hire additional staff. Each staff member is adequately trained to accomplish their current workload. Increase in work activities, including hazard mitigation activities, will increase the need for additional staff to effectively perform tasks.

The PADD, as a regional planning agency, has become a primary resource for technical assistance for all jurisdictions in the region. The PADD staff are trained in planning, GIS/GPS, financial management and project development.

SUMMARY: Capability Assessment

The available staff and financial resources of the departments in each jurisdiction determine the ability for expansion and improvement of existing authorities, policies, programs, and resources to reduce potential losses. The capability of cities in the Purchase Region varies so communities often work cooperatively with county government to perform projects that improve the quality of life for residents, including mitigation projects and activities. Because counties have more resources available to implement mitigation activities, it has been suggested that the goals and objectives be prioritized at a county level. City jurisdictions will have the opportunity at any given time to implement mitigation activities if their capabilities expand and the opportunity exists.

The jurisdictions that have participated in the mitigation planning process are identified in this plan. In addition to local participation, the PADD staff has provided professional assistance in GIS and plan development to help enhance the ability of the local jurisdictions to implement mitigation activities.

Based on the above information, the local Hazard Mitigation Goals, Objectives and Actions were compiled at a county level, taking city jurisdiction public input into consideration.

5:5.2 Hazard Mitigation Goals

The PADD staff, along with Fulton County MPT analyzed the loss estimates in the risk assessment to establish goals and objectives for loss reduction. The goals were established on a regional basis with input from local city participants. The goals and objectives will serve as a guide to develop specific actions to reduce potential losses caused by hazard events. These goals and objectives were determined to concur with existing community goals and the goals set forth by the Kentucky State Hazard Mitigation Plan.

Mitigation Goals – The mitigation goals were set to be general, long-term guidelines for hazard mitigation in jurisdictions.

Mitigation Objectives – The mitigation objectives define the strategies and process of implementation to achieve the identified goals. The objectives are specific, measurable, and have a defined completion.

Goal 1: Improve the survivability of critical facilities and infrastructure in order to preserve their capabilities to provide essential services during a hazard event, by reducing the vulnerability of these facilities.

Purpose of Goal in Relation to the Risk Analysis: It is understood that there will be a certain level of vulnerability to critical facilities and infrastructure depending on the nature of a hazard event. Loss of these capabilities directly affects public health and public safety in part or all of Fulton County. During a natural hazard event, roadways can be damaged and utility services knocked out. These types of damages hinder emergency first responders from being able to effectively get help to those in need.

The following objectives have been developed as a result of this goal:
1.1: Enhance the rapid restoration of transportation systems.
1.2: Enhance the rapid restoration of utility systems.
1.3: Where possible, move the critical facilities out of flood prone areas.
1.4: Enhance the resistance of/harden critical facility structures to the effects of natural hazards.
1.5: Enhance the capability to maintain essential public health and public safety services by providing back-up sources of power and redundant communications to critical facilities.

Goal 2: Reduce the potential damaging effects of natural hazards through development policies without limiting the goals for growth of the community.

Purpose of Goal in Relation to the Risk Analysis: It has been determined that potential losses associated with development in the Fulton County may be greatly reduced by enforcing or developing county and city policies that regulate development in hazard prone areas. Policies that regulate and guide the development of future infrastructure, residential, and industrial projects will reduce the vulnerability of these facilities.

The following objectives have been developed as a result of this goal:

2.1 Enforce existing policies and authorities.
2.2 Develop new policies such as ordinances and building codes that require new structures to meet standards that will resist natural hazards.
2.3 Develop land use planning policies that restrict development in hazard prone areas such as flood zones.
2.4 Develop subdivision requirements to protect utilities, such as buried power and phone lines.

Goal 3: Protect public health and safety by increasing public awareness of natural hazards that affect Fulton County and by fostering a sense of responsibility within the public for mitigating risks associated with those natural hazards.

Purpose of Goal in Relation to the Risk Analysis: It has been determined that the general public in Fulton County needs to be aware of the high-risk areas, and potential harm associated with the natural hazards that affect their area. While policies can be developed to reduce the development in hazard prone areas, public education will ensure that those policies are utilized to their fullest to reduce the number of existing and future structures in those areas. Through public education, individuals may realize the seriousness of potential hazards and act upon this realization by taking steps to secure their property and protect their families against the risks of natural hazards.

The following objectives have been developed as a result of this goal:

3.1 Educate the public on potential natural hazards that affect Fulton County.
3.2 Increase public understanding and support of the hazard mitigation process.
3.3 Educate the public on how they can take personal responsibility for their own health, safety and property protection.
3.4 Develop and maintain emergency evacuation routes. Educate the public to the location and use of evacuation routes.
3.5 Storm Ready: Maintain Fulton County's status as a Storm Ready Community.
3.6 Pursue Firewise Community status for Fulton County, City of Fulton, and City of Hickman.

Goal 4: Efficiently make use of public and private funds to increase the capabilities of local jurisdictions to reduce potential losses associated with flood hazard events.

Purpose of Goal in Relation to the Risk Area: It has been determined that potential losses can be reduced in Fulton County by their ability to effectively communicate, plan, and implement mitigation projects. Efficiently using public or private money to improve communication,

planning, and implementation capabilities for the general public as well as key critical facilities can reduce the impact a hazard has on Fulton County.

The following objectives have been developed as a result of this goal:
4.1 Promote inter-agency and inter-local cooperation for the use of mitigation funds and activities.
4.2 Take advantage of State Hazard Mitigation grants associated with Disaster Declarations, Pre-Hazard Mitigation Grant announcements, and other grants to fund Mitigation Projects.
4.3 Leverage State and local funding, local match sources and in-kind match resources to get the maximum utility from available Mitigation Funds.

Goal 5: Protect Fulton County's most vulnerable populations, buildings and critical facilities and infrastructure through the implementation of cost-effective and technically feasible mitigation projects.

Purpose of Goal in Relation to the Risk Area: During the review of the risk analysis, council members determined several structures and critical facilities and infrastructure that will need to have specific mitigation actions taken in order to be effective in reducing the vulnerability. Some identified structures and critical facilities and infrastructure need to be removed from the flood hazard area completely or built to appropriate standards to reduce the potential losses.

The following objectives have been developed as a result of this goal:
5.1 Increase the availability of adequate shelters and community shelters for protection from the direct and indirect effects of severe weather events.
5.2 Continue to improve early warning of impending severe weather events.
5.3 Reduce the number critical facilities and infrastructure in identified flood hazard areas.
5.4 Utilize available mitigation measures to reduce the number of vulnerable structures in the flood hazard areas.
5.5 Utilize available mitigation measures such as structure elevation to reduce the vulnerability of structures in the flood hazard areas.
5.6 Identify and remove stream blockages of tree limbs and trunks, form effective check dams and barrages, and result in the pooling of water during flood events.

Goal 6: Protect dwellings, structures and their occupants along the Wildland/Urban interface from the potential of Wildfire.

Purpose of Goal in Relation to the Risk Area: While there is not historical data to support damaging wildfires in Fulton County, small field fires and brush fires do occur, especially during periods of drought events. These events, historically, have been very small threats and generally not considered a risk. Although considered a low risk, it should be continually planned for and perhaps anticipated.

The following objectives have been developed as a result of this goal:
6.1. Ensure the protection of first responders.
6.2. Enhance the response capability for response to brush fires to mitigate growth into wildfires.

6.3. Facilitate communities/neighborhoods participation in the State's "Firewise" program.
6.4. Reduce the quantity of available wildfire fuels in proximity to critical facilities and to any/all structures in Fulton County
6.5. Incorporate fire buffer planning into the design considerations for any new critical facility.

Goal 7: Support and participate in regional Hazard Mitigation Planning

Purpose of Goal in Relation to the Risk Area: Fulton County, the City of Hickman, the City of Fulton, and representatives of various groups and organizations represented the county and participated in the JPHMC and the development of the regional portion of the plan. Because a regional "Authority" does not exist, the realization of the goals and objectives of the JPHMC Multi-jurisdictional Plan depends on the support and cooperation of Fulton County and the City of Hickman and the City of Fulton. This is especially true in that; the Regional Goals and Objectives affect all jurisdictions in the Purchase Region, damage to or destruction of the Regional Critical Facilities identified in the plan affect all jurisdictions in the Region, the strategies and mitigation projects that will evolve from these goals require the participation of all the jurisdictions in the region and the results will benefit all the participants. In the same vein Fulton County, and the City of Hickman and the City of Fulton will require the cooperation and assistance of other jurisdictions, both neighboring and region wide, and the assistance of regional organizations such as the PADD, the Kentucky State Police, KYTC District One, Purchase District Health Department to help plan, fund and implement Hazard Mitigation projects.

The following objectives have been developed as a result of this goal:
7.1. Request agencies such as the Kentucky Geological Survey and the University of Kentucky to conduct/expand further studies into seismicity, soil and ground shaking potential within the region.
7.2. Develop a regional high resolution, spatially accurate imagery data base from which to extract precise point locations and structure footprints for buildings and other critical facilities.
7.3. Adopt an All-Hazard Week public awareness campaign to include earthquakes, flood, tornados and severe storms.

Goal 8: Obtain the best data and analysis available to assess the landslide hazard in particular with regard to the stability Mississippi River bluffs in Fulton County and especially the City of Hickman.

8.1. Identify and map vulnerable structures, critical facilities, and risk prone areas.
8.2. Monitor the condition of the USCE Bluff Stabilization in the City of Hickman
8.3. Update County EOP as required.

5:5.3 Identification and Analysis of Mitigation Measures

The intention of this section is to identify, evaluate, and analyze a range of mitigation actions that will help reduce the potential effects of hazard events identified in the risk assessment section of the plan. These actions were derived based on the analysis of the risk assessment and support the goals and objectives identified in this plan.

The following list describes potential loss reduction mitigation actions and techniques identified for mitigation of hazard events. These actions and objectives were determined to have the greatest influence on hazard loss reduction in Fulton County. Hazard specific mitigation actions are listed in order of priority in accordance with the High-Risk Hazards for the county as identified and prioritized by the Fulton County MPT.

- Prevention activities are designed to keep current problems from getting worse and to eliminate the possibility of future problems. Prevention activities reduce a jurisdiction's vulnerability to hazard events. This type of activity is especially effective in hazard prone areas where development has not occurred. Prevention activities include the following:
  - Planning and Zoning
  - Floodplain regulations
  - Stormwater management
  - Building codes
  - Capital improvement programs.
  - Open space preservation
  - Dam inspection and monitoring

- Property protection activities are designed to adapt existing structures to withstand natural hazards or to remove structures away from hazard prone areas. Property protection activities include the following:
  - Acquisition
  - Relocation
  - Foundation elevation
  - Insurance – flood and homeowner's
  - Retrofitting (includes activities such as wind-proofing, flood-proofing, and seismic design standards)

- Structural projects lessen the impact of a natural hazard by changing the natural progression of the hazard. These types of projects are usually designed by engineers. Structural projects include the following:
  - Storm sewers
  - Floodwalls
  - Highway Projects
  - Retention Basins
  - Reservoirs
  - Dams
  - Levees
  - Dredging
  - Minor flood control projects
  - Culvert resizing
  - Retaining walls
  - Safe rooms

- Emergency services minimize the impact that a natural hazard has on the residents of a jurisdiction. Usually, actions are taken by emergency response services immediately before, during, or in response to a hazard event. Emergency service activities include the following:
  - Warning systems: sirens / automated calling system
  - Evacuation planning and management
  - Sandbagging for flood protection
  - Emergency response services
  - Protection of critical facilities

- Emergency generators

- Public information and awareness activities are used to educate the residents of a jurisdiction about the potential hazards that affect their area, hazard prone areas, and mitigation strategies they can take part in to protect themselves and their property. Public information and awareness activities include the following:
  - Public speaking events
  - Outreach projects
  - Availability of hazard maps
  - School programs
  - Library materials
  - Hazard Awareness Weeks
  - Real estate disclosure
  - Storm Ready Community Program
  - Firewise Community Program
  - CERT Teams and CERT Training
  - Citizens Corps Organizations

- Natural resource protection activities include those that minimize hazard losses and preserve or restore the functions of natural systems. Natural resource protection actions include the following:
  - Sediment and erosion control
  - Stream corridor restoration
  - Watershed management
  - Forest and vegetation management
  - Wetlands preservation and management

The goals and objectives for hazard mitigation in Fulton County were developed on a multi-jurisdictional basis. The mitigation activities defined for each goal and objective were largely based on the capability of the county to complete the activities given their geographical location and financial capability. Specific projects included in this plan or evolved out of participation in this planning process.

Table 5.46 Fulton County Hazard Summary Table

HIGH RISK HAZARDS	THUNDERSTORM WIND HAIL FLOOD TORNADO
MODERATE RISK HAZARDS	EARTHQUAKE WINTER STORM RIVER EROSION / DEPOSITION
LOW RISK HAZARDS	LANDSLIDE WILDFIRE

SOURCE: Fulton County MPT 2022

Thunderstorm Wind/Hail Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Listen to the latest forecasts, especially when planning outdoor activities.
- Keep a NOAA weather radio with extra batteries nearby to listen for weather updates.
- Listen especially for severe thunderstorm watches and warnings.
- Practice lightning safety.
  - Outdoor activities should not take place when lightning is present.
  - Fully enclosed vehicles and large permanent buildings provide safe havens from lightning.
- Pursue programs to provide or subsidize the provision of weather radios to low-income populations.
- Promote trimming of tree limbs and debris, particularly in areas close to critical facilities and infrastructure such as power lines.
- Ensure all critical facilities have a backup source of power - generators.

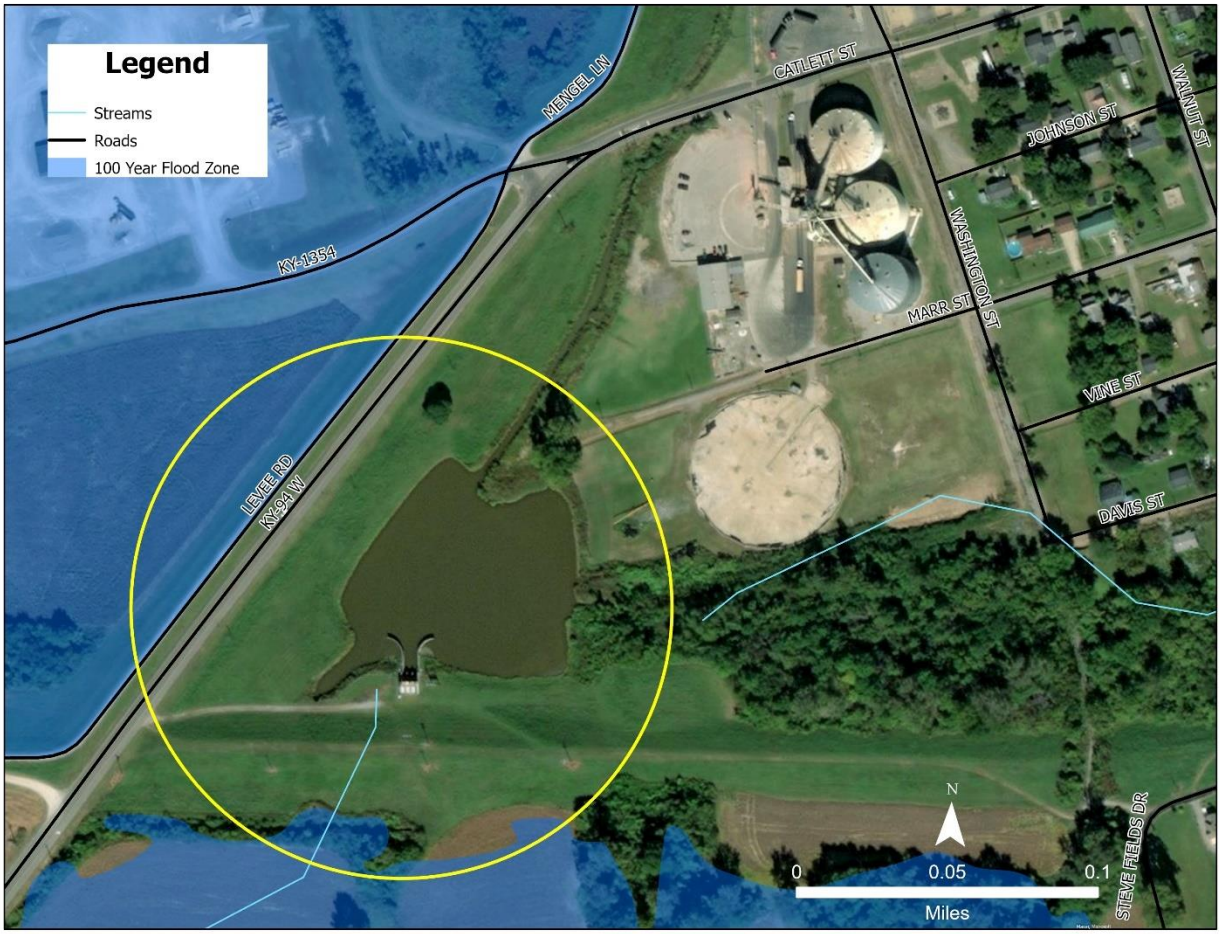
Flash Flood / Flood Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Enforce City and County Floodplain Ordnances.
- Participation in the NFIP.
- Promote the purchase flood insurance.
- Construct/Maintain a levee or flood wall.
- Elevate the lowest floor level of existing structures above the floodplain.
- Elevate flood prone roads.
- When feasible, relocate structures out of the floodplain.
- Acquire and demolish structures in the floodplain.
- Provide openings in foundation walls to allow water to flow in and out.
- Install backflow valves to drains, toilets, and other sewer connections
- Maintain ditches and storm water drainage systems
- Ensure all critical facilities have a backup source of power – generators
- Sedimentation control
- Wetland restoration.
- Stream re-alignment (see City of Fulton project below)
- Increase culvert cross section.
- Dredge existing channels to maintain current depths and flows.
- Identification and removal of stream blockages of tree limbs and trunks forming effective check dams and barrages and resulting in the pooling of water during flood events.
- Continue to monitor and evaluate the vulnerability of repetitive loss properties to determine if Mitigation action is warranted. Take mitigation action elevation, acquisition or other as required.

City of Hickman/Fulton County Flood Mitigation Project

Increase the capacity of the City of Hickman retention basin located between State Route 94 West and Catlett Street. This storm water retention basin may have been undersized when built, but over the years has also had its capacity significantly reduced by sedimentation. Consequently, during periods of heavy rain, it becomes necessary to pump out the retention basin while the ground and ditch drainages downstream are still full or saturated. The result is that this additional water can cause or exacerbate flooding along State Route 94 and tributary Roads. Fulton County and the City of Hickman would both benefit from the expansion of the capacity of this facility. This is a priority mitigation project for the County.

Figure 5.29



City of Hickman Wastewater Plant Flood Protection.

During the most recent Flood Hazard Event along the Mississippi River, DR 1976, significant effort and expense ($187,000) was expended protecting the City of Hickman wastewater treatment plant from rising flood waters. Additional mitigation action, possibly the construction of impervious berms around the facility, needs to be taken to secure the plant against the threat of future flood events.

Figure 5.30 City of Hickman Wastewater Plant Flood Protection

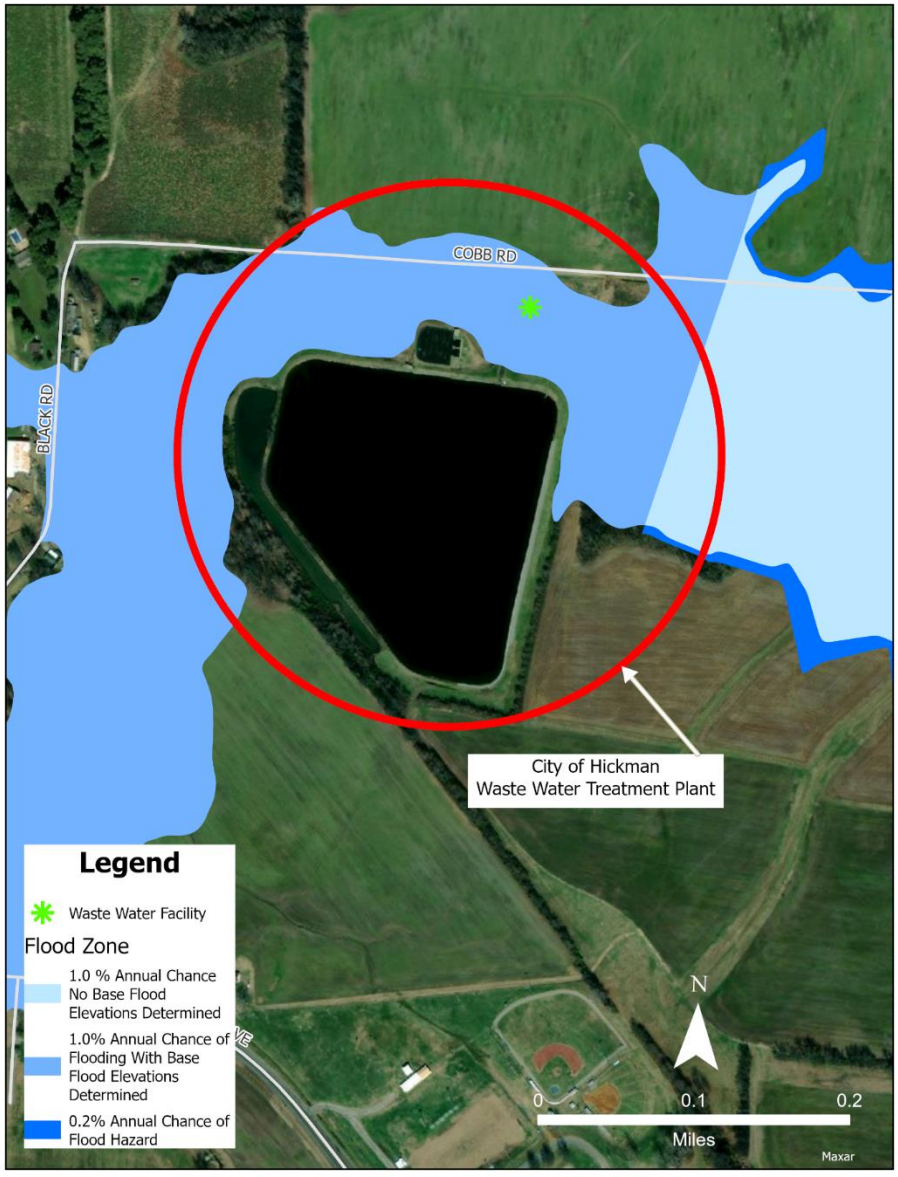
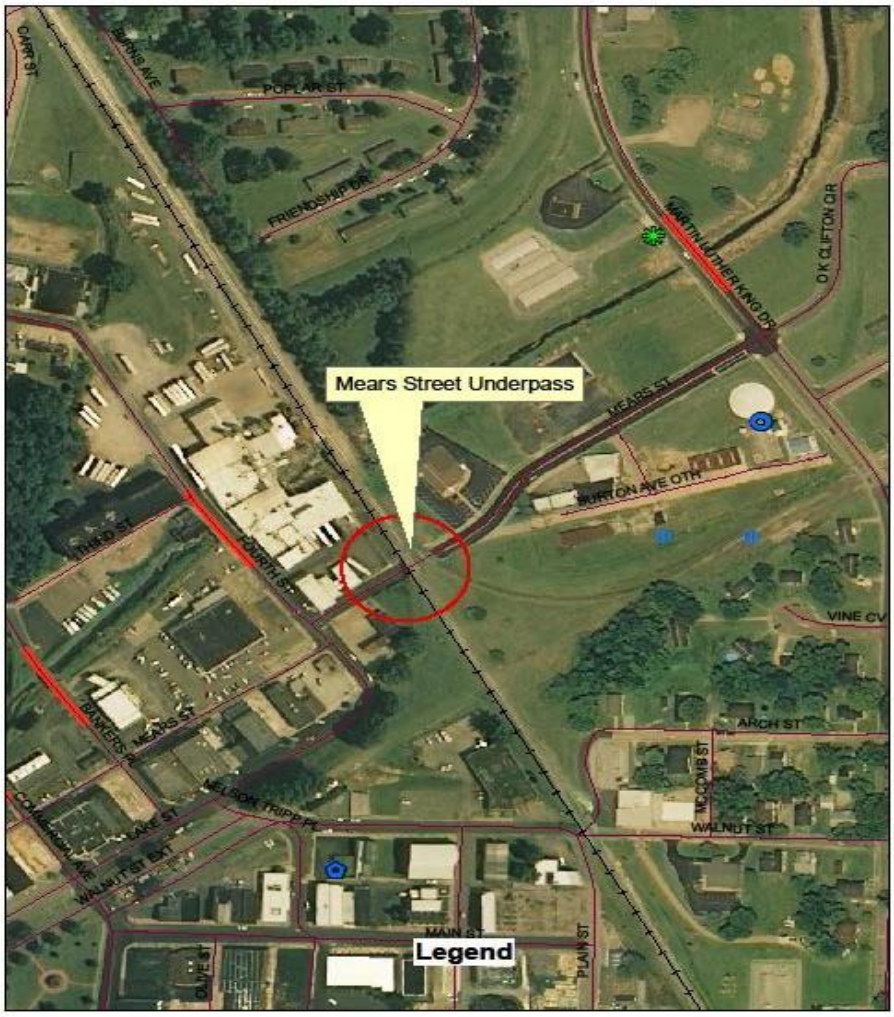


Figure 5.31



River Erosion/Deposition: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Dredge existing channels to maintain current depths and flows
- Identification and removal of stream blockages of tree limbs and trunks forming effective check dams and barrages, and resulting in the pooling of water during flood events

Tornado Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following:

- Develop a plan of action for a tornado event – include home, work, school, and outdoor situations
- Have tornado drills on a regular basis.
- Encourage all households to maintain a disaster supply kit:
  - A three-day supply of water (1 gallon per person per day)
  - Non-perishable food items
  - One change of clothing and shoes per person
  - One blanket or sleeping bag per person.
  - A first-aid kit, including all prescription medicines.
  - A battery-powered NOAA weather radio with warning alarm and extra batteries
  - A flashlight and extra batteries
  - Special items for infants, elderly or disabled individuals
- Listen to the latest forecasts, especially when planning outdoor activities.
- Publicize multi-media access to tornado watches and warnings.
- Inspect designated tornado shelters for compliance with building codes to ensure their ability to withstand high winds.
- Install warning systems that are not completely dependent upon electricity.
- Pursue programs to provide or subsidize the provision of weather radios to low-income populations.
- Evaluate the need for tornado safe rooms, particularly for mobile home parks.
- Analyze the shelter requirements for temporary residents/visitors to the County's Elder Care facilities.
- Evaluate the need for tornado safe rooms, particularly for mobile home parks.
- Initiate mobile home anchoring program.
- Build tornado safe rooms were deemed necessary.
- Ensure all critical facilities have a backup source of power – generators.
- Train, equip and maintain Storm Spotter cadre.
- Build Community Shelters in critical locations.

Earthquake Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Support, encourage, and lobby for the continuing study of the threat of ground shaking from the Wabash and New Madrid Seismic Zones.
- Evaluate public critical facilities and infrastructure to determine their resistance to ground movement.
- Replacement of brittle water and waste water infrastructure specifically cast iron pipe, asbestos cement pipe, and vitreous clay pipe.
- Ensure that all homes and other structures are secured to their foundations.
- Enforce existing seismic building standards (current building code)
- Identify "safe places" in structures that are vulnerable during an earthquake. A safe place might include space under a sturdy table or desk against an interior wall. Stay away from windows.

- Practice the "drop and cover" technique in each identified safe place. Drop under your identified safe place, duck your head between your knees, and cover the back of your neck with your hands. Practice makes this process an automatic response in the event of an earthquake.
- Participate in any/all earthquake planning and exercises at the state and national level.

Winter Storm Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Make sure critical facilities have a backup source of heat.
- Provide public education as to the safe use of back up heat sources.
- Promote trimming of tree limbs and debris, particularly in areas close to critical facilities and infrastructure such as power lines.
- Evaluate subdivision regulations for inclusion of underground utilities for new development.
- Insulate the walls and attic of structures.
- Caulk and weather-strip doors and windows.
- Allow water to slowly drip from faucets to prevent pipes from freezing.
- Check the antifreeze and battery in vehicles.
- Stay off snow- or ice-covered roads if possible.
- Keep a supply of non-perishable food and water.
- Ensure all critical facilities have a backup source of power – generators.
- Maintain residential addressed structure point database for house-to-house recon during widespread power failures.

Landslide Mitigation Actions: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Identify and map vulnerable structures, critical facilities, and risk prone areas.
- Monitor the condition of the USCE Bluff Stabilization in the City of Hickman
- Monitor and discourage construction in close proximity to high-risk landslide areas.

Wildfire Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Each community to strive to be a "Firewise" Community.
- Proper storage of flammables o Class Shingles or tin on roofs o Masonry construction
- Remove plants with resins, waxes, or oils from landscaping.
- Remove dead branches.
- Reduce the amount of fuel around homes.
- Aggressively reduce available fuels in the vicinity of critical facilities
- Amnesty programs for hazardous materials/storage vessels
- Tire amnesty programs
- Removal of potential fuels from the vicinity of Critical Facilities.
- Pursue the acquisition of equipment and training to rapidly respond to brush fires to mitigate their becoming wildfires.

5:5.4 Implementation of Mitigation Measures

The purpose of this section is to provide a road map on how the mitigation actions identified in section 5:5.3 will be prioritized, implemented and administered in Fulton County.

All jurisdictions will adopt the JPHM Plan upon approval in 2023. Each county in the PADD has equal ability to enforce and implement mitigation strategies. The smaller cities in the Purchase Region depend greatly upon the county government, and the PADD for support and combine resources to perform projects that improve the quality of life for residents, including mitigation projects and activities.

Given the (small) size of most of the Purchase region's cities, the planning process from which the following mitigation actions derived and were prioritized occurred at the county level. However, each city was represented at county-level meetings. Further, within each county-level planning meeting, individual city mitigation actions were discussed and prioritized. In practice, a city would derive one or two structural or property protection projects that it intended to pursue during the next five years and, first, discuss these projects' feasibility to implement in terms of local financing. Predictably, local financing was a significant constraint for both the county and its cities.

Preventative, natural resource protection, emergency service measures, and public information mitigation actions certainly were discussed at each planning meeting. However, the actions are not highly specific actions, by nature. Building code enforcement and enhancement, floodplain mapping and data, floodplain regulation, storm-water management, and planning activities, as examples, do not typically appear distinctive amidst a county and its cities. It is generally universally important, uncontroversial, and prescient to enforce codes, map and regulate floodplains, manage storm-water activity, and plan and zone. Similarly, emergency service activities and public information activities are uncontroversial and generally sought (and not mutually exclusively) by both counties and its cities. So, while such activities were discussed individually for counties and for cities, their inclusion within the following mitigation action list will appear similar within each jurisdiction's list. In other words: Fulton County and its incorporated cities, Fulton and Hickman all agreed that preventative activities, emergency service measures, and public information activities primarily should be implemented using local and federal-cum-state financing (e.g., EMPG) and are a high priority for pursuance during the next five years.

The jurisdictions that have participated in the mitigation planning process are listed in this plan. In addition to local participation, the PADD staff has provided professional assistance in GIS and plan development to help enhance the ability of the local jurisdictions to implement mitigation activities.

Funding: Outside of local financing and state financing options, the jurisdictions of the PADD will attempt to utilize the following funding sources in implementing goals, objectives and actions when possible: the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), the Pre-Disaster Mitigation Program (PDM), Hazard Mitigation

Technical Assistance Programs (HMTAP), the National Earthquake Technical Assistance Program, the Wind and Water Technical Assistance Program, and federal-state matching programs. It should be noted that the above list represents known funding sources at the time of this writing. It is not exhaustive.

Project Prioritization: Fulton County will maintain the list of set goals, objectives, and actions that have been identified in this plan. These items were prioritized based on a set of criteria located in the FEMA Multi-Hazard Mitigation Planning Guidance that includes social, technical, administrative, political, legal, economic, and environmental factors (STAPLE+E) within the county jurisdictions.

As mentioned above, this mitigation strategy will divide mitigation actions into Community-Rating System (CRS) categories *preventative activities*, *property protection activities*, *natural resource protection activities*, *emergency services measures*, *structural projects*, and *public information activities*.

Mitigation actions falling under *preventative activities*, *emergency services measures*, and *public information activities* generally (i.e., unless otherwise specified) are process-driven by nature and driven by uncontroversial and laudable goals. It is thus muddying and complicated to subject such measures to a formal, qualitative, and subjective prioritization mechanism like STAPLE+E. How does a community distinguish "technical assistance" or "hazard response operations" or "enforcement of building codes" as of equally or of higher priority than the construction of a community safe room? Consequently, such process-oriented actions are treated as default "High" in priority and are considered pursued by Fulton County and its incorporated cities of Arlington and Bardwell, e.g., Fulton County will "enforce building codes" while its cities may not.

The categories *structural projects*, *property protection activities*, and *natural resource protection activities* primarily will include actions that involve construction activity toward new and existing building structures. It is these intended projects and project categories that were prioritized using STAPLE+E.

Each structural/construction action for each community was given a High, Medium, or Low priority using the STAPLE+E framework. Because STAPLE+E relies upon qualitative and subjective assessment, Table 5.47 defines how each component of the STAPLE+E framework was interpreted. Generally, the mitigation actions with the highest priority were the most cost-effective and most compatible with the jurisdiction's social and cultural values. The below list of structural/construction actions includes a column specifying which components of the STAPLE+E framework as defined below were relevant in the designation of the projects' priority status. "E1" in the project lists refers to the "Economic" consideration. "E2" refers to the "Environmental" consideration.

The PADD staff reviewed each jurisdiction's priorities annually to ensure that they were properly prioritized. The designated council representative from each jurisdiction will be responsible for maintaining this list.

The STAPLE+E criteria guidelines for action prioritization that were given to the council members in order to analyze their actions were as follows:

Table 5.47 STAPLE+E Criteria Explanation

S - Social	Mitigation actions are acceptable to the community if they do not adversely. affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered. and opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority. to implement and enforce a mitigation action.
E – Economic	Budget constraints can significantly deter the implementation of mitigation. actions. It is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.
E - Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Tables 5.48-5.50 represent non-process actions requiring construction or acquisition related to the goals and objectives set forth in this plan, prioritized by each jurisdiction. The table identifies the hazard the action addresses, the action, the action priority, the entity responsible for the action, the potential sources of funding for the action, and to which Community Rating System (CRS) action category each project belongs.

Table 5.51 represents process actions that, thusly, are of High priority to Fulton County *and* to its incorporated jurisdictions equally: For example, it is expected that "adopting and enforcing building codes" applies with equally "High" priority to Fulton County and to its incorporated cities of Fulton and Hickman.

Construction/Non-Process Projects to Be Pursued by Each Jurisdiction:
Table 5.48: Fulton County, Unincorporated

Hazard	Action	Priority	STAPLE+E	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeline
Flooding	Elevate segments of roads prone to flooding	High	S, T, A, P, L, E1, E2	Fiscal Court; KYTC	Local, State, Federal Grant Programs	Structural	On going
Flooding	Acquire/Demolish Repetitive-Loss Properties	High	S, T, A, P, L, E1	Fiscal Court; KYEM; FEMA	FEMA HMA, Local	Property Protection	On Going
Flooding	Relocate Critical Facilities out of flood-prone areas or elevate them	High	S, T, P, L, E2	Fiscal Court; Owners of Facilities	Local, State, Federal Grants Programs	Property Protection	Immediate
Tornadoes	Purchase and Install Emergency Warning Sirens for Cayce and Brownsville Communities	High	S, T, A, P, E1	Fiscal Court	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes	Construct Community Safe Room for the Cayce Community	High	S, T, A, P, L, E1	Fiscal Court	FEMA HMA, Local	Structural; Emergency Services Measures	Immediate
All Identified Hazards	Purchase Generators for Critical Facilities such as the EOC	High	S, T, A, P, E1	Fiscal Court	Local, FEMA HMA	Emergency Services Measures	On Going
All Identified Hazards	Purchase Emergency Power Sources for rural areas' designated shelters	High	S, T, P, L, E1	Fiscal Court	Local, FEMA HMA	Emergency Services Measures	On Going
Flooding		Medium	S, P, L, E1, E2	Fiscal Court; Public Works	Local, Federal Grants	Public Information ; Natural Resource Protection	On Going
Tornadoes; Severe	Trim Trees and Debris from	Medium	S, P, L, E1	Utilities Providers	Private, Local	Preventative Activities	On Going

Storms; Ice Storms	Overhead Powerlines						
Wildfires	Purchase Equipment to suppress brush fires	Medium	S, P, E1	Fire Departments; Fiscal Court	Non-Profit, Private, Local, Federal Grants	Natural Resource Protection	On Going
All Identified Hazards	Upgrade Emergency Services Communication Equipment (for Critical Facilities)	Medium	S, T, P, E1	Emergency Management Agency	FEMA/DHS, Other Federal Grants, Local	Emergency Services Measures	On Going
All Identified Hazards	Energy/Grid Resilience	High	S, T, L, P, E1	Fiscal Court, EMA, Owners of Facilities	FEMA, HMA, Local, State, and Federal Grants	Emergency Services Measures	On Going

Table 5.49: Fulton, City of

Hazard	Action	Priority	STAPLE+E	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeline
Flooding	Study cause of Harris Fork Creek flooding in the vicinity of Wells Ave and identify measures to alleviate flooding	High	S, T, A, P, L, E1, E2	City	Local, State, Federal Grant Programs	Structural	Immediate
Tornadoes	Purchase and Install Emergency Warning Sirens for portions of the City of Fulton that don't have adequate coverage	High	S, T, A, P, E1	City; Fiscal Court	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes	Construct Community Safe Room for the City of Fulton	High	S, T, A, P, L, E1	City	FEMA HMA, Local	Structural; Emergency Services Measures	Immediate
All Identified Hazards	Purchase Generators for Critical Facilities such as City Hall	High	S, T, A, P, E1	City	Local, FEMA HMA	Emergency Services Measures	On Going
Flooding	Identify measures to eliminate flooding in the Mears Street area	Medium	S, T, A, P, L, E1, E2	City	Local, State, Federal Grant Programs	Structural	Immediate

	and implement						
Tornadoes; Severe Storms; Ice Storms	Trim Trees and Debris from Overhead Powerlines	Medium	S, P, L, E1	Utilities Providers	Private, Local	Preventative Activities	On Going
All Identified Hazards	Energy/Grid Resilience	High	S, T, L, P, E1	Fiscal Court, EMA, Owners of Facilities	FEMA, HMA, Local, State, and Federal Grants	Emergency Services Measures	On Going

Table 5.50: Hickman, City of

Hazard	Action	Priority	STAPLE+E	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeline
Flooding	Dredge the Elvis Stahr Harbor	High	S, T, A, P, L, E1, E2	City	Local, State, Federal Grant Programs	Preventive Activities	Immediate
Flooding	Expand the City of Hickman's retention basin	High	S, T, A, P, L, E1, E2	City	Local, State, Federal Grant Programs	Structural	Immediate
Tornadoes	Purchase and Install Emergency Warning Sirens for the areas in the City of Hickman that don't have adequate coverage	High	S, T, A, P, E1	City	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes	Construct Community Safe Room for the City of Hickman	High	S, T, A, P, L, E1	City	FEMA HMA, Local	Structural; Emergency Services Measures	Immediate
All Identified Hazards	Purchase Generators for Critical Facilities	High	S, T, A, P, E1	City	Local, FEMA HMA	Emergency Services Measures	On Going
Tornadoes; Severe Storms; Ice Storms	Trim Trees and Debris from Overhead Powerlines	Medium	S, P, L, E1	Utilities Providers	Private, Local	Preventative Activities	On Going

Landslide	Continue to monitor the Hickman Bluffs Project	Medium	S, T, A, P, L	City, KYEM, USACE	Local, State, Federal Grant Programs	Preventive Activities	Long Term
All Identified Hazards	Energy/Grid Resilience	High	S, T, L, P, E1	Fiscal Court, EMA, Owners of Facilities	FEMA, HMA, Local, State, and Federal Grants	Emergency Services Measures	On Going

Table 5.51: Process Mitigation Actions That Apply to Fulton County and Each of Its Incorporated Cities (Fulton and Hickman) with Equally (i.e., "High") Priority

Hazard	Action	Priority	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeline
All Hazards	Upgrade Emergency Services Communication Equipment (for Critical Facilities)	High	Fulton County Emergency Management Agency	FEMA/DHS, Other Federal Grants, local	Emergency Services Measures	Immediate
Flooding	Enforce NFIP Flood Ordinances	High	County and City Executives; Floodplain Managers	Fiscal Court; City Councils	Preventative Activities	On Going
Flooding	Monitor, Evaluate, Collect Damages Data to determine additional and on existing Repetitive-Loss Properties	High	County EMAs; City-Appointed Designees; Floodplain Managers	Fiscal Court; City Councils	Preventative Activities. Property Protection	On Going
Flooding	Provide Updated Floodplain Mapping and other information regarding flood-prone areas to Public	High	County and City EMA and EM agents; Floodplain Managers	Fiscal Court; KYEM; KDOW	Public Information. Preventative Activities	On Going

All Identified Hazards	Provide generators for all critical facilities	High	County; City; County EMA and EM agents; Floodplain Managers; Insurance	Fiscal Court; City Councils; KYEM	Public Information; Preventative Activities	Immediate
Flooding	Develop a debris removal plan for all streams and ditches	High	County; City	Fiscal Court; City Councils; KYEM; FEMA (through HMGP Initiative)	Preventative Activities	On Going
All Identified Hazards	Public Outreach for the Development of Evacuation Plans and Procedures relevant to All Identified Hazards	High	County; City	Fiscal Court; City Councils; KYEM	Public Information; Emergency Services Measures. Preventative Activities	Long Term
All Identified Hazards	Develop and Implement a Protection Program for Critical Information Systems	High	County; City	Fiscal Court; City Councils	Emergency Services Measures. Preventative Activities	Immediate
All Identified Hazards	Promote the Usage of NOAA Weather Radios	Med	County; City; EMA; EM Agents	Fiscal Court; City Councils	Preventive Activities; Public Information	On Going
All Identified Hazards	Energy/Grid Resilience	High	Fiscal Court, EMA, Owners of Facilities	FEMA, HMA, Local, State, and Federal Grants	Emergency Services Measures	On Going