Cumberland Valley Multi-Jurisdictional, Multi-Hazard Mitigation Plan Update

Bell, Clay, Harlan, Jackson, Knox, Laurel, Rockcastle, and Whitley Counties

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I. Introduction

A. Purpose of the Mitigation Plan

The 2021 Cumberland Valley Multi-Jurisdictional Multi-Hazard Mitigation Plan is an update of the most recent plan approved in 2012. In 2018, officials and citizens from the 25 local jurisdictions – 8 counties and 17 cities – met collectively and then in local groups to begin discussions about the hazards present in their communities and to identify what resources are currently in place to mitigate the hazards. The focus was on natural hazards, as the risk of manmade hazards is not prevalent in the district. The meetings also provided a mechanism for individuals, organizations, local governments, and private industry to collaborate in planning future mitigation efforts.

The 2021 Cumberland Valley Multi-Jurisdictional Multi-Hazard Mitigation Plan was developed in accordance with the current rules and regulations governing regional mitigation plans. The plan will be routinely monitored for compliance with the Robert T. Stafford Disaster Relief and Emergency Assistance Act as Amended by the Disaster Mitigation Act of 2000 (Public Law 106-390, October 30, 2000).

The state of Kentucky is centrally located in the eastern part of the United States. This location enables Kentucky to have four distinct seasons: spring, summer, autumn, and winter. Each season brings potential for dangerous weather conditions. Like the state as a whole, the Cumberland Valley Region is prone to natural hazards. This plan reviews historic data of disasters, assesses the vulnerability to future potential disasters, and develops a mitigation strategy to reduce the effects of future disasters. This mitigation plan is based upon the best available data at the time of writing.

B. The Cumberland Valley Area Development District: Formation and Structure

Kentucky formed 15 Area Development Districts following the passage of the Appalachian Regional Development Act and the Public Works and Economic Development Act of 1965. The districts were directed to promote economic development in collaboration with locally elected officials; business and civic leaders; and representatives of minorities and the poor.

The Area Development Districts (ADDs) were authorized by Kentucky Revised Statute Chapters 147A.050 to 147A.140. Each ADD is governed by a board of directors consisting of elected officials from each local government in the district as well as citizen members from throughout the region. Area Development District employees consist of professionals with a wide range of backgrounds including development, human services, management, planning, and geospatial services. By sharing expertise at the Area Development District level, local governments within each of the ADD jurisdictions are collectively able to utilize the expertise of a professional staff that many of the individual counties and cities could not otherwise access.

The Cumberland Valley Area Development District (CVADD) borders Virginia to the east and Tennessee to the south, including 3,213.91 square miles. There are 8 counties and 17 Home Rule cities within the CVADD. These include:

CVADD Counties and Cities	
County	***Cities within each County***
Bell	Middlesboro
	Pineville
Clay	Manchester
Harlan	Benham
	Cumberland
	Evarts
	Harlan
	Loyall
	Lynch
Jackson	McKee
Knox	Barbourville
	Corbin*
Laurel	London
Rockcastle	Brodhead
	Livingston
	Mt. Vernon
Whitley	Corbin*
	Williamsburg
*Corbin is in both Knox and Whitley Counties	

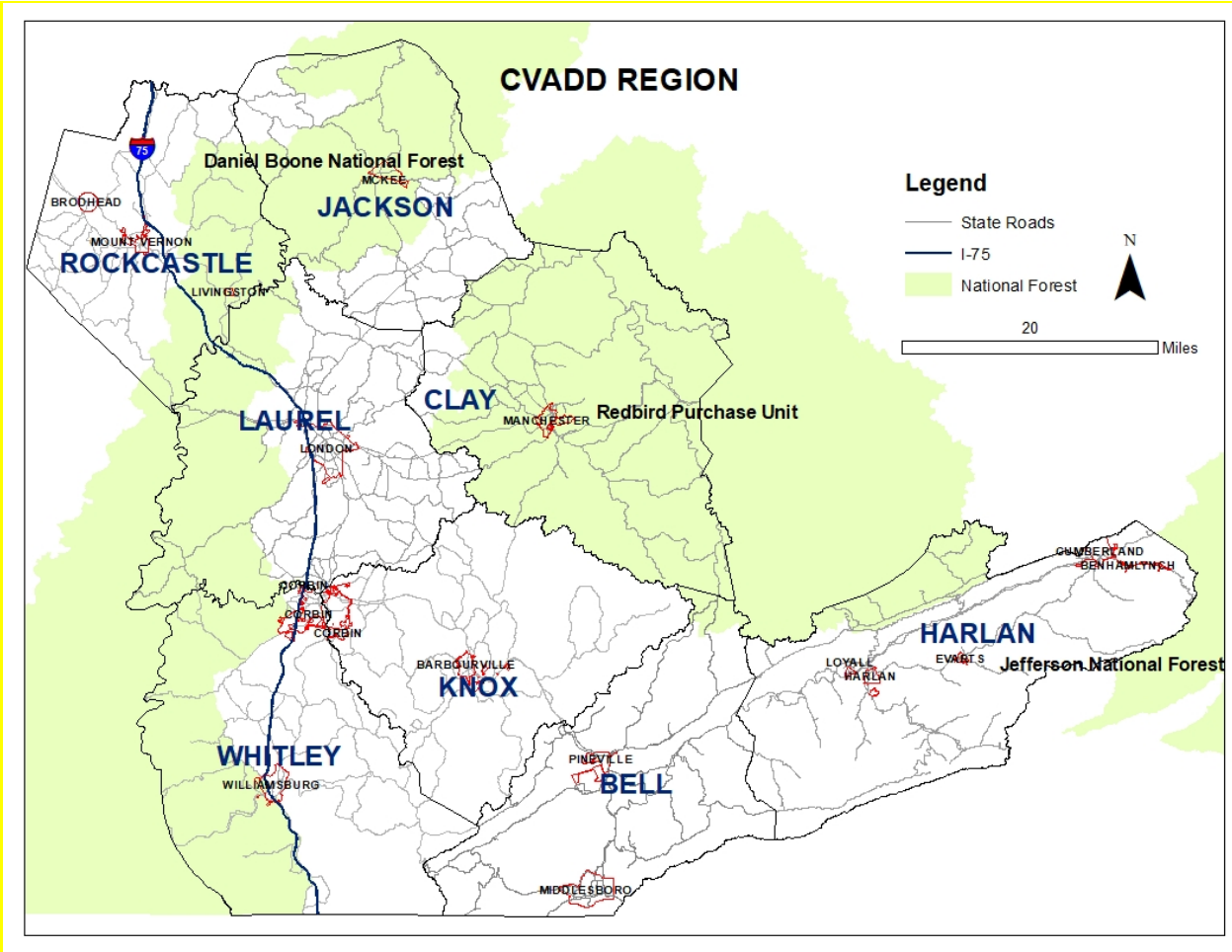

Figure 1 – Map of CVADD Region

C. Land Use

The CVADD is primarily rural and geographically located in the southeast section of Kentucky, which borders Tennessee and Virginia, also known as the Eastern Coal Field Region. The Appalachian Mountains extend into the state in this region, including the highest point in Kentucky located in Harlan County on Black Mountain. The CVADD's topography is hilly to mountainous and is nestled in the heart of the Daniel Boone National Forest. Kentucky has the greatest length of navigable waterways and streams in the continental 48 states[1], and CVADD has its share. This combines to create the lush fields and woodlands in the area, but also increases the potential of flooding. The region's primary watercourse is the Cumberland River. The river flows through the southern portion of the region, which includes the counties of Harlan, Bell, Knox, and then into Whitley County, where the headwaters are located at Cumberland Falls. The municipal areas within each county share land use characteristics with the surrounding counties.

D. Transportation

The CVADD transportation system continues to improve and expand through the implementation of significant transportation projects aimed at increasing overall efficiency of the system and enhancing the safety of the district's transportation infrastructure. Kentucky's Highway Plan, including all projects in CVADD counties, is approved by the Kentucky General Assembly during each new session.

E. Major Highways

The Cumberland Valley region is served by Interstate 75 and the Hal Rogers Parkway as well as several other major state and federal highways. Interstate 75 runs north and south through Whitley, Laurel and Rockcastle counties. US 25 runs north and south crossing and paralleling I-75 through Rockcastle, Laurel, Knox, Bell, and Whitley counties. Hal Rogers Parkway, or KY 80, begins in the City of Somerset in Pulaski County and travels east through the City of London into Clay County and points east. These highways provide access and opportunities to communities throughout the Cumberland Valley region, with I-75 being the primary artery.

F. Airports

There are a few small airports located within Bell, Laurel, Whitley, and Harlan counties. These airports are mainly used for small commercial or private air traffic. Several of the heliports are located at local hospitals to provide emergency medical transportation.

City of Middlesboro	ARH Heliport
	Air Evac 33 Heliport
	Middlesboro – Bell Co. Airport
City of Cumberland	ARH Tri-City Clinic Heliport
City of Manchester	Manchester Memorial Hospital Heliport
	Sky Airport (Private)
City of Barbourville	Knox County Hospital Heliport
City of London	London – Corbin Airport
	Chestnut Knolls Airport (Private)
	Kentucky One Health Heliport
	Tec Field Airport (Private)

[1] Cooper, Kent. *Kentucky.* Retrieved from https://www.newworldencyclopedia.org/entry/Kentucky on 6/11/20.

City of Brodhead	Crawford Ultralight (Private)
City of Mt. Vernon	Rockcastle Hospital Inc. Heliport
City of Williamsburg	Carr Airport (Private)
	Williamsburg – Whitley Co. Airport
Harlan County	Harlan Hospital Airport
	Tucker-Guthrie Memorial Airport

G. Railroad

CSX, based in Jacksonville, Florida, provides rail services to seven of the eight counties within the Cumberland Valley region. Jackson County is not served by the railroad. Currently, there are no passenger trains that serve the Cumberland Valley region. Rail companies typically notify local officials if volatile materials or other potentially dangerous cargo is transported through the region. However, this rarely occurs.

H. Public Transportation

The CVADD region is served by three public transportation providers: RTEC, Daniel Boone Community Action Agency, and Harlan County Community Action Agency.

CVADD Transportation at a Glance	
Airport	4 General Aviation or Reliever NPIAS
Highways	2111.464 Total State Maintained Roads
Railroads	4 Rail Yards
Bike/Pedestrian	2 USBRS Trails, 7.41 Miles of Rail Trails and 191.788 Miles of Sidewalks, Bike Lanes, Cross Walks, Multi-Use Paths, and Pedestrian Bridges
Transit	3 Rural Transit Systems
Source: KY Transportation Cabinet, Division of Planning – State Primary Road System Data & KY Office of Highway Safety	

I. Water & Wastewater

Projects initiated through strategic planning by the CVADD Water Management Planning Council (WMPC) and local leaders have continued to make great strides in achieving the state's goal of making safe drinking water available to every household in Kentucky. Approximately 97% of the residences located within the CVADD have access to public drinking water and approximately 33% have available public sewage treatment services.

During the FY 2016 CVADD WMPC review, it was noted that repair and/or replacement of aging infrastructure is a common need throughout the region, particularly in Bell, Jackson, Harlan, Knox and Rockcastle counties. Unserved consumers within these areas include: Bell County – 398; Jackson County – 610; Harlan County – 35; Knox County – 150; Rockcastle County – 13. These numbers were confirmed as unchanged in 2021.

Other needs in the region are water storage, regionalization, source protection, improved security, economic stimulation and meeting regulatory requirements. Extending lines to unserved customers is also a primary need in the region because of the Council's goals to extend lines to underserved households as soon as possible. Miles of older lines have been replaced since 2001 when the planning process began; however, many line connections installed before 1930 are still in use.

During FY2021, Cumberland Valley ADD wastewater planning needs to include extending lines to unserved areas, repairing and replacing existing infrastructure, new collector sewer and appurtenances, sanitary sewer overflow correction, meeting regulatory requirements, ground water protection, regionalization and improving security. Lack of wastewater services in rural areas is a major challenge.

J. Industrial Parks

The Cumberland Valley region is served by numerous industrial parks, from individual county parks to super-regional industrial parks that span several hundred acres. These industrial parks have allowed for the attraction of many businesses and manufacturing firms that have spurred the region forward in economic growth. In addition, local industrial authorities have implemented strategies to further spur economic development and business locations through continued industrial park development.

Regional Industrial Parks

- Southeast Kentucky Regional Business Park – Located in Knox County and serves Bell, Clay, Knox, Laurel, McCreary, and Whitley County
- Elk Hill Regional Park – Located in Clay County and serves Clay, Leslie, and Knox Counties
- Coal Fields Regional Industrial Park – Located in Perry County and serves Perry, Harlan, Leslie, Breathitt, and Knott Counties

County Industrial Parks

Bell County

- Whitimer Industrial Park
- Bell County Technology and Training Park

Jackson County

- Jackson County Regional Industrial Park

Knox County

- Barbourville Business Park
- Corbin Tri-County Industrial Park

Laurel County

- London-Laurel County Industrial Park
- Dennis Karr Airpark
- Fariston Industrial Park
- Greer Industrial Park

Rockcastle County

- Rockcastle County Industrial Park South

K. Population Trend

From 2010 to 2020 (estimated), the population in the CVADD region declined 2% as compared to the increase of the State at 7.68% and the US at 7.7%. According to estimates by Census.gov, out migration is responsible for the recent population decline in the CVADD region, which accounts for approximately 4,871 people who have left the region since 2010. Laurel County is the only county in the region with a positive net migration (more people moving into the county than moving out), with the population increasing from 58,849 in April 2010 to 62,613 in April 2020 – an increase of 6.4%.

Historic & Projected Populations 2000-2030

Geographic Area	Census 2000	Census 2010	2019 Estimate	Projection 2020	Projection 2025	Projection 2030
US	281,421,906	308,745,538	328,239,523	334,503,000	347,335,000	359,402,000
Kentucky	4,041,769	4,339,367	4,467,673	4,672,754	4,634,415	4,951,178
CVADD	238,270	236,618	230,189	231,747	227,836	222,647

Source: KY State Data Center and US Census Bureau

II. History of Federal Disaster Declarations

From 2000 through 2020, the Federal Emergency Management Agency (FEMA) made 24 major disaster declarations, all but two weather related (the other two were for the COVID-19 pandemic).

Federal Disaster Declarations in CVADD Counties

DR#	Declaration Date	Disaster Type	Total Declared Counties	CVADD Counties Declared for Public Assistance and Individual Assistance	Counties Declared for Public Assistance Only	Counties Declared for Individual Assistance Only
1407	4/3/2002	Storms and Flooding	30	Bell, Clay, Harlan, Knox, Laurel, Whitley	0	0
1414	5/6/2002	Severe Storms, Tornadoes, and Flooding	32	Clay, Jackson, Knox, Laurel, Rockcastle, Whitley	0	0
1454	3/14/2003	Severe Winter Storms	30	Clay, Knox	Whitley	0
1471	6/3/2003	Severe Storms, Flooding, Mud and Rock Slides, and Tornadoes	38	0	0	Knox
1523	6/10/2004	Severe Storms, Tornadoes, Flooding, and Mudslides	78	Bell, Clay, Harlan, Jackson, Knox, Laurel, Rockcastle, Whitley	0	0
3231	9/10/2005	Hurricane Katrina Evacuation	120	0	Bell, Clay, Harlan, Jackson, Knox, Laurel, Rockcastle, Whitley	0
3302	1/28/2009	Severe Winter Storm	110	0	Clay, Jackson	0
1818	2/5/2009	Severe Winter Storm and Flooding	103	0	Clay, Jackson, Rockcastle	0

DR#	Declaration Date	Disaster Type	Total Declared Counties	CVADD Counties Declared for Public Assistance and Individual Assistance	Counties Declared for Public Assistance Only	Counties Declared for Individual Assistance Only
1841	5/29/2009	Severe Storms, Tornadoes, Flooding, and Mudslides	24	0	Clay, Jackson	0
1912	5/11/2010	Severe Storms, Flooding, Mudslides, and Tornadoes	76	Jackson, Rockcastle	Clay	0
1976	5/4/2011	Severe Storms, Tornadoes, and Flooding	76	0	Clay, Harlan	0
4008	7/25/2011	Severe Storms, Tornadoes, and Flooding	7	Bell, Knox	0	0
4057	3/11/2012	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	21	Laurel	0	0
4216	4/30/2015	Severe Winter Storms, Snowstorms, Flooding, Landslides, and Mudslides	41	Harlan, Jackson, Knox, Rockcastle	0	0
4218	5/12/2015	Severe Winter Storm, Snowstorm, Flooding, Landslides, and Mudslides	51	Bell, Clay, Harlan, Jackson, Knox, Rockcastle, Whitley	0	0
4239	8/12/2015	Severe Storms, Tornadoes, Straight-line Winds, Flooding, Landslides, and Mudslides	34	0	Clay, Jackson, Rockcastle	0
4278	8/26/2016	Severe Storms, Tornadoes, Flooding, Landslides, and Mudslides	20	0	Clay	0

DR#	Declaration Date	Disaster Type	Total Declared Counties	CVADD Declared for Public Assistance and Individual Assistance	Counties Declared for Public Assistance Only	Counties Declared for Individual Assistance Only
4358	5/12/2018	Severe Storms, Flooding, Landslides, and Mudslides	22	0	Bell, Clay, Harlan, Knox, Whitley	0
4428	5/17/2019	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	61	0	Bell, Clay, Harlan, Jackson, Knox, Laurel, Rockcastle, Whitley	0
3469	3/13/2020	COVID-19	38	0	Rockcastle, Whitley	0
4497	3/28/2020	COVID-19 Pandemic	120	0	Bell, Clay, Harlan, Jackson, Knox, Laurel, Rockcastle, Whitley	0
4540	4/24/2020	Severe Storms, Flooding, Landslides, and Mudslides	27	0	Bell, Clay, Harlan, Knox, Whitley	

Two of the disaster declarations, DR-4057 and DR-4216, showcase the volatility of Kentucky's weather. In February of 2012, Kentucky experienced severe storms, tornados, straight line winds, and flooding. This severe storm system contained an EF2 tornado that struck East Bernstadt in Laurel County, killing 6 and injuring 40 people. In February of 2015, Kentucky was hit with winter storms, snowstorms, flooding, landslides, and mudslides. Both disasters happened during the same month within a three-year time span and vary drastically in weather events. The variety and frequency of these natural disasters emphasizes the importance of mitigation planning to minimize the impacts of such disasters. Below is a brief profile of each county and city, all of which have been subject to a FEMA disaster declaration in the past five years. An expanded discussion of weather hazards in each county is provided later in the document.

No weather-related disasters were declared in Kentucky between April 2020 and December 2020.

III. Counties and Cities in CVADD

A. Bell County

Bell County, located along Kentucky's southeastern border with Tennessee, was formed in 1867 and is governed by a judge executive and five magistrates. Its county seat is Pineville, and the estimated population in 2019 according to the US census was 26,032. It has lost just over 7% of its population since the 2010 census. It has 13,245 housing units of which 65% are owner-occupied. Only 37% of the population are in the labor force, which likely contributes to its median[2] household income in 2017 dollars standing at $23,558, 50% of the Kentucky median income of $46,535 and 41% of the US median income of $57,652.[3] A factor that may have an impact on hazard event responses is the fact that 26% of the county's population under 65 is disabled, as compared to 6.3% in Kentucky and 8.7% nationwide. Any evacuation and/or recovery will need to address the needs of the disabled population both for removing them from their residences and meeting their needs post-event if new housing must be located.

Bell County's land area encompasses 359 square miles[4] of primarily mountainous land; according to McGrain and Currens (1978), "flat areas are almost nonexistent"[5] except along Yellow Creek and the Cumberland River. Pine Mountain is a ridge that begins in Whitley County and extends through Bell County before terminating in Pike County; it is one of the most distinctive topographic features in the state, despite not being the highest. Cumberland Mountain runs parallel to Pine Mountain and includes the highest peak in Bell County at 3,500 feet, in the vicinity of White Rock lookout tower. "The sides of many of the mountain peaks and ridges are quite steep", which contributes to the fact that "(t)he communities are all located in the valleys."[6,7] There are two home-rule cities in Bell County:

> The City of Middlesboro is in south-central Bell County close to the Tennessee line and has a population of 9,326, according to the US Census 2018 estimate.[8] It is the largest city in southeastern Kentucky.
>
> The City of Pineville is located close to the center of Bell County. It is the county seat and has a population of 1,734[9]. Pine Mountain runs adjacent to the town, and the Cumberland River runs through it.

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[2] "Median household income" refers to the middle point of income for that population; that is, half of the population makes more than that amount, and half the population makes less. For income, this is a more useful measure than "average/mean", as an average can be distorted by very high values or very low values at either end that may actually represent very few people.

[3] US Census. Quick Facts Bell County, KY. Retrieved from https://www.census.gov/quickfacts/bellcountykentucky on 8-16-2019.

[4] US Census. Quick Facts Bell County, KY.

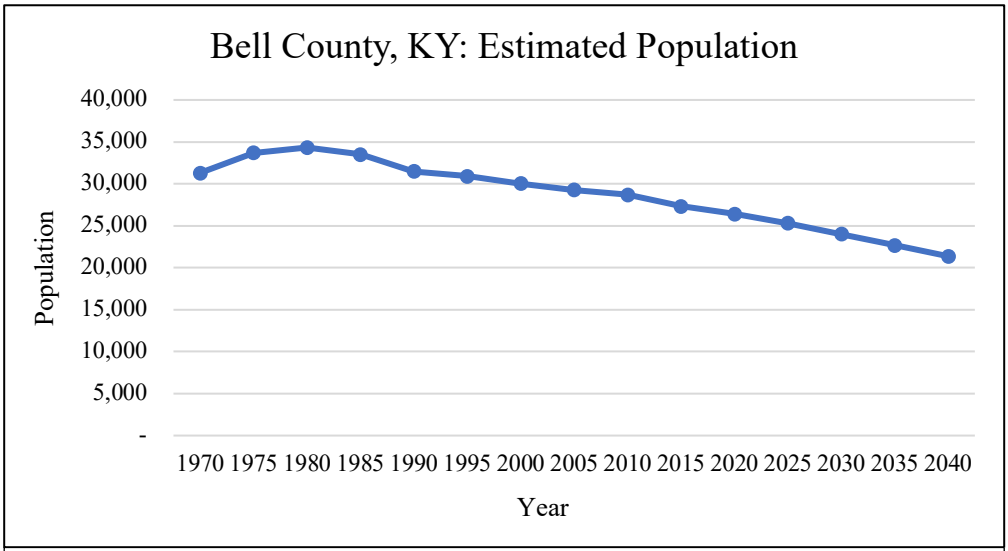
[5] University of Kentucky. "Topography. Discussion from McGrain and Currens (1978)". Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Bell/Topography.htm on 8-16-19. First paragraph.

[6] University of Kentucky. "Topography: Discussion from McGrain and Currens (1978)". Paragraphs 5&6.

[7] The information on topography is summarized from the above reference.

[8] US Census. Quick Facts Middlesboro City, KY. Retrieved from https://www.census.gov/quickfacts/fact/table/middlesboroughcitykentucky,bellcountykentucky/PST045218 on 8-19-19.

[9] Retrieved from http://www.city-data.com/city/Pineville-Kentucky.html on 9-12-19.



Source: U.S. Census Bureau & KY State Data Center

B. Clay County

Clay County, located north of Bell County and east of Laurel County, had a population of 20,345 as of 2020. It was originally created in 1807, but later lost much of its size by contributing to the formation of eight other counties, reaching its current size of 471 square miles in 1880. It is the largest county by land mass in the CVADD area. It is governed by a judge executive and six magistrates.

Clay County has lost 6.8% of its population since the 2010 census. It has 9,043 housing units with 71.3% owner-occupied. Only 37.6% of the population are in the labor force, which likely contributes to its median household income in 2017 dollars standing at $24,596, only 53% of the Kentucky median income of $46,535 and 42.6% of the US median income of $57,652. A factor that may have an impact on hazard event responses is the fact that 21.4% of the county's population under 65 is disabled, as compared to 6.3% in Kentucky and 8.7% nationwide.[10] Any evacuation and/or recovery will need to address the needs of the disabled population both for removing them from their residences and meeting their needs post-event if new housing must be located. Clay County has the lowest percentage of high school graduates of any CVADD county, with only 63% of residents over 25 having completed high school or received a GED. It barely edged out Bell County for lowest percentage of college graduates at 9.5%.

The majority of land in Clay County is a part of the Daniel Boone National Forest and is heavily forested. The highest elevations are in the southern part of the county near the Bell and Knox county lines. Manchester, the county seat, is located in the valley of Goose Creek near the center of the

[10] US Census. Quick Facts Clay County KY. Retrieved from https://www.census.gov/quickfacts/fact/table/claycountykentucky/PST045218 on 8-19-19.

county. The terrain includes nearly equal amounts of mountains and valleys, creating an environment amenable to living and farming.[11]

There is one home-rule city in Clay County:

The City of Manchester is the county seat of Clay County with a population of 1,161.

C. Harlan County

Harlan County was the 60th of Kentucky's 120 counties to be formed, identified as an official part of the state in 1819.[12] As of 2020, the county had a population of 26,831, 8.4% fewer than in 2010. Harlan County is led by a judge-executive and five magistrates.

Harlan County has 13,621 housing units, with 68.4% of them owner-occupied. The median value is $69,900. Only 43.1% of residents over 16 are in the labor force, while 27.3% under the age of 65 are on disability – more than three times the rate in the US as a whole at 8.7%, twice that of Kentucky at 13%, and the highest percentage in the eight-county district. The median home value is $53,500, the lowest in the district. As in Clay County, nearly half of Harlan County residents – 41.5% - are in poverty. The county falls in the middle with education, with 71.4% of residents over 25 having a high school degree and 11.4% having college degrees. Harlan has been hit hard by reduction in coal mining in the state, which contributes to the reduced population, poverty, and low home values.

Harlan County has two mountain ridges traversing the county, Pine Mountain and Cumberland Mountain, with Black Mountain rising between them to the greatest height in the state at 4,139 feet. These features combine to created "some of the most rugged terrain in the Commonwealth".[13] It covers 466 square miles of land, making it the second largest by land mass in the CVADD area; Clay County has only 5 more square miles of land. Harlan County shares a long border with Virginia.

There are six home-rule cities in Harlan County, all with Mayor-Council type governments.:

The City of Harlan is the county seat, located south of the Pine Mountain ridge in the western third of the county. Population in 2017 was 1,551.[14]
The City of Benham is located in the far northeastern section of the county, along Pine Mountain. Population in 2017 was 442.[15]
The City of Cumberland is located in the far northeastern section of the county, along Pine Mountain and close to Benham and Lynch. Population in 2017 was 1,998.[16]
The City of Evarts is located in the middle of the county, some miles south of Pine Mountain ridge. Population in 2017 was 824.[17]

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[11] University of Kentucky. "Topography: Discussion from McGrain and Currents (1978)" Clay County. Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Clay/Topography.htm on 8-19-19.
[12] Kleber, John E. The Kentucky Encyclopedia. Lexington, KY: The University Press of Kentucky. Page 408. Retrieved from https://books.google.com/books?id=8eFSK4o--M0C&pg=PA408#v=onepage&q&f=false on 8-20-19.
[13] University of Kentucky. "Topography: Discussion from McGrain and Currens (1978) – Harlan County". Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Harlan/Topography.htm on 8-20-19.
[14] Retrieved from http://www.city-data.com/city/Harlan-Kentucky.html on 9-12-19.
[15] Retrieved from http://www.city-data.com/city/Benham-Kentucky.html on 9-12-19.
[16] Retrieved from http://www.city-data.com/city/Cumberland-Kentucky.html on 9-12-19.
[17] Retrieved from http://www.city-data.com/city/Evarts-Kentucky.html on 9-12-19.

The City of Loyall is located close to Harlan in the western third of the county, close to Pine Mountain ridge. Population in 2017 was 622.[18]
The City of Lynch is located in the far northeast of the county, very close to Lynch and not far from Cumberland. Population in 2017 was 665.[19]

D. Jackson County

Jackson County is north of Clay County and east of Rockcastle County. With a population of 13,442, it is the smallest of the CVADD counties in numbers but has retained most of its population in recent years, with only a 0.4% reduction in population from 2010 to 2018. It was established in 1858; the county seat, McKee, was likewise founded in 1858. McKee is located centrally in the county on the headwaters of Indian Creek.[20] Its land area is 345 square miles, and it is governed by a judge executive and three magistrates.

There are 6,632 housing units in Jackson County with an owner occupancy rate of 74.8% and a median home value of $69,900. Fewer than 50% of citizens over 16 are in the labor force, at 43.1%, while 26.4% under 65 are on disability and 31.4% are in poverty. The median household income, however, is fourth highest in the region at $32,055, nearly $10,000 more/year than Bell County and only $5,000 less than the highest median household income in Laurel County, which comes in at $37,235. The county is also fourth highest in high school graduates over 25, with 74.3%, and fifth in college graduates at 10.5%.

Jackson County has a consistently mountainous topography, with few large valleys. Most flat land is narrow and tracks with waterways, which limits its viability as a farming center and also makes it at great risk for flooding as rainwater flows down the steep mountains and pools in valleys with scant room for spreading.[21] With 345 square miles of land, Jackson County is the second smallest county in land mass, 30 square miles larger than Rockcastle County.

There is one home-rule city in Jackson County; it has a Mayor-Council form of government:

The City of McKee had a population of 785 in 2017.[22] It is located in the center of Jackson County, at the intersection of US 421, KY 89, and KY 290.

E. Knox County

Knox County is nestled in the center of the CVADD region, with Laurel and Clay counties to the north and Whitley and Bell to the south. It was formed in 1799. While the county seat for Knox County is Barbourville, its largest city is Corbin, which is located at the junction of Laurel, Knox, and Whitley counties in the northwest corner of Knox. The county has the third highest population in the CVADD

[18] Retrieved from http://www.city-data.com/city/Loyall-Kentucky.html on 9-12-19.
[19] Retrieved from http://www.city-data.com/city/Lynch-Kentucky.html on 9-12-19.
[20] Bawden, Jen. "Brief Early History of Jackson County". Kentucky History and Genealogy Network, Inc. Retrieved from https://khgninc.org/brief-early-history-of-jackson-county/ on 8-19-19.
[21] University of Kentucky. "Topography: Discussion from McGrain and Currens (1978) Jackson County". Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Jackson/Topography.htm on 8-20-19.
[22] Retrieved from http://www.city-data.com/city/Lynch-Kentucky.html on 9-12-19.

region at 31,145 in 2019, much of it clustered in the Corbin area. It is retaining its population well, losing only 1.8% since 2010.

Knox County has 14,759 housing units, with 63.30% owner occupied. Median household value is $76,900. It has the lowest disability rates in the region, with only 13.3% of residents under 65 receiving disability support, although its median household income stagnates at $26,061 and 32.2% of its citizens are in poverty. While 68% of county residents over the age of 25 have high school degrees or GEDs, only 10% have college degrees.

The county, with 366 square miles of land, has the mountainous topography characteristic of the region, but the hills are gentler and the valleys larger. The highest point is 2,322 feet at a mountain peak near the Knox-Bell County line two miles south-southwest of the community of Kayjay.[23]

There is one home-rule city in Knox County:

> The City of Barbourville, with a population of 3,104 in 2017[24], is nearly at the geographic center of the county.

F. Laurel County

Laurel County has the largest population in the CVADD area with 60,813 as of 2019. This is reflective of its position as a regional shopping and industrial area. Its location along I-75, a major north-south corridor between Michigan and Florida, has helped it diversify its economic base and serve as a bedroom community for workers driving to other counties. Laurel Lake is a major tourist destination. The county seat, London, has a population of 8,043, making it the second largest city in the CVADD area, second only to Middlesboro in Bell County. It was founded in 1825, formed from parts of Rockcastle, Clay, Knox, and Whitley counties.

The county population increased by 3.1% between 2010 and 2018, nearly twice the increase for Whitley County at 1.7%; the other six counties lost population. Laurel County has 25,988 housing units with 69.1% owner occupancy. The median home value is $102,000, nearly $20,000 more than the next highest median value in the region. There are other signs that Laurel County is the most prosperous in the CVADD area, the most economically sound, and the best prepared for growth: Nearly 80% of the residents over 25 have a high school degree or GED, and nearly 20% have bachelor's degrees. The median household income is $37,235, with 52.7% in the work force. The county has the second lowest poverty rate at 24.3%, just a few points higher than Kentucky's poverty rate of 17.2%, but still nearly twice the rate of the nation at 12.3%.

The topography of Laurel County is much more rolling, with larger valleys and fewer hills than in other counties further east. The Rockcastle River forms the western boundary and part of the northern boundary of the county, [25] and joins the Laurel River 3.5 miles east of the mouth of Rockcastle River. The man-made Laurel Lake serves as a major recreational area in the region.

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[23] University of Kentucky. "Topography: Discussion from McGrain and Currens (1978) – Knox County". Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Knox/Topography.htm on 8-21-19.
[24] Retrieved from http://www.city-data.com/city/Barbourville-Kentucky.html on 9-12-19.
[25] University of Kentucky. "Topography: Discussion from McGrain and Currens (1978) – Laurel County". Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Laurel/Topography.htm on 8-22-19.

There is one home rule city in the county:

The City of London, the county seat of Laurel County, is located near the geographic center of the county, at the intersection of US 80 and US 25. It had a population of 8,043 in 2017.

G. Rockcastle County

Rockcastle County is the smallest in land mass in the CVADD, with 316 square miles, and the second smallest in population with 16,695 in 2019. It was formed in 1825, and it extends further west than the rest of the counties, beyond the Appalachian foothills that characterize the topography of other CVADD counties. Its highest elevations are only about a third of the height of elevations in Harlan County. However, the close hills still create narrow valleys in the eastern part of the county that increase the potential for flooding, including flash flooding, during significant rain events.[26] Mount Vernon, at the extreme southern edge of the county, has a population of 2,450.[27]

While Rockcastle's population decreased between 2010 and 2018, it was only by 1.8%. It has 7,852 housing units with an owner-occupancy rate of 75.9%, the highest in the CVADD and nearly 9 points higher than the Kentucky rate of 67%. The median cost for a home is $80,800. This promising fiscal picture reflects the education and employment in the county. Nearly 78% of residents over 25 have high school degrees or GEDs, and almost 12% have bachelor's degrees. A robust 51.3% of the work force are employed, although 18.8% of those under 65 are on disability. The median household income is $35,888. The poverty rate is the lowest in the CVADD: 21.3%.

There are three home-rule cities in Rockcastle County:

The City of Brodhead is located near the county's western boundary with Lincoln County, with a population of 1,183 in 2017.[28]
The City of Livingston is located in the southeast section of the county near Laurel County, with a population of 218 in 2017.[29]
The City of Mt. Vernon, the county seat, is located near the geographic center of the county, with a population of 2,446 in 2017.[30]

H. Whitley County

Whitley County is in the southwest corner of the CVADD area, sharing boundaries with Laurel County, Knox County, Bell County, and the state of Tennessee. It was formed in 1818 and had a population of 36,264 in 2019 within a land mass of almost 438 square miles. It is the second most populous county in the CVADD and has 15,473 housing units with an owner-occupancy of 70.4%. The median value of owner-occupied homes is $83,800, the second highest in the region behind Laurel

[26] Topographic-map.com "Rockcastle County". Retrieved from https://en-us.topographic-map.com/maps/1u0/Rockcastle-County/ on 8-23-19.
[27] World Population Review. "Mount Vernon, Kentucky Population 2019" Retrieved from http://worldpopulationreview.com/us-cities/mount-vernon-ky-population/ on 8-23-19.
[28] Retrieved from http://www.city-data.com/city/Brodhead-Kentucky.html on 9-12-19.
[29] Retrieved from http://www.city-data.com/city/Livingston-Kentucky.html on 9-12-19.
[30] Retrieved from http://www.city-data.com/city/Mount-Vernon-Kentucky.html on 9-12-19.

County. Williamsburg, the county seat, had a population of 5,280[31] in 2017. Much of the city of Corbin is also in Whitley County, one of the reasons for its higher population. I-75 also runs through the county, providing opportunities for locals to work in other counties and for local industries to move raw materials and finished goods readily to and from market.

The Appalachian Mountains come down from Maine in a gently curving diagonal, ending in north Alabama. West of the mountains in Kentucky is an area called The Knobs, a transition zone between the mountains and what was in ancient times a savannah. The former savannah is now mostly flat fields undulating with ground subsidences caused by the prevalent karst topography, forming a rolling landscape. Whitley County sits astride this transition area, with sizeable but not large mountains to the east and south, moving through hilly knobs and, in its northwestern reaches, rolling fields. A distinctive range traversing southern Whitley, Pine Mountain climbs to elevations above 4,000 feet in Harlan County. In Whitley County, it includes the highest point in the county at 2,220 feet.

"The Cumberland River crosses the county from east to west and then flows northward, marking the boundary between Whitley and McCreary Counties. This part of the river occupies a narrow, rocky gorge some 400 feet deep, and descends rapidly over a series of shoals, rapids, and falls. Cumberland Falls, which is located here, is the site of one of Kentucky's oldest and most scenic state parks. The lowest elevation in the county, 723 feet, is the normal pool level of Lake Cumberland at the north edge of the county."[32] Laurel River Lake extends into Whitley County as well.

With the combination of interstate access and attractive tourist destinations, Whitley County has built up a larger population and economic base than other counties in the region, second only to Laurel overall. The median household income is $34,103, with 49.8% of those over 16 in the labor force. Only 26.5% are in poverty, which is still twice the national rate but better than many eastern Kentucky counties. Of those under 65, only 15.8% were on disability. Whitley has the highest percentage of high school graduates with 79.1% and is tied with Laurel for most with bachelor's degrees at 19.9%.

Whitley County has two home-rule cities:

> The City of Williamsburg, the county seat, is located roughly in the center of the county, with a population of 5,280 in 2017.
> The City of Corbin is located in the far northeastern corner of the county; the metro area of Corbin extends into Knox and Laurel counties. It had a population of 7,272 in 2017.[33]

IV. Risk Assessment

Understanding how to mitigate and recover from hazards requires first identifying the hazards most likely to occur locally, including history of occurrence and extent of harm caused.

[31] Retrieved from http://www.city-data.com/city/Williamsburg-Kentucky.html on 9-12-19.
[32] University of Kentucky. "Topography: Discussion from McGrain and Currens (1978) – Whitley County." Retrieved from http://www.uky.edu/KGS/water/library/gwatlas/Whitley/Topography.htm on 8-27-19.
[33] Retrieved from http://www.city-data.com/city/Corbin-Kentucky.html on 9-12-19.

A. Identifying Hazards

A risk assessment:

- Looks at potential natural and man-made disasters,
- Identifies which are likely within our jurisdictions,
- Determines the level of serious threat each potential event presents,
- Inventories prevention and mitigation efforts in place, and
- Plans which prevention and mitigation efforts need to be added.

All potential hazards recognized by FEMA were reviewed and discussed at the Hazard Mitigation Plan meetings with area public officials, emergency management professionals, and interested members of the public. These discussions and a review of both hazard research and historic events in the region were utilized in identifying which hazards are likely to occur in the CVADD counties.

The following assessment of natural hazards was developed through input from local officials and community members during the County meetings, historical and scientific data gathered from the Kentucky Climate Center, the National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA), United States Geological Survey (USGS) and the UK Kentucky Geological Survey. Each potential hazard identified by FEMA is included, with a brief discussion of the local risk.

1. Potential Hazards

FEMA recognizes many natural hazards, some of which are unlikely in eastern Kentucky. The major natural hazards include (with brief probability assessment):

a. Geologic hazards

- **Tsunami** – Not possible in the CVADD area as there are no oceanic coastlines.
- **Volcano** – No active volcanoes in the vicinity.
- **Earthquake** – While not on an active fault line, mostly small earthquakes are possible.
- **Land Subsidence/Karst** - Subsidence due to karst geology are most likely in the counties on the western edge of the CVADD. Subsidence due to the collapse of abandoned underground mines is greatest in the eastern counties, where underground mining was most prevalent. However, it has not proven a serious threat to safety in the CVADD area as yet.

b. Topography

- **Landslide** – Most likely in the most mountainous areas of the district. However, many roads in the CVADD are cut along the side of hills/mountains, leaving raw rock walls. Landslides of varying severity occur along these roadways annually.

c. Weather generated hazards

- **Avalanche** – There is rarely sufficient snow, even in the highest regions, for avalanches to occur.
- **Hurricane** – These are unlikely given the district's distance from the ocean. However, the remnants of hurricanes can spin out thunderstorms and tornadoes in the district as they move northeast, the typical trajectory.

- **Severe Thunderstorm** – Likely in all areas of the district.
- **Hailstorm** – Infrequent but possible in all areas of the district.
- **Windstorm/Microburst** – Infrequent but possible in all areas of the district.
- **Severe Winter storm** – Infrequent but do occur occasionally throughout the district.
- **Tornado** – Possible in all areas of the district, but less likely in the more mountainous areas in the eastern counties.

d. *Wildfire* – Extensive burning in uninhabited areas is uncommon. However, burn bans are common in all sectors of the district in late summer and early fall when foliage is often dry and susceptible to rapid spread of fire.

e. Flooding

- **Flash floods** – Probable in all areas of the district, but more likely in the more mountainous areas because of the steep slopes leading to narrow valleys that channel water.
- **General Flooding** – Occurs annually throughout the region, often causing much damage. CVADD counties are most at risk of this hazard.
- **Coastal Flooding** – Not possible, as there are no oceanic coasts.
- **Riverine Flooding** – Frequent throughout the region and often serious, backing up into streams and creeks.

f. *Urban* – there is very little opportunity for urban natural disasters, as there are few truly urban spaces. The greatest risk would be flooding causing damage to homes, streets, and businesses in our small cities and towns, as well as in unincorporated communities.

g. Climate

- **Drought** – There are often mild droughts in the district, especially in late summer and early fall. While it does happen, it is rare for droughts to last continuously more than one season.
- **Extreme Heat** – Temperatures do reach in the 100s occasionally, but usually top out in the 90s. Public health and emergency response officials are aware of the potential for harm to people who have health problems and no air conditioning; often assistance is provided to those people. However, the area is not prone to heat waves that would qualify as a natural disaster.

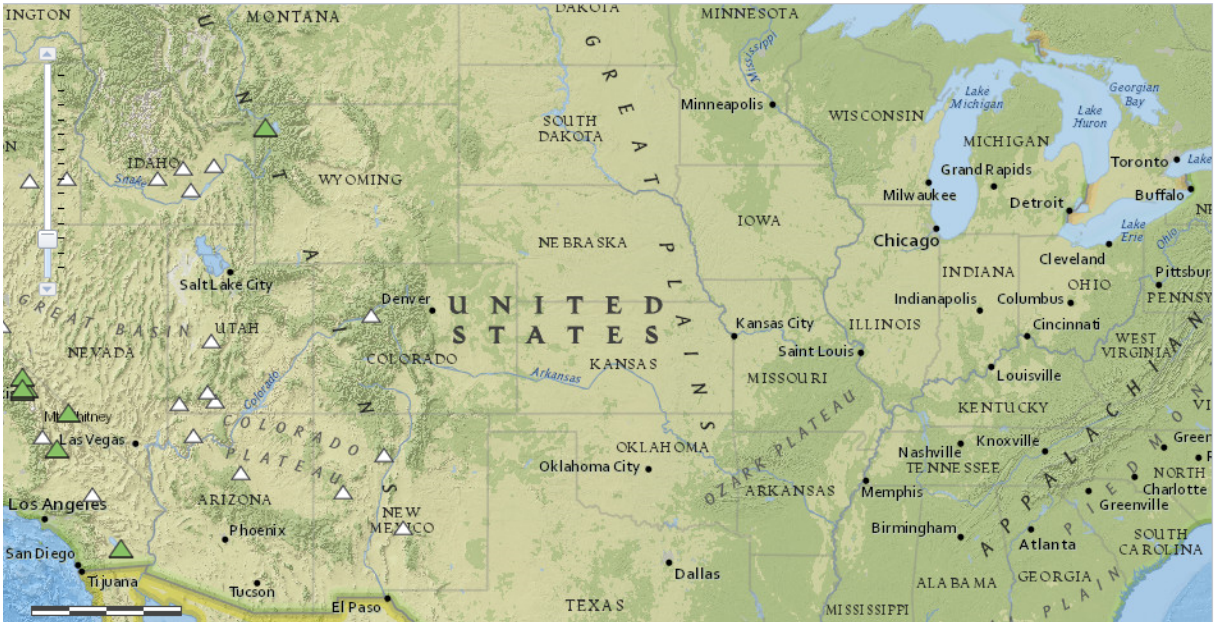
h. Failure of Man-made structures from the impact of natural forces

- **Dam Failure** – There are several dams in the area, so this is a concern.
- **Levee/Flood Wall Failure** – This is possibility in the areas of the district with levees or flood walls.

2. Hazards not detailed

Some of the hazards listed above will not be covered further in this plan because they are not risks for this region. Below are those hazards and the explanation:

Volcano – There are no active or quiescent volcanos located in the CVADD area, in Kentucky, or in adjacent states. The following is a map from the U.S. Geological Survey's Volcano Hazards Programs which shows a region of the United States and the known volcanoes within it.



Tsunami – According to FEMA, "a tsunami is a series of great waves that are created by undersea disturbances, such as earthquakes or volcanic eruptions… Areas at greatest risk are less than 50 feet above sea level and within 1 mile of the shoreline."[34] Kentucky does not have any ocean coastline, and thus cannot be affected by a tsunami.

Tropical Storms/Hurricanes – Kentucky is land-locked and is not close to any coast. However, remnants of tropical storms and hurricanes have been known to sweep far enough inland to dump heavy amounts of rain on Kentucky. High winds are also a possibility, with thunderstorms from the tropical storm able to spin out tornadoes. Local governments need to be aware of this potential and keep a close watch on the trajectory of tropical storms approaching and making landfall on the US. The below map[35] shows how a Category 2 hurricane at landfall in the southeastern USA can send storms and even tornadoes well into the center of the country; at times they will move into Kentucky and eventually bring rain to the northeastern states before exiting to the ocean.

[34] FEMA (January 2013) *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*. Washington, DC: 2013. Page 65.88

[35] Retrieved from https://www.directenergy.com/learning-center/weather-readiness/hurricane on 4-22-2020.

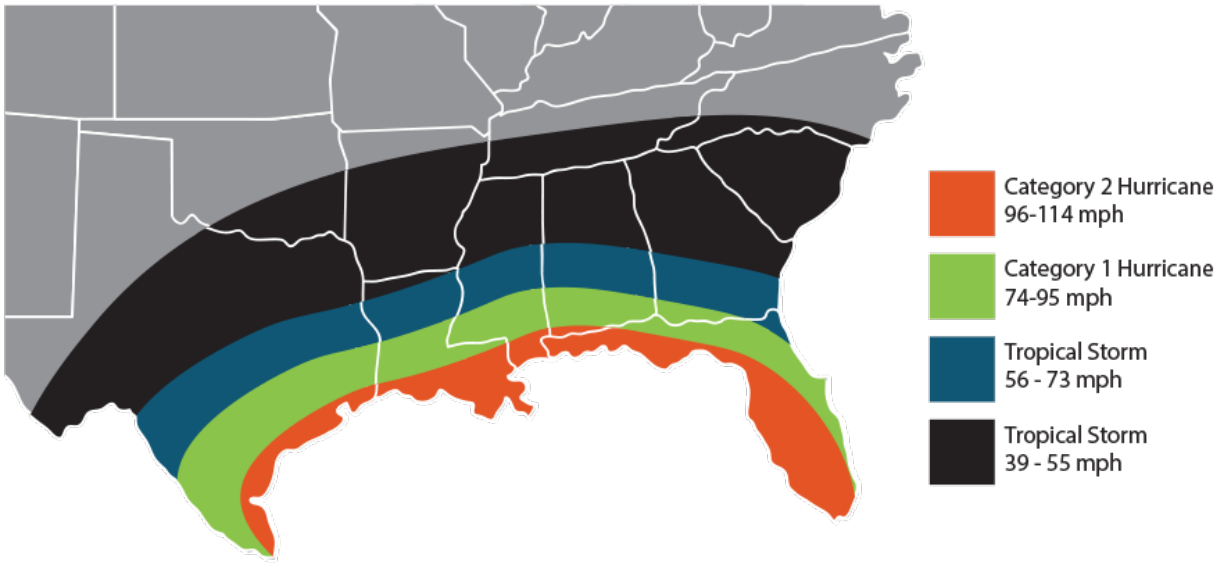


Figure 2: Example of wind reach and type from Category 2 hurricane

B. Profiling Hazards

The natural hazards that face any region are dependent on the climate, geology, water features, and topography of that region. Some hazards occur frequently, some occasionally, others rarely or never in a specific region. The eight counties of the Cumberland Valley Area Development District share a similar topography and climate, with the exception that the mountains become smaller and further apart toward the west, and the potential for subsidence and sinkholes arises from different causes in the east vs west counties of the district. That does have an impact on the types of weather that occur and the likelihood of flash floods and landslides.

1. Flooding

Flooding is one of the most persistent weather hazards in the CVADD. The terrain in all the CVADD counties is hilly to mountainous with numerous streams, creeks, rivers, and lakes. In places the landscape opens into narrow valleys typically following a stream or river. This topographical configuration is perfect for flooding, where water flows down the hills into the streams, which then rise and spread out into the valleys. Often flooding cuts off communities from other parts of the county, limiting access to medical care, work, school, and shopping, which can cause issues from inconvenience to life-threatening situations. Some areas are even prone to flash flooding, where rapid rainfall coupled with steep slopes and homes sited in flood plains can cause damage to property or even physical harm to residents as the water raises quickly and currents become dangerous.

There are several factors that can contribute to flooding. The two key elements are rainfall intensity and duration. Intensity is the rate of rainfall, and duration is how long the rain lasts. Topography, soil conditions, and ground cover also play important roles. As land is converted from fields to roads or parking lots, it loses its ability to absorb rainfall.

100-Year Flood

The term "100-year flood" is a statistical designation stating there is a 1-in-100 chance that a large flood will happen during any year. The actual number of years between floods of any given size varies widely. Since the 100-year flood level is statistically computed using past, existing data, and new data, the level of the 100-year flood will change.

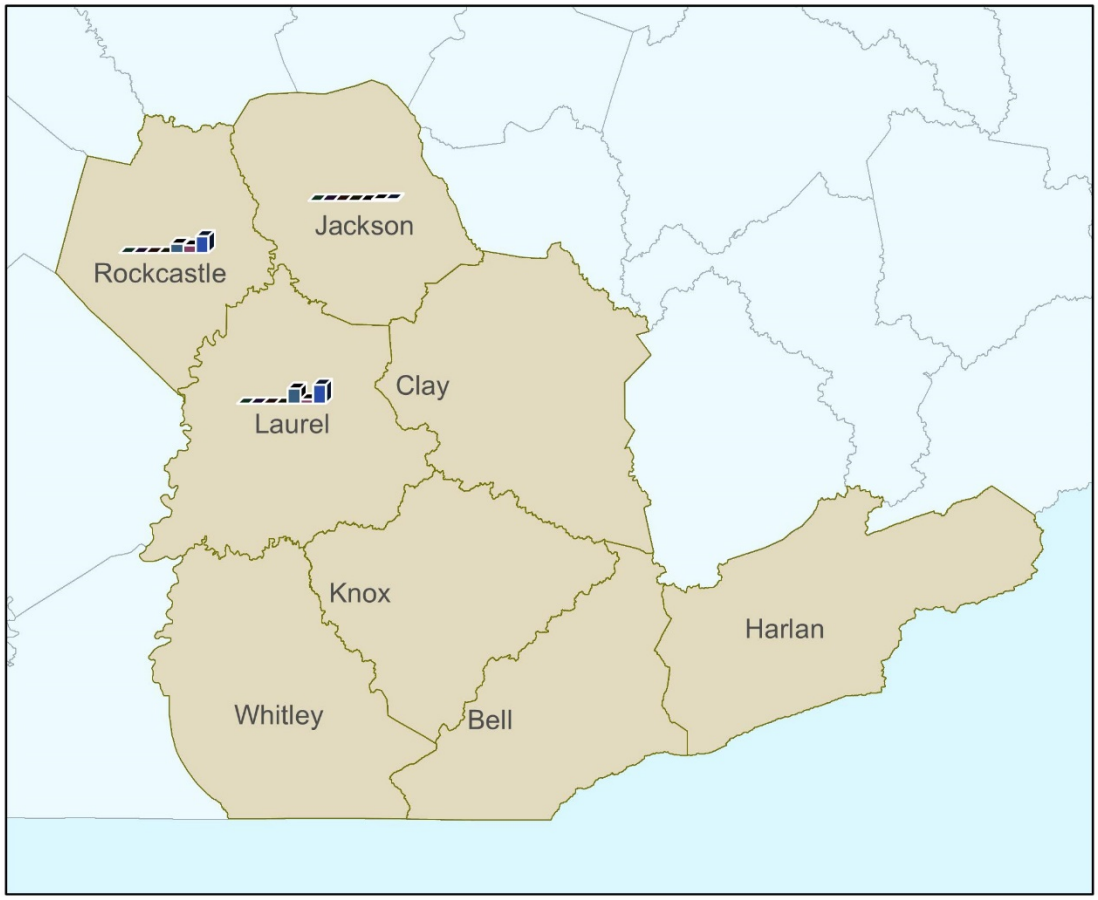
Recurrence intervals and probabilities of occurrences		
Recurrence interval, in years	**Probability of occurrence in any given year**	**Percent chance of occurrence in any given year**
100	1 in 100	1
50	1 in 50	2
25	1 in 25	4
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

The areas affected by past floods have been mapped by the Federal Emergency Management Agency and many other government agencies. A floodplain is the lowland area adjacent to a small waterway, river, lake, or ocean. Floodplains are designated by the frequency of the flood that is large enough to cover them. A person living in a designated floodplain has a 1 in 2 chance that they will experience a flood during their lifetime. To view flood maps in your area, go to https://msc.fema.gov/portal and search the specific address.

The CVADD is served by four major waterways. These are the Cumberland River, Little Laurel River, Rockcastle River, and the Red Bird River. The Cumberland River is the primary watercourse located in the CVADD. Cranks Creek, Martins Fork, and the North Fork come together at the City of Harlan in Harlan County to form the Cumberland River. The Cumberland River flows southwest out of Harlan County and travels through four of the eight counties in the District until the Laurel River and Rockcastle River join the Cumberland River, to become Lake Cumberland. The Red Bird River flows alongside the easternmost boundary of Clay and Bell Counties and eventually drains into the Kentucky River.

The following charts were accessed from the 2018 update of the Kentucky Flood Risk Assessment[36] and provide a macro overview of losses due to flooding, by county, in the Cumberland Valley Area Development District.

[36] *Kentucky Flood Risk Assessment 2018 Update*. Kentucky Division of Water. Retrieved on 4-21-22 from CK-EHMP 2018, S3-S6, Risk Assessment, Hazard Identification, 2, Flooding, Original Submittal.pdf (ky.gov).



Miles
0 5 10 20

N

Agriculture Losses by County

Winter Wheat
Wheat
Alfalfa-Hay
Soybeans
Corn Silage
Corn

= $3,700,000

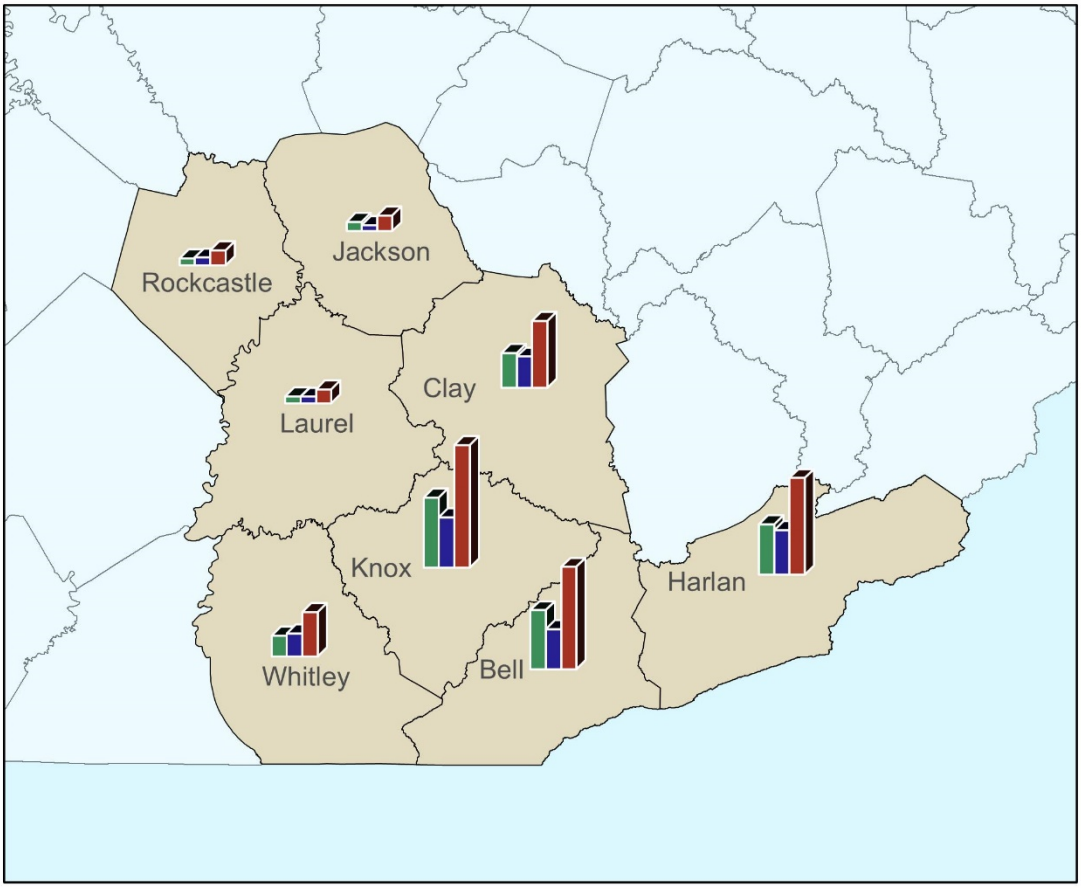
Total Losses

*Counties with no bars indicate no losses.

Cumberland Valley Area Development District

County	WINTER WHEAT	ALFALFA-HAY	WHEAT	SOYBEANS	CORN SILAGE	CORN
Jackson	$0.00	$0.00	$0.00	$0.00	$0.00	$295,302.83
Laurel	$0.00	$0.00	$0.00	$0.00	$2,764,688.17	$737,076.83
Rockcastle	$0.00	$0.00	$0.00	$0.00	$1,698,611.46	$1,330,226.39
Bell	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Clay	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Harlan	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Knox	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Whitley	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

KDOW - 58



Miles
0 5 10 20

N

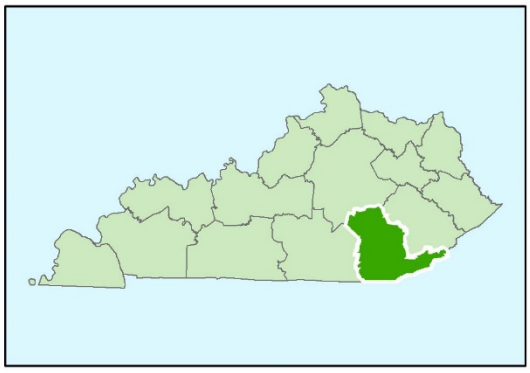
Cumberland Valley Area Development District

General Building Loss

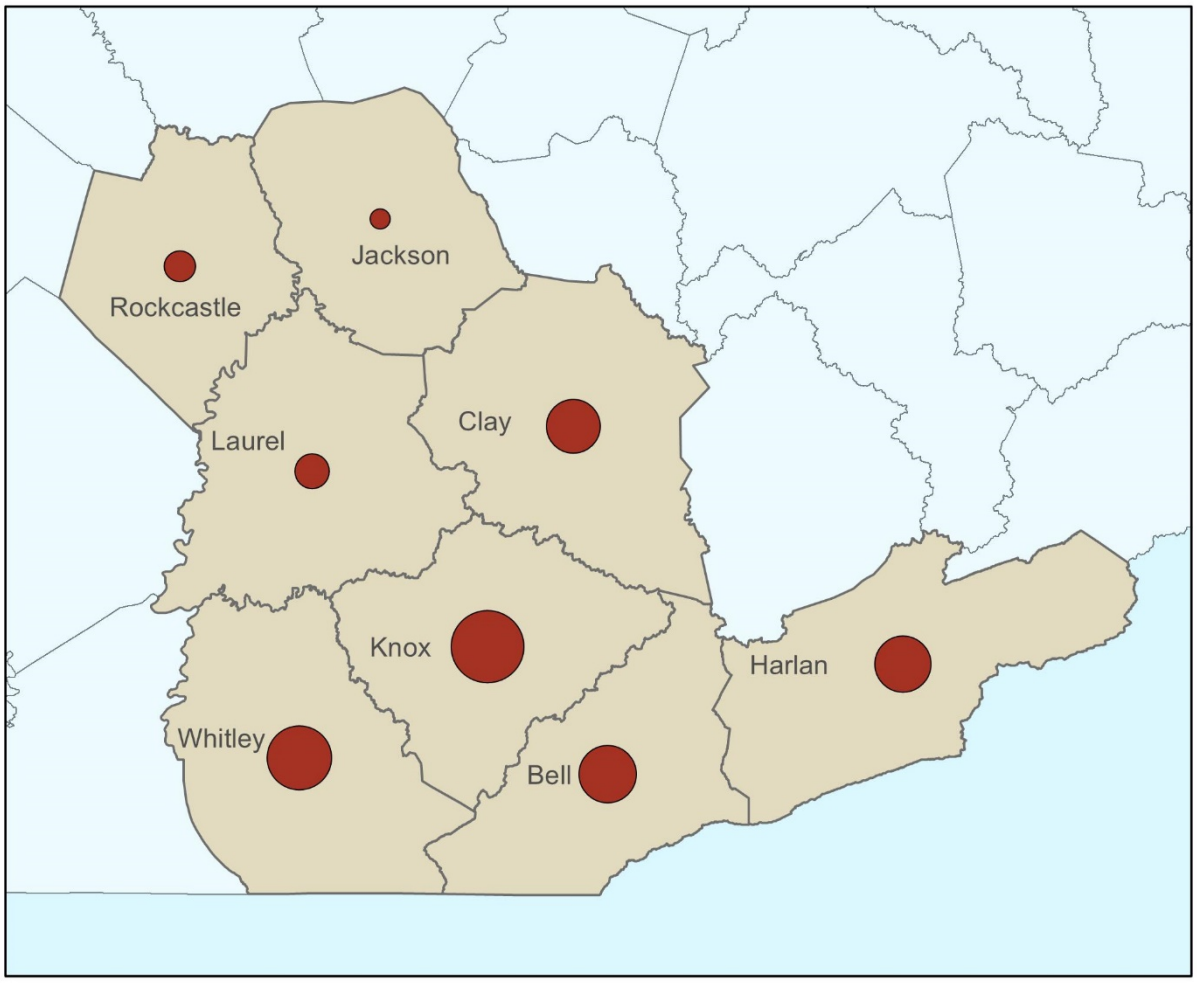
Contents Loss
Building Loss
Total Loss

= $160,000

County	Total Loss	Bldg Loss	Contents Loss
Bell	$267,714.00	$104,635.00	$154,377.00
Clay	$175,003.00	$81,456.00	$90,325.00
Harlan	$252,712.00	$116,706.00	$132,060.00
Jackson	$41,535.00	$16,077.00	$24,883.00
Knox	$320,714.00	$131,604.00	$183,901.00
Laurel	$36,625.00	$17,823.00	$17,990.00
Rockcastle	$39,466.00	$20,084.00	$18,489.00
Whitley	$116,065.00	$59,493.00	$54,761.00



KDOW - 59



0 5 10 20 Miles

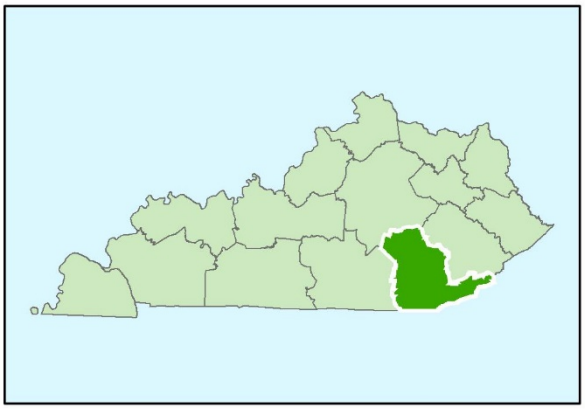
Debris in Tons

1,000 5,000 10,000 50,000 100,000

N

Cumberland Valley Area Development District

County	Debris Tons
Bell	16491
Clay	14196
Harlan	15675
Jackson	2227
Knox	26156
Laurel	6144
Rockcastle	4741
Whitley	20406



KDOW - 60

Miles
0 5 10 20

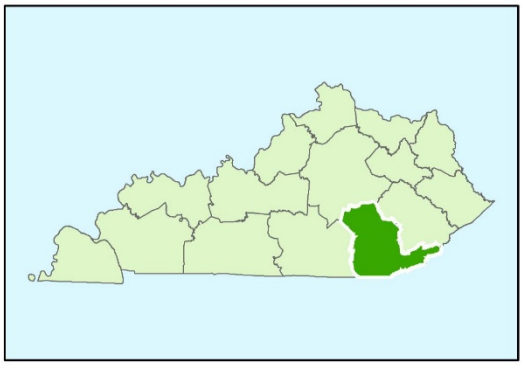
N

CUMBERLAND VALLEY
Area Development District

Change in percent impervious surface from 2006-2011 for each 30x30 m area

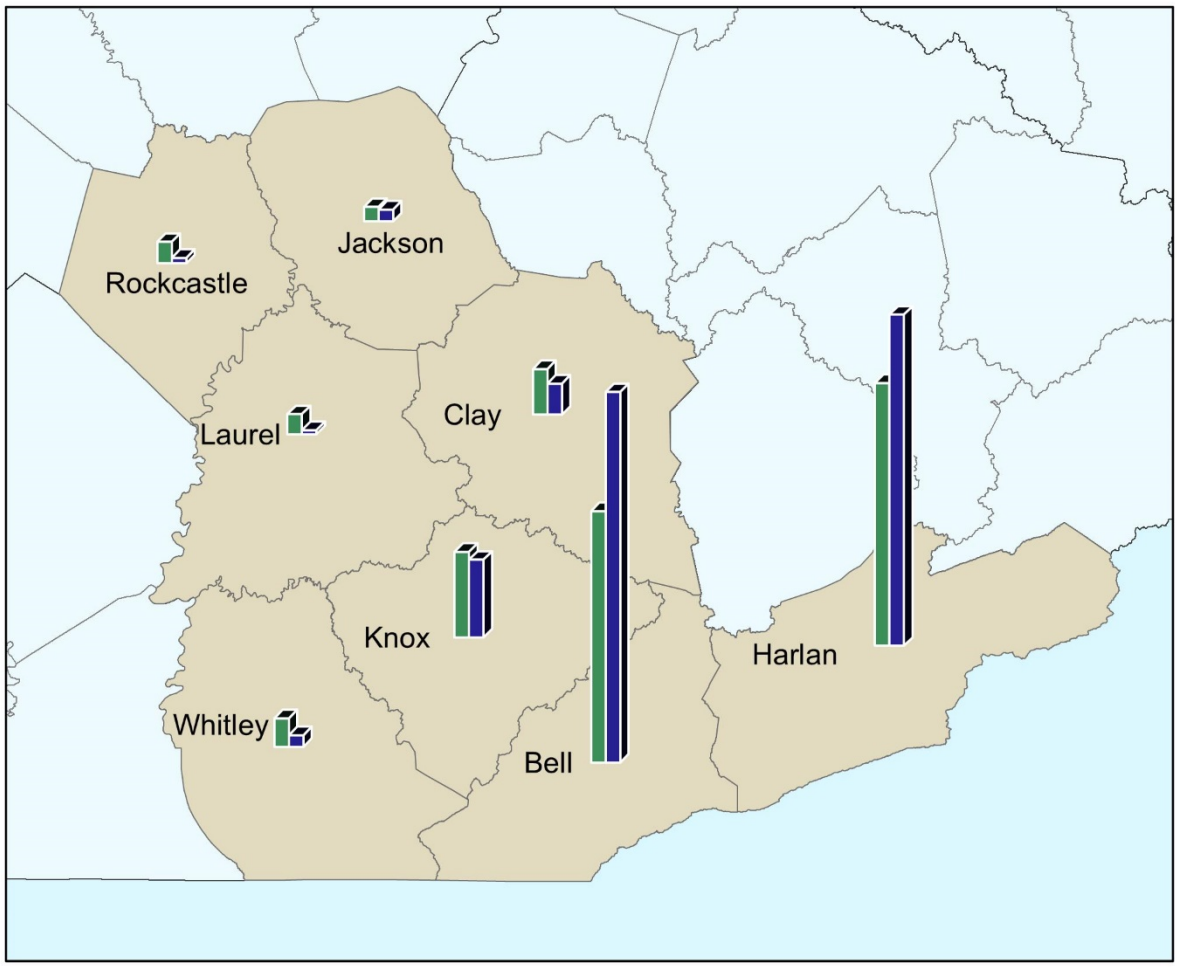
0
1 - 25
26 - 50
51 - 75
76 - 100

Trends in development as indicated by increased impervious surfaces.



Impervious surface change from the NLCD 2006 to 2011 Percent Developed Imperviousness Change data file (NLCD 2011). Black indicates areas of no change. Colored areas indicate the difference between the percent impervious of each 30x30 m area between 2006 and 2011.

KDOW - 61



Miles
0 5 10 20

Cumberland Valley Area Development District

National Flood Insurance Program Policies and Claims (1978 - May 2018)

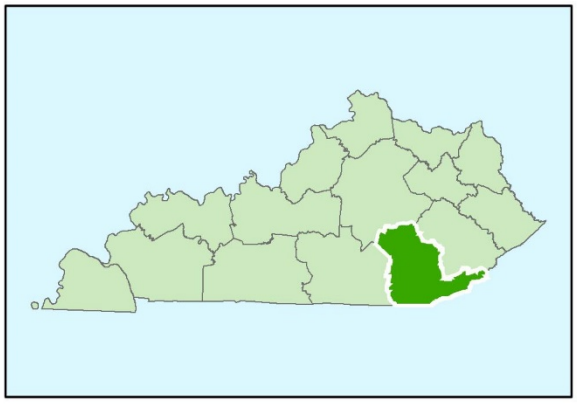
Number Policies

Total Claims

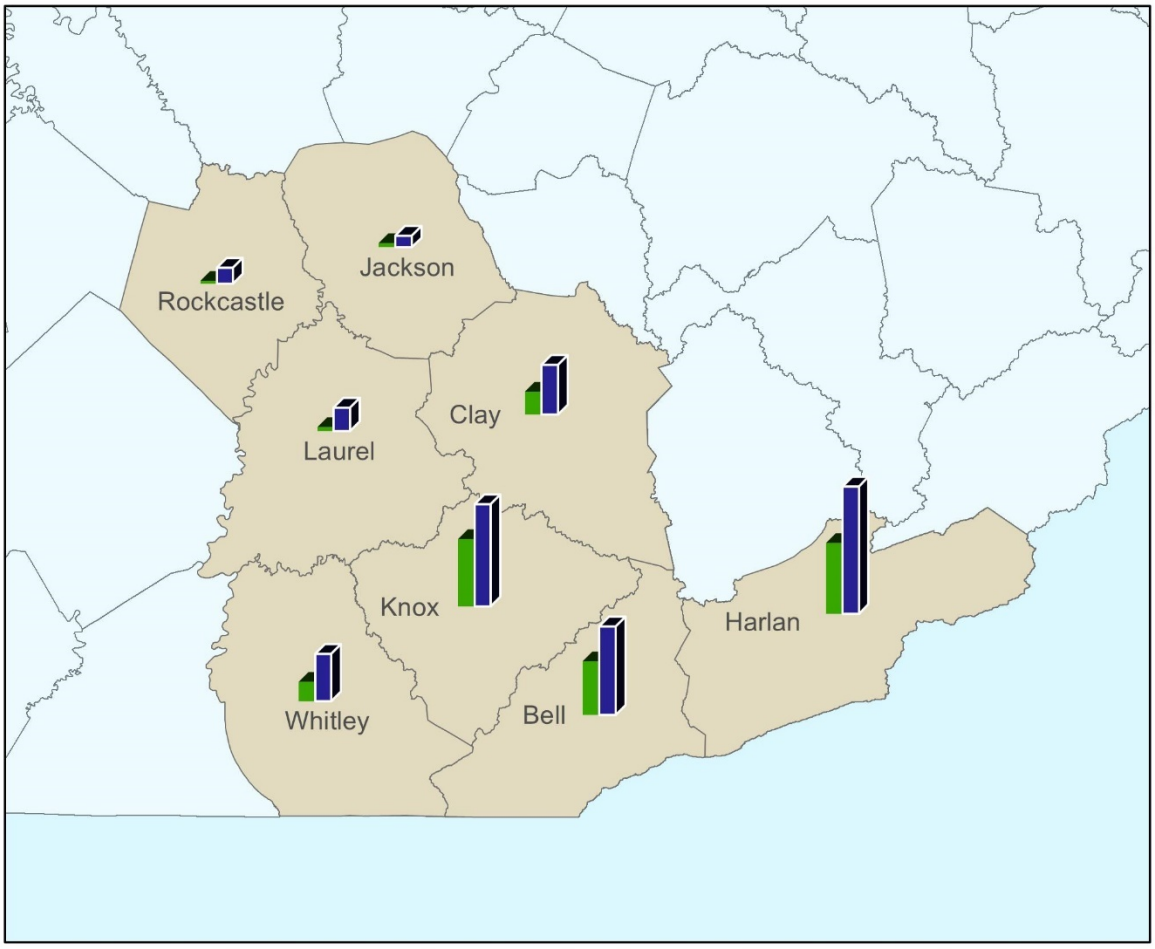
= 84

N

County	Number Policies	Total Claims
Bell	363	535
Clay	66	45
Harlan	379	478
Jackson	21	17
Knox	123	112
Laurel	29	6
Rockcastle	31	8
Whitley	41	17



KDOW - 62



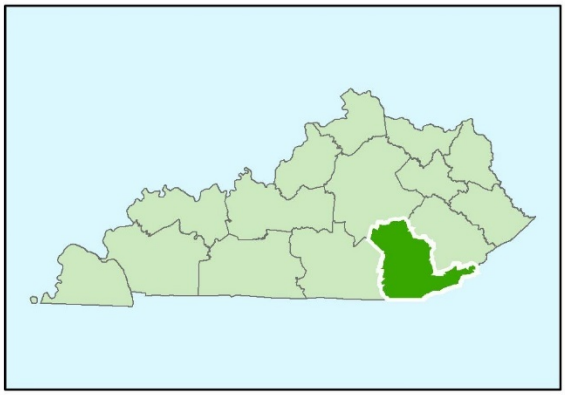
Miles
0 5 10 20

N

= 3,800 people

Need Shelter

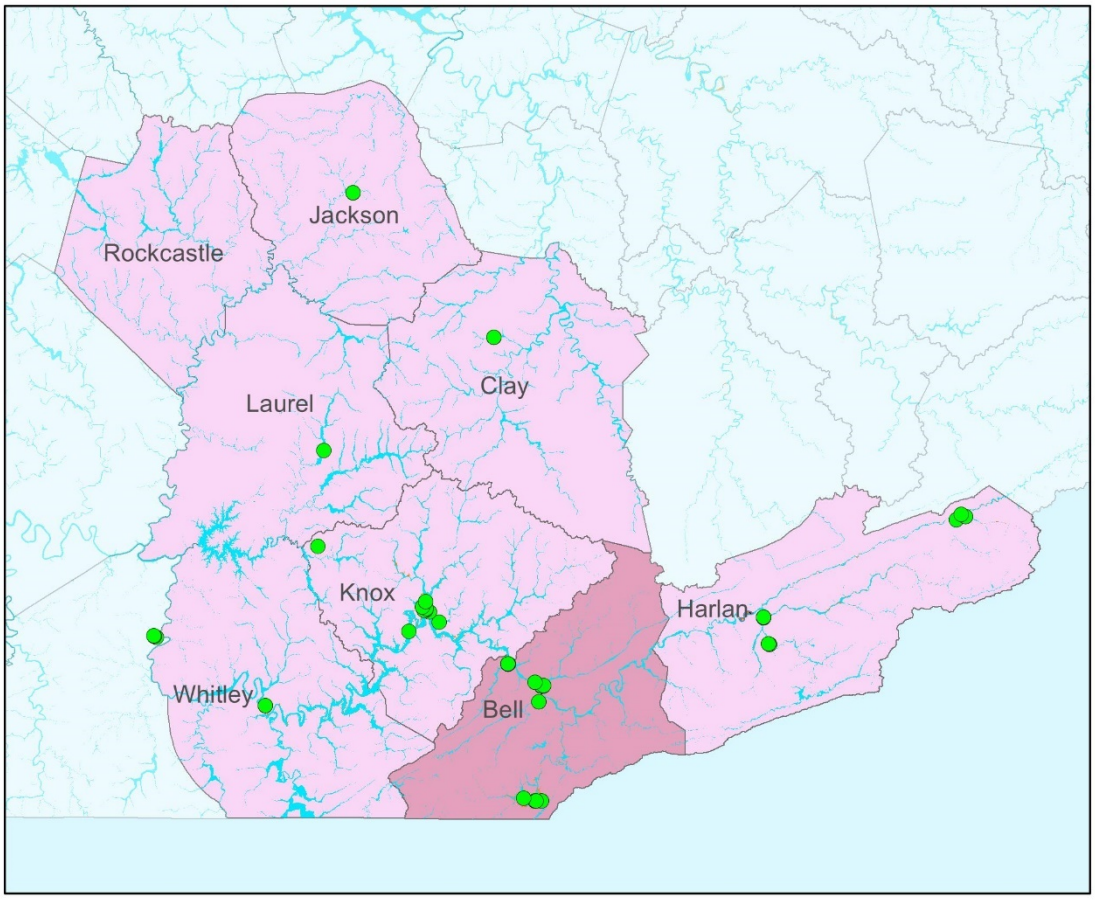
Displaced



Cumberland Valley Area Development District

County	Displaced	Need Shelter
Bell	5118	3089
Clay	2860	1323
Harlan	7354	4112
Jackson	669	240
Knox	5924	3915
Laurel	1356	242
Rockcastle	913	170
Whitley	2719	1119

KDOW - 63



Miles
0 5 10 20

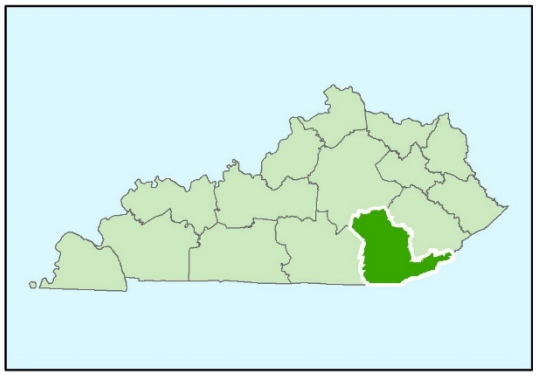
N

Cumberland Valley Area Development District

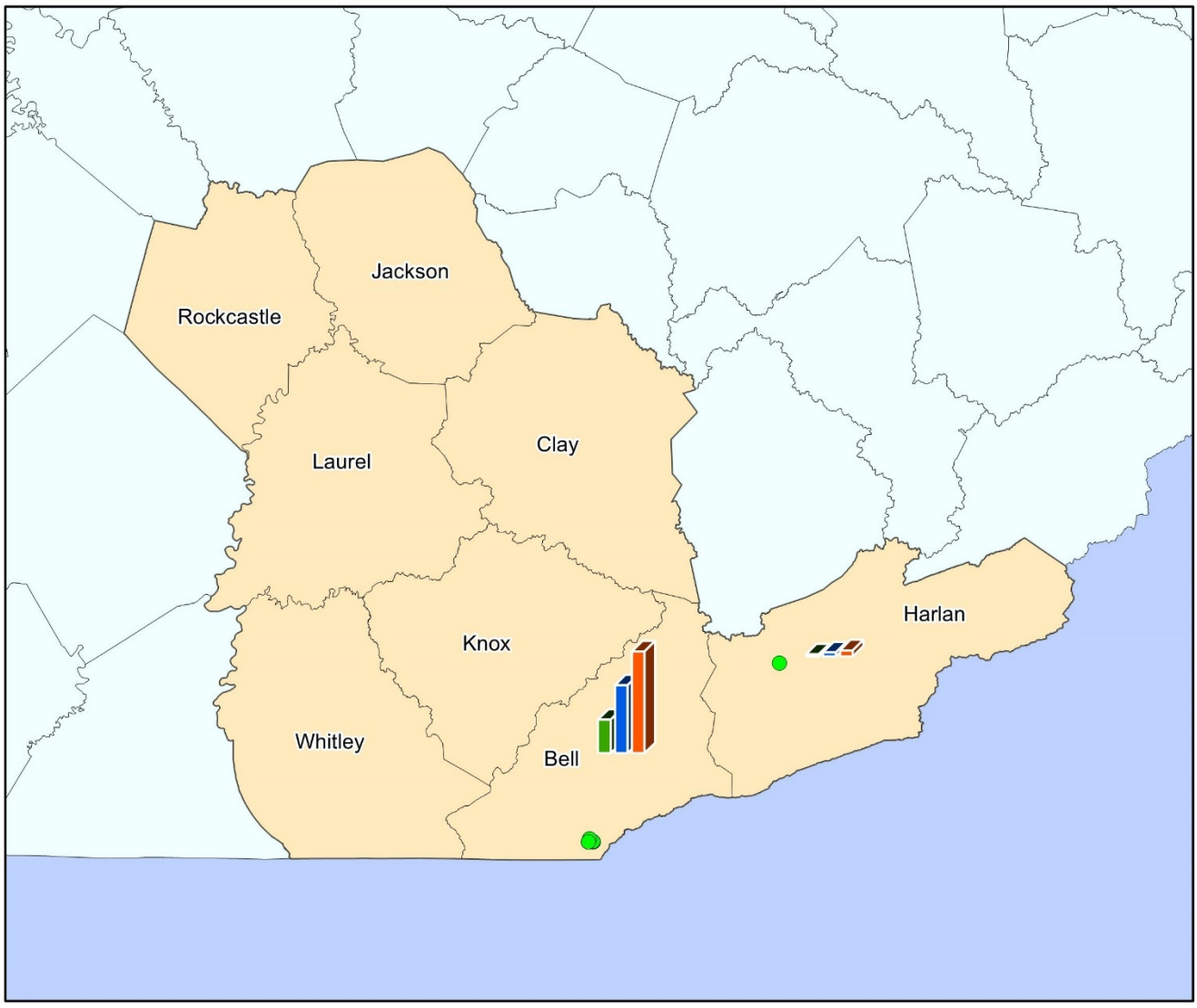
Replacement Cost Value

- $0.00 - $3 million
- $3 million - $13 million
- $13 million - $20 million
- $20 million - $50 million
- $50 million - $500 million
- State Facilities in Floodplain

County	No. Vulnerable State Facilities	Replacement Cost Value
Bell	27	$6,154,935.46
Clay	2	$0.00
Harlan	11	$1,639,304.60
Jackson	2	$0.00
Knox	11	$2,107,870.98
Laurel	1	$131,971.00
Rockcastle	0	$0.00
Whitley	6	$876,719.00



KDOW - 64



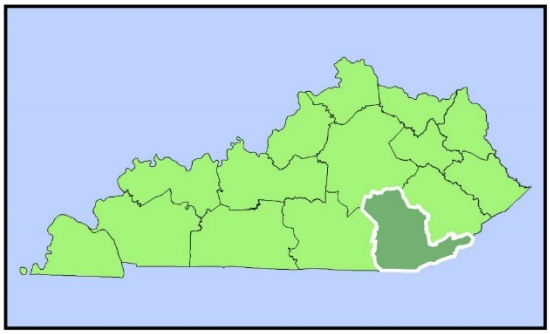
0 2.5 5 10 15 20 25 Miles

General Building Losses

730,000

Content Losses
Building Losses
Total Losses
SRL Buildings

N

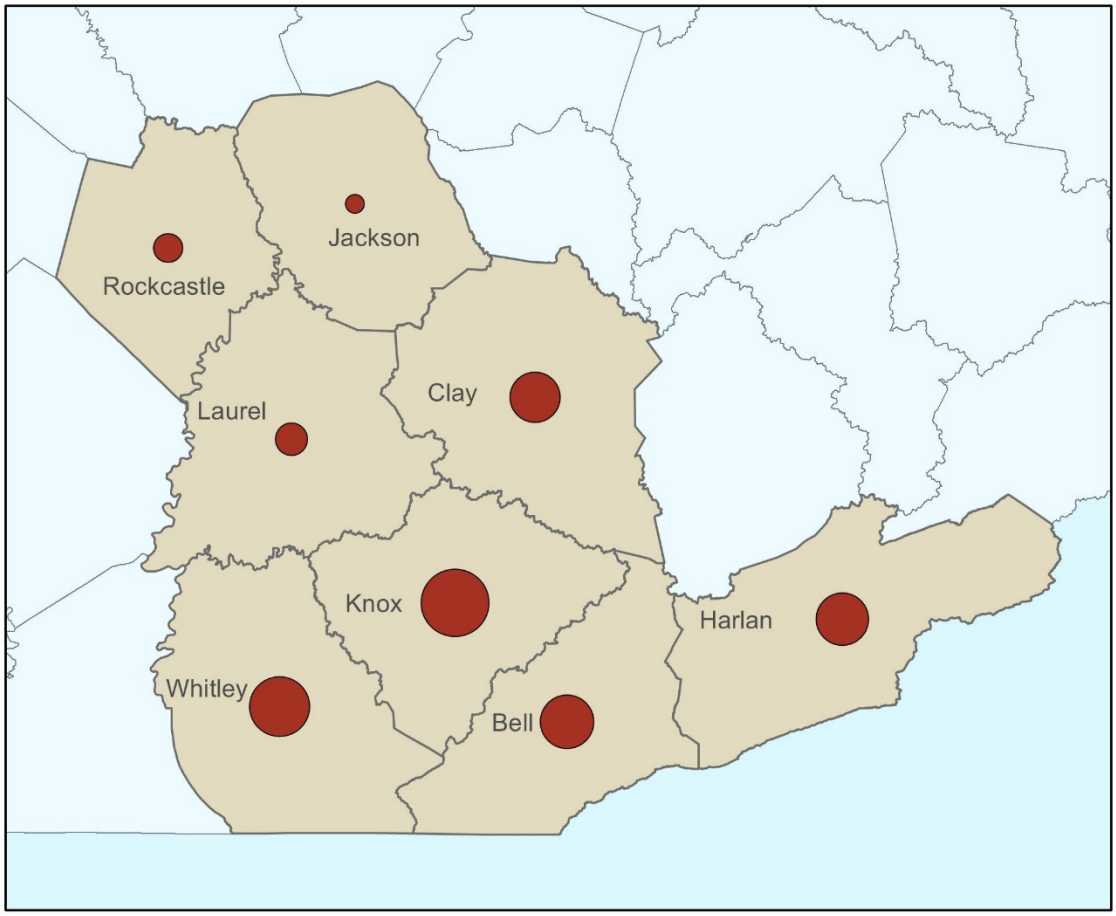


Cumberland Valley Area Development District
Severe Repetitive Loss (SRL) and Special Direct Facility (SDF) totals

County	Flooding Source	SRL Buildings	Total Losses	Building Losses	Content Losses
Bell	Little Yellow Creek	2	$515,720.74	$251,968.04	$263,752.70
Bell	Yellow Creek	3	$943,308.16	$724,138.66	$219,169.50
Clay	none	0	$0.00	$0.00	$0.00
Harlan	Cumberland River	1	$88,660.69	$57,174.81	$31,485.88
Jackson	none	0	$0.00	$0.00	$0.00
Knox	none	0	$0.00	$0.00	$0.00
Laurel	none	0	$0.00	$0.00	$0.00
Rockcastle	none	0	$0.00	$0.00	$0.00
Whitley	none	0	$0.00	$0.00	$0.00

RL - 13

Kentucky SRL as of 3/31/2018



Miles
0 5 10 20

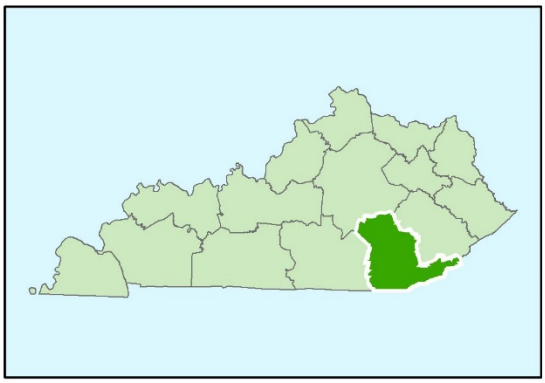
Debris in Tons

1,000
5,000
10,000
50,000
100,000

N

Cumberland Valley Area Development District

County	Debris Tons
Bell	16491
Clay	14196
Harlan	15675
Jackson	2227
Knox	26156
Laurel	6144
Rockcastle	4741
Whitley	20406



KDOW - 60

2. Thunderstorms/Winds

A thunderstorm is a rain shower containing thunder and lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail one inch or greater, winds gusting in excess of 57.5 mph, or a tornado. Thunderstorms are most likely to happen in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. Following are the different types of thunderstorms[37]

Types of Thunderstorms:

- **Single-cell Thunderstorms:** These are **s**mall, brief, weak storms that expand and die within a short span of time, often in as little as an hour. They usually occur during times of high temperatures, often on summer afternoons. Single-cell storms may produce brief heavy rain and lightning.
- **Multi-cell Storm:** This type of thunderstorm is very common. New updrafts form along the leading edge of rain-cooled air (known as the gust front), resulting in the formation of additional storm cells as the front progresses. Individual cells usually last 30 to 60 minutes, while the system as a whole may last for many hours. Multicell storms may produce hail, strong winds, brief tornados, and/or flooding.
- **Squall Line:** A "squall line" forms when storms form a long, comparatively narrow line, producing "squalls" of high wind and heavy rain. Squall lines tend to pass quickly and are less prone to produce tornados than are supercells. They can be hundreds of miles long but are typically only 10 or 20 miles wide.
- **Supercell:** A highly organized storm lasting more than an hour, feeding off a rising current of air (updraft) that is tilted and rotating. This rotating updraft- as large as 10 miles in diameter and up to 50,000 feet tall – can be present as much as 20 to 60 minutes before a tornado forms. Scientists call this rotation a mesocyclone when it is detected by Doppler radar. A tornado is a very small extension of this larger rotation. Most large and violent tornados come from supercells.
    - **Derecho:** A widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. Although a derecho can produce destruction similar to that of tornados, the damage typically goes in one direction along a relatively straight line. As a result, the term "straight-line wind damage" sometimes is used to describe derecho damage. To meet the threshold of a derecho, the storm must create wind damage along a 240 mile swath or longer, and include wind gusts of at least 58 mph or greater along most of its length.

Natural Hazards That Can Occur During a Thunderstorm

A. Severe Wind: This can occur alone, as in a straight-line wind event or derecho, or it can accompany other natural hazards, including hurricanes and severe thunderstorms. Severe wind poses a threat to lives, property, and vital utilities primarily due to flying debris or downed trees and power lines. Severe wind will typically cause the greatest damage to structures of light construction, particularly manufactured homes, which is why storm safety guidance often includes leaving mobile or manufactured homes for more stable structures when heavy winds are anticipated.

[37] Severe Weather 101: Thunderstorm Types. Retrieved on 6/15/2020 from https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/types/.

The Beaufort Scale			
0	Calm	> 1 mph	Calm, Smoke rises vertically.
1	Light Air	1-3 mph	Smoke drift indicates will direction, still wind vanes.
2	Light Breeze	4-7 mph	Wind felt on face, leaves rustle, vanes begins to move.
3	Gentle Breeze	8-12 mph	Leaves and small twigs constantly moving, light flags extended.
4	Moderate Breeze	13-17 mph	Dust, leaves, and loose paper lifted, small branches move.
5	Fresh Breeze	18-24 mph	Small trees in leaf begin to sway.
6	Strong Breeze	25-30 mph	Larger tree branches moving, whistling in wires.
7	Near Gale	31-38 mph	Whole trees moving, resistance felt walking against wind.
8	Gale	39-46 mph	Twigs breaking off trees, generally impedes progress.
9	Strong Gale	47-54 mph	Slight structural damage occurs, slate blows off roofs.
10	Storm	55-63 mph	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	Violent Storm	64-73 mph	
12	Hurricane	74+ mph	

B. Lightning: Lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground.[38] When the opposite charges build up enough, this insulating capacity of the air breaks down and there is a rapid discharge of electricity that we know as lightning. Lightning can strike communications equipment and hamper communication and emergency response. Lightning strikes can also cause significant damage to buildings, critical facilities, and infrastructure, largely by igniting a fire. Lightning can also ignite wildfires.[39]

C. **Hail:** Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Hail can cause substantial damage to vehicles, roofs, landscaping, and other areas of the built environment. U.S. agriculture is typically the area most affected by hailstorms, which cause severe crop damage even during minor events. Hail forms when raindrops are forced up by wind drafts into the higher and colder reaches of the atmosphere. There the raindrops freeze and grow as the ice collides with other raindrops that freeze and increase its diameter. It will eventually fall to the ground when its weight is too great for the wind to hold it aloft.[40]

D.

Hail Size	Object Analog Reported
.50	Marble, Moth Ball
.75	Penny
.88	Nickel
1.00	Quarter

[38] Severe Weather 101: Frequently Asked Questions about Lightning. Retrieved on 6/16/2020 from https://www.nssl.noaa.gov/education/svrwx101/lightning/faq/.

[39] National Fire Protection Association. "Lightning Fires and Lightning Strikes." Retrieved on 6/16/2020 from https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/Lightning-Fires-and-Lightning-Strikes.

[40] Severe Weather 101: Hail Basics. Retrieved on 6/15/2020 from https://www.nssl.noaa.gov/education/svrwx101/hail/.

1.25	Half Dollar
1.50	Walnut, Ping Pong Ball
1.75	Golf Ball
2.00	Hen Egg
2.5	Tennis Ball
2.75	Baseball
3.00	Tea Cup
4.00	Softball
4.50	Grapefruit

3. Tornados

"A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground... Tornadoes are the most violent of all atmospheric storms."[41] While Kentucky does not have the number of tornados annually that states in Tornado Alley do, from 1878 through 2012 there were 20 EF4 or EF5 tornados in Kentucky, causing 446 fatalities – three such tornadoes in the past 20 years.[42] Only one of those was in the CVADD area, in Bell County; buildings at the Southeast Kentucky Community College were damaged, but all 12 fatalities associated with the tornado occurred in Tennessee. An F-5 tornado is the fastest and most forceful as measured on the Enhanced Fujita Scale, with gusts up to 318 mph.[43] An EF 2 tornado cut through East Bernstadt, KY, in Laurel County, on March 2, 2012, killing five[44]. An EF-2 can produce sustained 3-second gusts of 110 mph.

The destruction caused by tornados ranges from light to catastrophic depending on the intensity, size, and duration of the storm. Typically, tornados cause the greatest damage to structures of light construction, including residential dwellings and particularly manufactured homes. Tornados are more likely to occur during the months of March through May and tend to form in the late afternoon and early evening.

The Enhanced Fujita Scale		
EF Rating	3 Second Gust (MPH)	
0	65-85	Light Damage
1	86-110	Moderate Damage
2	111-135	Significant Damage
3	136-165	Severe Damage
4	166-200	Devastating Damage
5	Over 200	Incredible Damage

[41] Severe Weather 101. The National Severe Storms Laboratory. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/tornadoes/ on 7/26/19.
[42] Violent Tornados in Kentucky. National Weather Service. Retrieved from https://www.weather.gov/lmk/violent_tornadoes_kentucky on 7/26/19.
[43] Enhanced F Scale for Tornado Damage. National…. Retrieved from https://www.spc.noaa.gov/faq/tornado/ef-scale.html on 7/26/19.
[44] McCrarey, M. "Friday's Tornado Kills Five in East Bernstadt". *Sentinel-Echo*. Retrieved on 6/16/2020 from https://www.sentinel-echo.com/news/friday-s-tornado-kills-five-in-east-bernstadt/article_e2a04cbe-68ca-53f1-8c28-a82aa28760e8.html.

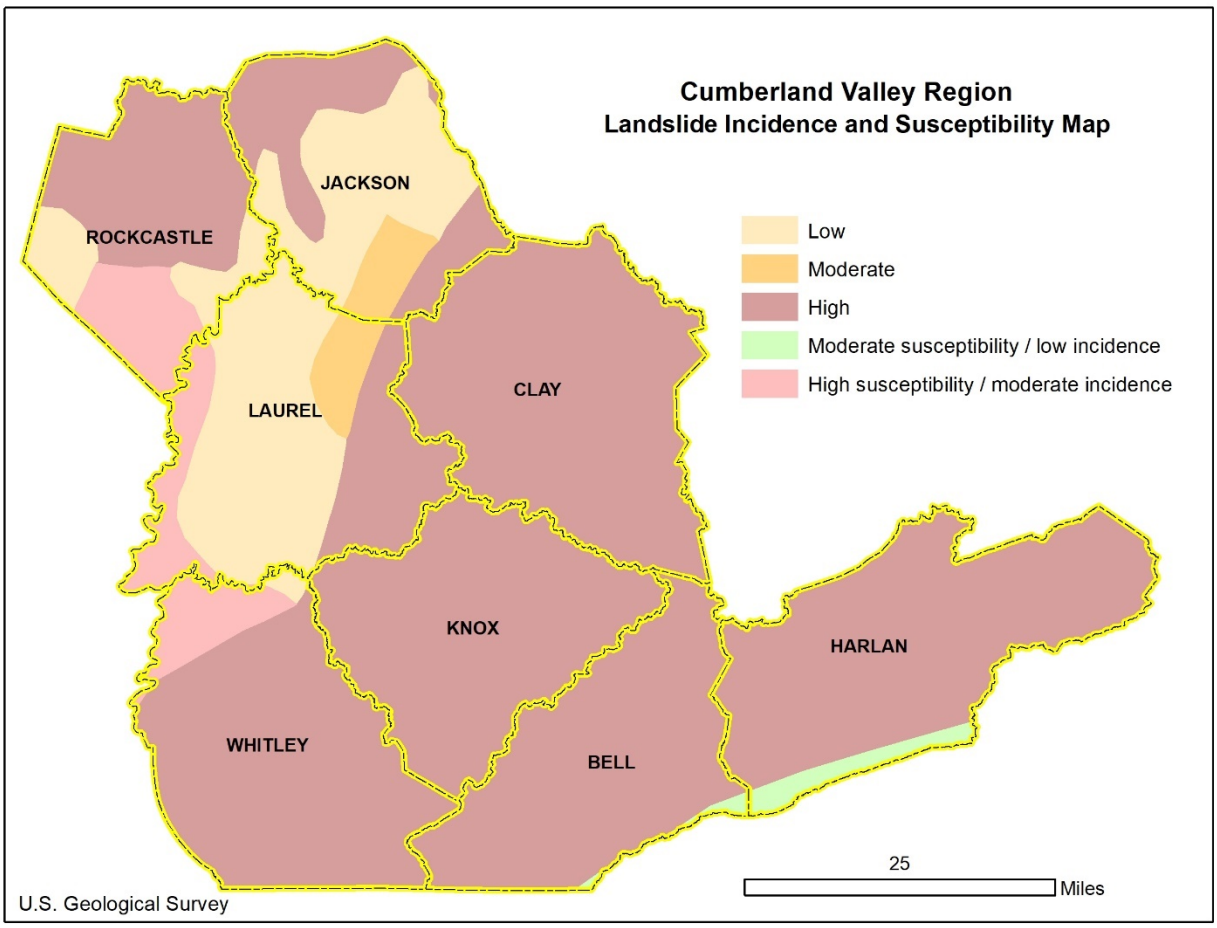
The Enhanced F-Scale still is a set of wind estimates (not measurements) based on damage.

4. Landslide/Slope Failures

"A landslide is defined as the movement of a mass of rock, debris, or earth down a slope." [45] Landslides are a type of "mass wasting," which is any down-slope movement of soil and rock under the direct influence of gravity. The term "landslide" includes five modes of slope movement: falls, topples, slides, spreads, and flows. These are further subdivided by the type of geologic material (bedrock, debris, or earth). Debris flows (commonly referred to as mudflows or mudslides) and rock falls are examples of common landslide types.

Almost every landslide has multiple causes. Slope movement occurs when forces acting down-slope (mainly due to gravity) exceed the strength of the earth materials that compose the slope. Causes include factors that increase down-slope forces and that contribute to low or reduced strength. Landslides can be initiated in slopes already on the verge of movement by rainfall, snowmelt, changes in water level, stream erosion, changes in ground water, earthquakes, volcanic activity, disturbance by human activities, or any combination of these factors."[46]

[45] The United States Geological Survey. "What is a landslide and what causes one?" Retrieved on 6/15/2020 from https://www.usgs.gov/faqs/what-a-landslide-and-what-causes-one?qt-news_science_products=0#qt-news_science_products.
[46] Ibid.



"**Landslides** are caused by disturbances in the natural stability of a slope. They can accompany heavy rains or follow droughts, earthquakes, or volcanic eruptions. Mudslides develop when water rapidly accumulates in the ground and results in a surge of water-saturated rock, earth, and debris. **Mudslides** usually start on steep slopes and can be activated by natural disasters. Areas where wildfires or human modification of the land have destroyed vegetation on slopes are particularly vulnerable to landslides during and after heavy rains."[47]

All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

5. Dams/Levees

There are approximately five dams in the CVADD. The primary concern with dams and levies is that a breach would release a rush of water onto the land below. Local emergency management officials have the capability to map the danger zones should a dam be in danger of breaching. In addition, the dams

[47] CDC. Landslides and Mudslides: Fact Sheet. Retrieved on 6/15/2020 from https://www.cdc.gov/disasters/landslides.html.

are equipped with overflow options that will reduce the volume of water pressing on the dam if water becomes unusually high.

6. Severe Winter Storms

Eastern Kentucky does not have the intense winter weather common in the northern parts of the country. However, it does have snow every winter and at times the snowstorms can approach blizzard conditions. The sporadic history of snowfall in the region means that winter weather preparedness is not as encompassing as it is where snow is more frequent and deeper. Eastern Kentucky local governments – and to a lesser extent, state government – do not purchase the type or volume of equipment and materials to quickly and efficiently remove large quantities of snow and ice from area roadways, because it usually is not needed. Most winters their level of preparedness is sufficient to meet their need. When a major storm hits it can quickly overwhelm local road departments, which struggle to clear roadways safely when snow continues to fall and temperatures dip into very low ranges. An added complication is the roadways themselves. Many miles of roads in eastern Kentucky are narrow and winding, with steep slopes, sharp drops on one or both sides, and often unpaved. Some of these roads are not truly safe until the weather shifts and the road clears naturally. Other winter hazards include hail, strong winds, and temperatures low enough to be life threatening.

Types of Winter Weather:

- **Blizzards** are dangerous winter storms that are a combination of blowing snow and wind resulting in very low visibilities. While heavy snowfalls and severe cold often accompany blizzards, they are not required. Sometimes strong winds pick up snow that has already fallen, creating a ground blizzard. [48]
- An **Ice Storm** is a storm which results in the accumulation of at least .25" of ice on exposed surfaces. They create hazardous driving and walking conditions. Tree branches and powerlines can easily snap under the weight of the ice.[49]
- **Snow Squalls** are brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.[50]

7. Forest Fires/Wildfires

A wildfire is an unplanned fire that burns in a natural area such as a forest, grassland, or prairie.[51] Such fires are often caused by lightning or humans carelessly or deliberately igniting an area. While they can happen at any time, risk increases in periods of little rain and high wind. The impact of such fires can range from a brush fire that destroys a small area of vegetation to massive fires that burn thousands of acres, killing people and destroying homes and businesses. Kentucky's firefighters often respond to small brush fires, but large ones at the scale sometimes raging in California are rare here. Following are data and maps from the 2020 Kentucky Forest Action Plan, highlighting wildfires in the state

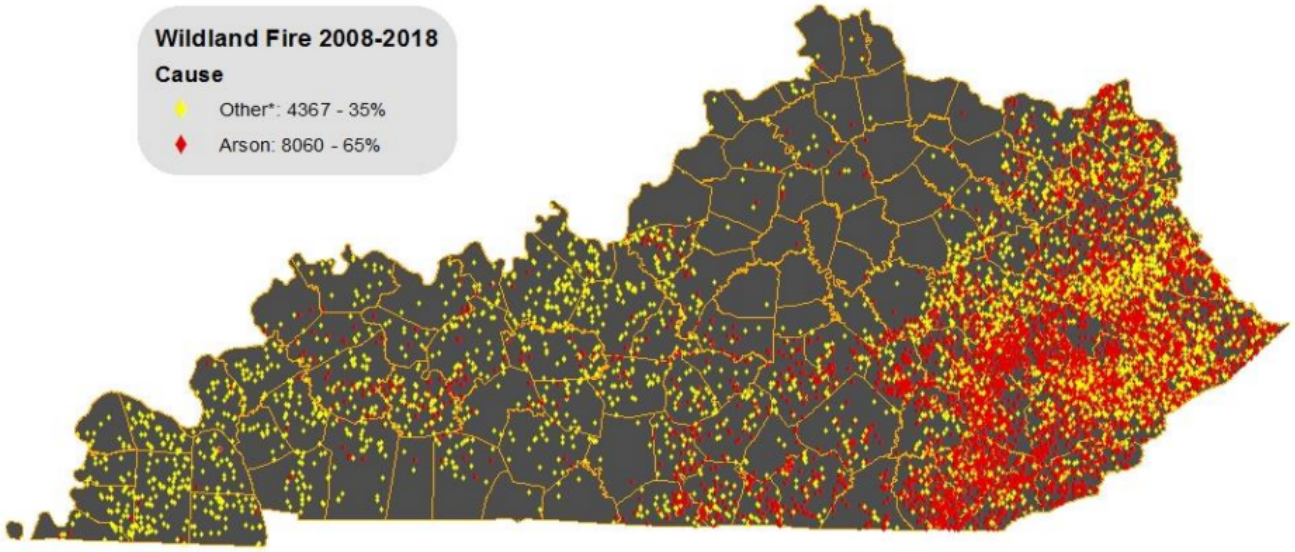
[48] SKYbrary. "Blizzard". Flight Safety Foundation. Retrieved on 6/15/2020 from https://www.skybrary.aero/index.php/Blizzard.
[49] "Ice storm. Wikipedia. Retrieved 6/15/2020 from https://en.wikipedia.org/wiki/Ice_storm.
[50] Boeckmann, C. "Winter Weather Terms." *The Old Farmer's Almanac*. Retrieved on 6/15/2020 from https://www.almanac.com/content/winter-weather-terms.
[51] Ready.gov. Wildfires. Retrieved from https://www.ready.gov/wildfires on 5/20/2020.

including eastern Kentucky and CVADD. Wildfire data on specific counties and cities are placed in the sections dedicated to each jurisdiction.

"Fire [has both] positive and negative effects on the forest resources of Kentucky. Beginning in the 1930s, fire suppression was initiated as a control measure to limit the negative impacts of fire on forest stands. Although seemingly necessary at the time, recent evidence suggests some negative effects on forest stand structure and species composition resulting from this policy of fire suppression. Previous research is showing that the Daniel Boone National Forest is more crowded due to fire suppression [about half of CVADD land area is within the National Forest]. In forests experiencing crowding in the midstory and understory, species that can tolerate more shade, such as red maples, can out compete oaks and other species that require more sun. Although the effects and benefits of fire are still under research, prescribed fire may be used to reduce forest density and promote the growth of shade intolerant species. It can also reduce the potential of catastrophic and destructive wildfires by lowering hazardous fuel loads, control invasive species, and reduce the incidence of disease and insect damage to forests. Prescribed fire releases nutrients, removes excess leaf litter that inhibits vegetative growth, releases seed for germination, and increases species diversity. According to the OKNP, "loss of diversity, in both number of species and varieties of habitat, is also caused by the virtual elimination of wildfire as a normal event in natural environments where it traditionally occurred... Without periodic fire, the special fire-adapted communities of plants and their associated fauna will cease to exist as part of our landscape. Fire exclusion is also a cause in the decline of oak reproduction, which is changing the nature of the forest and reducing a hard mast food source that is critical for wildlife." Uncontrolled wildfires can be extremely dangerous and costly, both in terms of forest health and in terms of socioeconomic impacts. In regard to forest health, wildfires occurring in dry environments with large fuel sources, such as those created by the recent ice storms, can consume large quantities of timber resources and eliminate habitat for protected species. *Kentucky has the highest rate of deliberately set wildland fires in the southern U.S.* [Emphasis ours.] Data from the Kentucky Division of Forestry reported 12,422 wildland fires from 2008 to 2018 burned 371,782 acres of private land and cost over $8.5 million in suppression costs. From 2008 through 2018, arsonists started 65% of the 10,942 fires in Kentucky, predominantly in the eastern Kentucky area, as shown in [the map below]. The costs associated with arson fires are much greater than just dollars spent on suppression efforts. There are costs to the timber resource, the economy, the forest industry, the health of Kentucky citizens, and the personal costs to residents and firefighters dealing with the risks associated with smoke and fire.

"Kentucky has identified communities at risk (CARs) in order to help ensure the protection of people and property from wildfires. The most recent CARs assessment was generated during the Southern Wildfire Risk Assessment. The Southern Wildfire Risk Assessment used population density and a wildfire susceptibility index to determine the CARs ratings of low, medium, high, and very high. The wildfire susceptibility index is calculated using the factors of probability of fire occurrence, estimated fire behavior, and fire suppression effectiveness. This assessment found over 800 CARs at high or very high risk from wildfires, all of which are located in the eastern part of the state. This is due to the wildfire susceptibility index factors of fire occurrence, estimated fire behavior, and fire suppression

effectiveness."[52] A heavy concentration of arson fires are in the eight counties comprising the CVADD.



* Other causes include Lightning, Campfire, Smoking, Debris, Railroad, Equipment, Children, & Miscellaneous

"As discussed earlier, Kentucky has the highest rate of deliberately set wildfires in the southern U.S.22 Strong preventative measures must continue to be enforced to discourage arsonists. The Wildland Arson Task Force recommended a two-fold approach to address this problem. First, establish a KDF law enforcement unit with proper positions, funding, and equipment to investigate and prosecute wildland arson with increased penalties for offenders. Second, increase KDF funding to initiate a comprehensive media campaign, to increase the education of officials, and to develop a strong fire prevention program in Kentucky's schools. Unfortunately, none of these recommendations were funded, so the arson problem persists. However in 2016, the KDF partnered with the KDFWR Law Enforcement Division to provide assistance to the KDF employees in investigating and prosecuting violations of burning laws. This partnership was made possible through a grant from the USFS. Kentucky utilizes the Community Wildfire Protection Plan and Firewise USA® program to help reduce wildfire risk to communities. The Healthy Forests Restoration Act of 2003 authorized and defined CWPPs and outlined how they relate to hazardous fuel reduction funding. Key points for the CWPP include:

- Plans are generally developed by local government with assistance from state and federal agencies and other interested partners

[52] Kentucky Division of Forestry. 2020 Kentucky Forest Action Plan. Retrieved on 1/26/2022 from Kentucky's Forest Action Plan - Kentucky Energy and Environment Cabinet.

- Plans can take a variety of forms and may be as simple or complex as necessary, based on the specific needs and desires of the local community or county Kentucky Forest Action Plan – 2020 Part 1: Issue 1: Forest Health
- Plans do not need to be complicated but they should effectively address local forest and range conditions, values-at-risk, and priorities for action

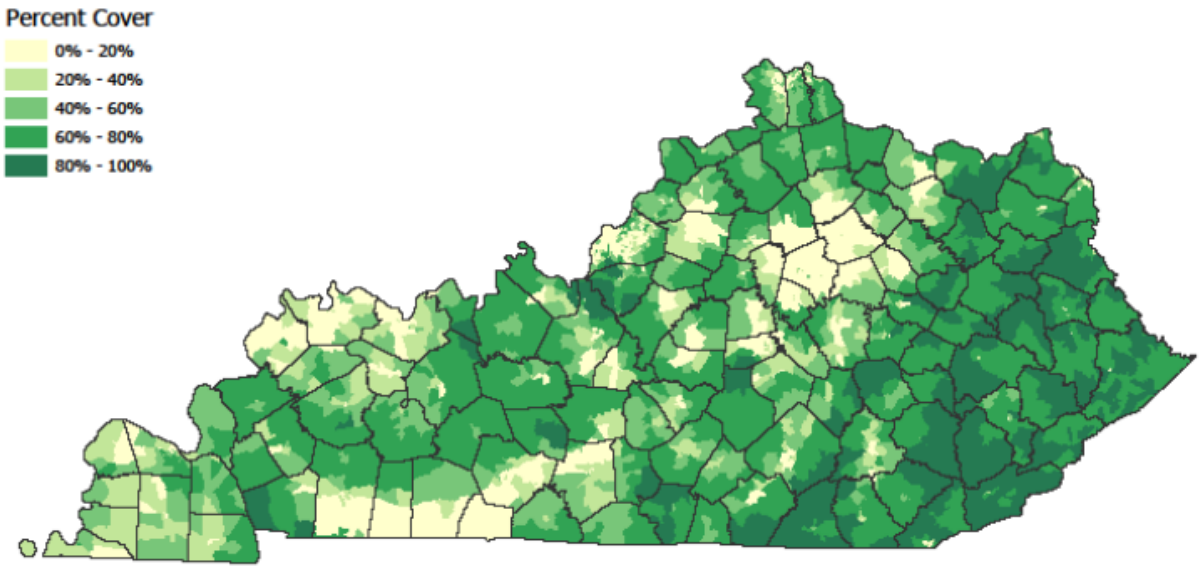
Currently, 50 Kentucky communities and six counties have developed CWPPs... Since 2016, seven plans have been developed for communities at high risk of wildfires, and six more plans are expected to be completed by 2020[53]. Local, state, and federal officials, as appropriate, collaboratively developed these plans. They identify and prioritize areas for hazardous fuel reduction treatments to reduce the wildfire risk, and recommend measures that communities can take to reduce the ignitability of structures in the community. CWPPs incorporate an education component to prioritize teaching residents about wildfire safety, prevention, and risk reduction."

As of the date of publication of the state plan, only one CVADD county – Harlan – had a county-wide Wildfire Protection Plan, although a total of eight communities in four CVADD counties had such a plan. (Not all of the communities are incorporated jurisdictions.)

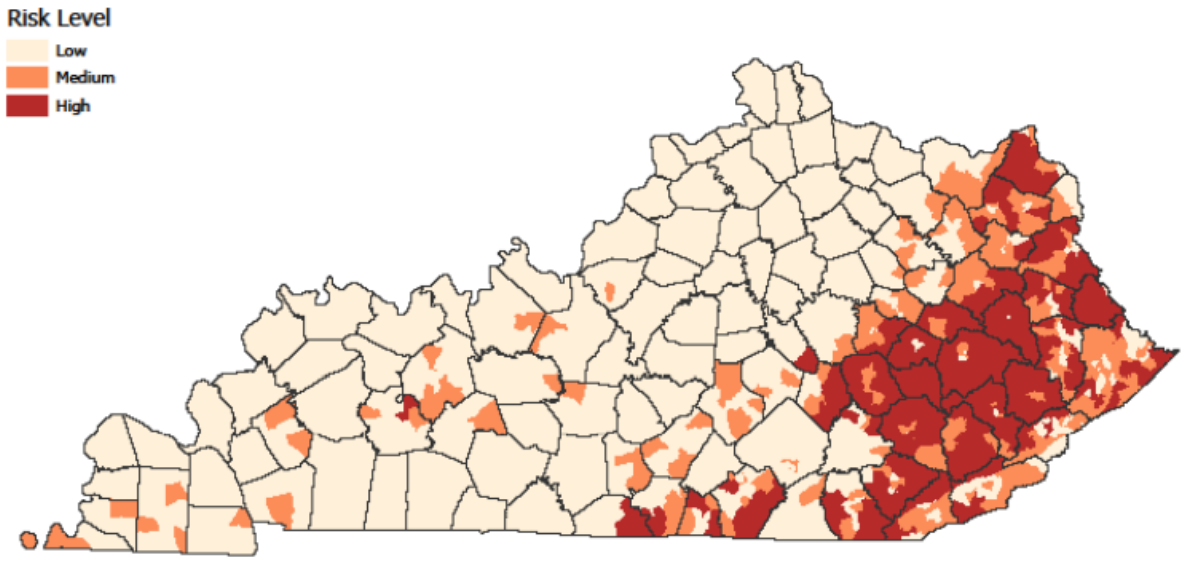
The great majority of CVADD land mass is under 60-100% forest cover (see Forest Cover map below). Most of that is considered High Risk for wildfires, with a much smaller percentage at Medium and Low Risk (see Wildfire Risk map below). As discussed above, the same counties are also among the highest risk for wildfires, especially arson fires, in the state. This situation is complicated by the fact that the majority of fire departments in the CVADD are volunteer, which often have increased response times, on-call personnel only, and less firefighting training than professional firefighters. In the United States as a whole, 54% of firefighters are volunteers; in Kentucky, the percentage is much higher. More than 75% of fire departments in Kentucky are staffed by volunteers and another 14.3% are mostly volunteer. Kentucky is fortunate to have thousands of civic-minded citizens willing to serve as volunteer firefighters, thereby increasing the safety of citizens, property, and wild spaces. However, the low percentage of paid firefighters results in a firefighting force that is susceptible to turnover and may have other duties when firefighting is needed. This in turn means that fires can spread readily before firefighters arrive. The firefighting data in this paragraph comes from the U.S. Fire Administration division of FEMA, specifically the National Fire Department Registry Quick Facts.[54]

[53] Current status unknown.
[54] U.S. Fire Administration, FEMA. National Fire Department Registry Quick Facts. Last updated January 27, 2022. Retrieved 1/28/2022 from National Fire Department Registry Quick Facts (fema.gov).

Forest Cover



Wildfire Risk

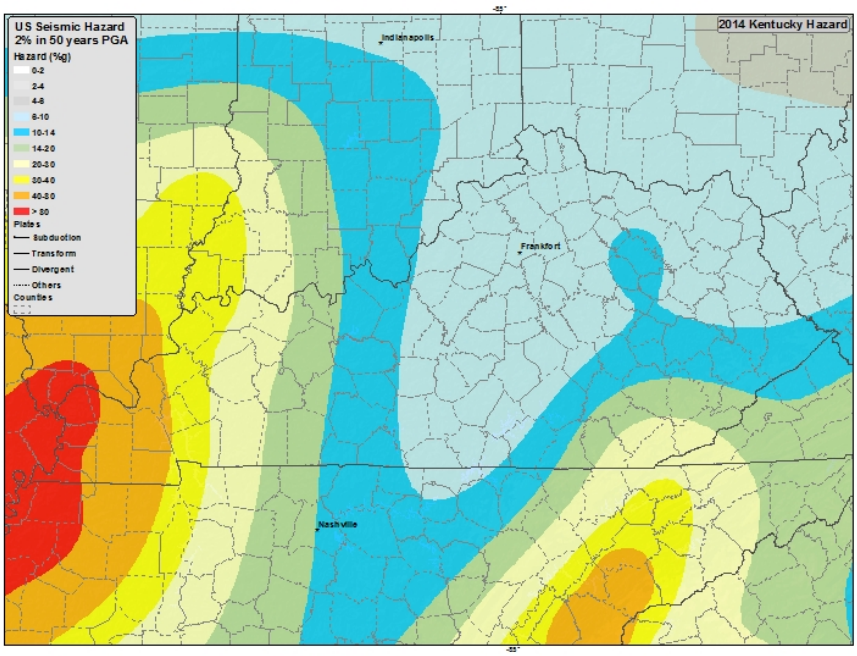


8. Earthquakes

"An earthquake is what happens when two blocks of the earth suddenly slip past one another…(causing) stored up energy…(to radiate) outward from the fault in all directions in the form of seismic waves like ripples in a pond….when the waves reach the earth's surface, they shake the ground…"[55] There have been no major earthquakes in Kentucky in the past 200 years[56], and no smaller earthquakes causing structural damage in CVADD's counties during that time. A 4.3 magnitude earthquake with its epicenter in Letcher County occurred in November 2012; it was felt in Hazard (Perry County), Whitesburg (Letcher County), and even Jackson (Breathitt County), 60 miles away, but no serious damage was reported[57]. Letcher and Perry Counties are adjacent to CVADD. Thus while earthquakes are not a common hazard in eastern Kentucky, they do occur and have the potential to result in structural damage and even harm to humans.

Magnitude	Typical Maximum Modified Mercalli Intensity	Abbreviated Modified Mercalli Intensity Scale
1.0 – 3.0	**I**	**I.** Not felt except by a very few under especially favorable conditions.
3.0 – 3.9	**II – III**	**II.** Felt only by a few persons at rest, especially on upper floors of buildings. **III**. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rocks slightly. Vibrations similar to the passing of a truck.
4.0 – 4.9	**IV – V**	**IV.** Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, and doors disturbed; walls make cracking sounds. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. **V.** Felt by nearly everyone; may awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 – 5.9	**VI – VII**	**VI**. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. **VII**. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 – 6.9	**VII – IX**	**VIII**. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy Furniture overturned. **IX**. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 & Higher	**VIII or higher**	**X.** Some well-built wooden structures remain standing. Bridges destroyed. Rails bent greatly. **XII.** Damage total. Lines of sight and level are distorted. Objects thrown into air.

[55] USGS. The Science of Earthquakes. Retrieved on 5/28/2020 from https://www.usgs.gov/natural-hazards/earthquake-hazards/science/science-earthquakes?qt-science_center_objects=0#qt-science_center_objects.
[56] Kentucky Geological Survey. Retrieved on 5/29/2020 from https://www.uky.edu/KGS/earthquake/earthquake_information.php.
[57] WKYT-TV (Nov 14, 2012) "4.3 magnitude earthquake rattles Ky., seven other states." Retrieved on 5/29/2020 from https://www.wkyt.com/home/headlines/43-magnitude-earthquake-rattles-eastern-Kentucky-178408451.html.



The above map from USGS shows the Peak Ground Acceleration (PGA) for Kentucky. The PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity (g). The Cumberland Valley region is within ranges of 8-10, 10-14, 14-20, and 20-40% g.

E. Conclusions of Hazard Profiles

a. Weather Versus Climate

The difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time such as hours or days, while climate is the average pattern of weather for a region, usually taken over a 30-year time frame. There are several different components to weather such as rain, snow, sleet, sunshine, thunderstorms, and flooding, etc. which impacts the daily lives of people.

To keep up with the ever-changing weather the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS), can issue 25 different types of warnings, statements, or watches. They also provide special weather statements and short and long-term forecasts. Studying weather and climate change is important, as climate change will affect people around the world. Rising global temperatures are expected to raise sea levels and change precipitation and other local climate conditions, altering forests, crop yields, and water supplies.

"One of the most visible consequences of a warming world is an increase in the intensity and frequency of extreme weather events. The National Climate Assessment finds that the number of heat waves, heavy downpours, and major hurricanes have increased in the United States, and the strength of these events have increased too."[58] Climate change is expected to increase the frequency, intensity, and impacts of some types of extreme weather events. It is imperative that Cities, Counties, and States begin preparing and planning for future extreme weather events through effective mitigation strategies.

b. Kentucky's Weather

The state of Kentucky is centrally located in the eastern part of the United States. This location enables Kentucky to have four distinctive seasons; spring, summer, autumn, and winter. Each season brings with it the potential for dangerous weather conditions.

The following list of natural hazards were identified through input from local officials and community members during the County meetings, historical and scientific data gathered from the Kentucky Climate Center, the National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA), United States Geological Survey (USGS) and the UK Kentucky Geological Survey.

[58] Center for Climate and Energy Solutions. "Extreme Weather and Climate Change." Retrieved on 6/16/2020 from https://www.c2es.org/content/extreme-weather-and-climate-change/.

F. Assessing Vulnerability

1. Identifying Assets

IMPACT OF NATURAL HAZARDS ON COMMUNITY ASSETS

Disasters can cause loss of life, damage to buildings and infrastructure, and have devastating consequences for a community's economic, social, and environmental well-being. The exposure of people, property, and other community assets to natural hazards can result in disasters depending on the impacts. Impacts are the consequences or effects of the hazard on the community and its assets. The type and severity of impacts are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capabilities to mitigate, prepare for, respond to, and recover from events.

Several of the hazards that affect the CVADD region, including tornados, severe thunderstorm, wind, severe winter storms, wildfire, landslides, drought and earthquake have no defined vulnerable areas due to either data limitations or due to the nature of the hazard. These hazards are a general threat to the entire area. As a result, all community assets are at risk to these hazards.

COMMUNITY ASSETS:

1. **People:** People are the most important asset. There are areas within a County and/or City of greater population density, as well as populations that may have unique vulnerabilities or be less able to respond and recover during a disaster. These would include visiting populations and access and functional needs populations.
2. **Built Environment:** Includes existing structures, infrastructure systems, critical facilities, and cultural resources.
3. **Natural Environment:** Environmental assets and natural resources are important to community identity and quality of life. It supports the economy through agriculture, tourism, recreation, and a variety of other ecosystem services, such as clean air and water.
4. **Economy:** Every community has specific economic drivers. Economic assets can be described as "direct or indirect" losses. Direct losses would include building or inventory damage. Indirect losses would be functional downtime and loss of employment wages.

PLAN MAINTENANCE

PLAN MONITORING: The Emergency Managers (EM) will oversee implementation and local distribution of the plan upon adoption. They will be responsible for coordinating with their Local Emergency Planning Committees (LEPC), Disaster and Emergency Services (DES), or other regularly scheduled committee meetings to monitor plan activities at the County and or City level. Periodically, the Emergency Manager will review the mitigation projects listed in The Cumberland Valley Multi-Jurisdictional, Multi-Hazard Mitigation plan to determine their progress to date.

PLAN EVALUATION: The Emergency Manager, LEPC and/or DES will evaluate the Cumberland Valley Multi-Jurisdictional, Multi-Hazard Mitigation Plan annually to coincide with FEMA's annual grant cycle. The Emergency Manager, LEPC and/or DES members will evaluate the relevance and effectiveness of the plan's goals and objectives. They will assess:

1. Whether the planned actions address current and expected conditions.

2. Whether the nature/magnitude of risks has changed.
3. Availability of current and expected resources for implementing the actions.

The EM, LEPC, and/or DES will make recommendations to CVADD for any necessary changes to the plan.

PLAN UPDATE: The Cumberland Valley Area Development District in collaboration with Emergency Mangers and Local Emergency Planning Committees will review and revise the plan at least once every 5 years to show progress in local mitigation efforts as well as changes in development and priorities. The plan update will be in conjunction with FEMA's Hazard Mitigation Grant Program.

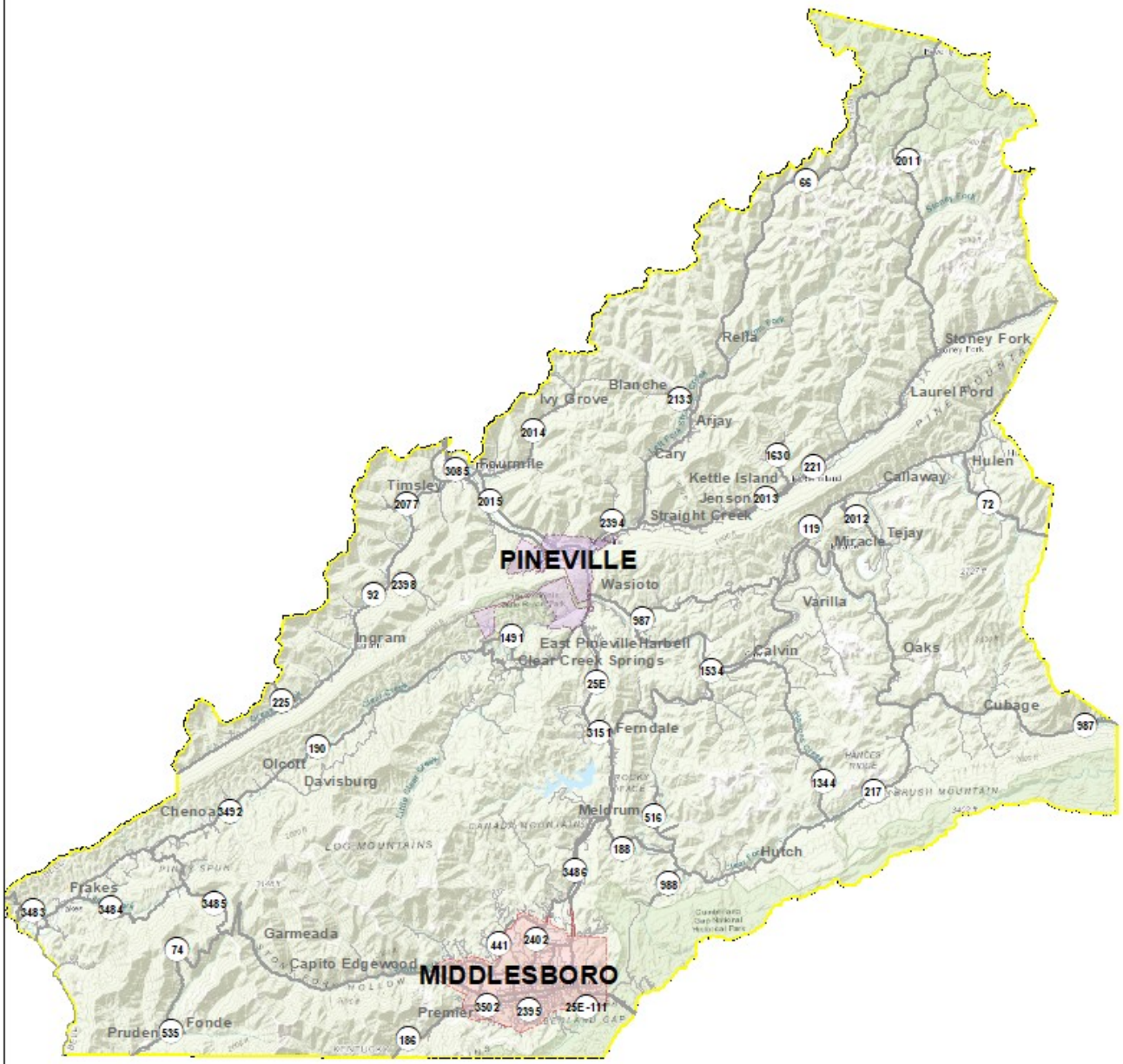
PLAN IMPLEMENTATION: A hard copy of the plan will be distributed to each County EM. A hard copy of the plan will also be available at the CVADD office. A digital copy of the plan is available online at the CVADD's website. Upon completion/approval, the updated plan should be more widely adopted into the emergency planning efforts of the CVADD region.

CVADD's CONTINUED INVOLVEMENT: CVADD will offer their facilities for meetings and assistance with the plan. Cumberland Valley ADD staff will be available to the County Emergency Managers and local committees on an as-needed basis. CVADD staff will be proactive in soliciting funding for administrative activities as well as funding for mitigation actions as outlined in the plan.

ADOPTION BY LOCAL GOVERNING BODIES

After review of the plan, each jurisdiction within the District was notified that it must adopt or not adopt the Regional Hazard Mitigation Plan Update. By adopting the plan, that jurisdiction agreed with the findings and agreed to implement mitigation projects when funds became available. All jurisdictions were advised that they would not receive mitigation funding during future disaster events if they failed to adopt the Plan.

Bell County, KY:
Hazard Mitigation Overview



V. BELL COUNTY OVERVIEW

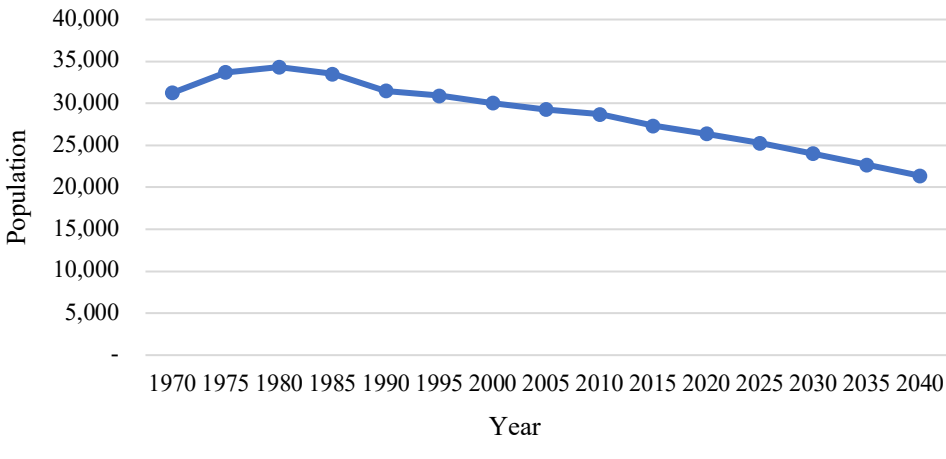
Bell County is in the southeastern corner of Kentucky where the state meets Tennessee and Virginia at the famed Cumberland Gap. Its 359 square miles are dominated by two mountain ridges; Pine Mountain and Cumberland Mountain. Much of its rugged terrain is heavily forested with picturesque streams cutting through deep valleys. Kentucky's first state park, Pine Mountain State Resort Park, and the country's largest national historical park, Cumberland Gap National Historical Park, showcase the county's natural beauty. Tourism is becoming an ever-growing part of the economy.

Bell County, KY Quick Facts	
Population Estimates, July 1, 2019	26,032
Population per Square Miles, 2010	79.9
Land Area in Square Miles, 2010	359
Housing Units, July 1, 2016	13,086
Persons in Poverty, percent	38.7%
Median Value of Owner-Occupied Housing Units, 2012-2016	$59,800
Median Household Income, 2012-2016	$22,603
Total Employment, 2015	6,825
Total Employer Establishments, 2015	482
Source: U.S. Census Bureau	

BELL COUNTY POPULATION

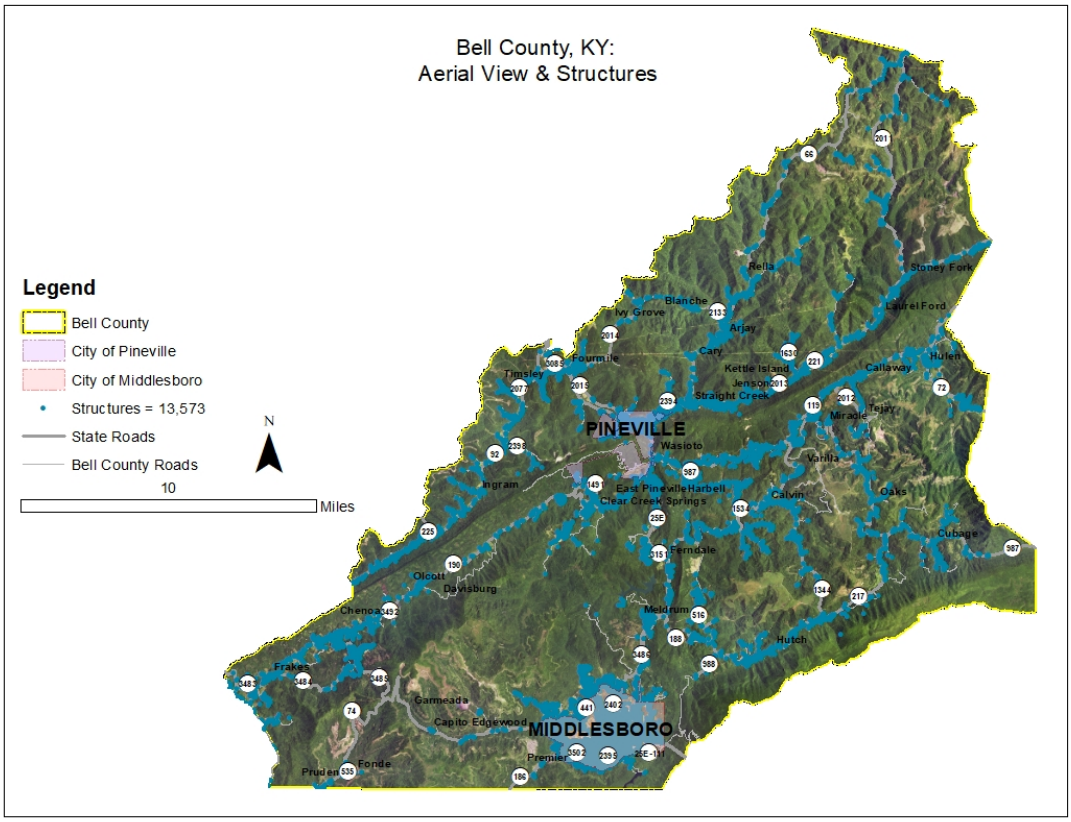
In 2019, Bell County's estimated total population was 26,032. Bell County, the City of Middlesboro, and the City of Pineville have all experienced a decline in population. Between 2012 and 2020, Bell County lost 5% of its population; it is expected to continue declining.

Bell County Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Bell County	28,247	27,294	26,791	5% fewer	
City of Middlesboro	10,041	9,694	9,858	1.8% fewer	
City of Pineville	1,833	1,769	1,800	1.8% fewer	
Source: U.S. Census Bureau					



Source: U.S. Census Bureau & KY State Data Center

According to the United States Census there were 13,272 housing units located in Bell County in 2019. The following map illustrates where the residential and commercial structures are located based on CVADD ArcGIS database.



COMMUNITY CAPABILITIES

Bell County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Bell County Fiscal Court is comprised of a judge executive and 5 magistrates. The City of Pineville & the City of Middlesboro are both Home Rule class cities lead by a mayor-council government. Both the Fiscal Court and City Council have the financial, administrative, technical, planning, and regulatory capabilities to accomplish hazard mitigation.

Bell County Plans & Programs									
	Emergency Operation Plan	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Bell County	✓		✓	✓	✓	✓	✓	N/A	
Middlesboro	✓	✓	✓	✓	✓	✓	✓	N/A	
Pineville	✓	✓	✓	✓	✓	✓	✓	N/A	

EMERGENCY MANAGEMENT

To prepare for future natural hazards Bell County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Bell County's 2016 THIRA.

THIRA	
1	Flood
2	Winter Storms
3	Severe Weather & Tornados

The Bell County Emergency Management also has a Local Emergency Planning Committee that meets quarterly and promotes emergency planning and preparedness. The LEPC includes members from various professions and is open to the public. For more information about Bell County's THIRA and LEPC meetings contact the Emergency Management Director.

BELL COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. The following chart summarizes the natural hazards that have had a negative impact on the people and places of Bell County. These hazards were discussed and reviewed during the community meetings.

Rank	**Natural Hazards**
1	Flood
2	Severe Winter Weather
3	Wildfire
4	Drought
5	Severe Thunderstorms & Tornado

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

BELL COUNTY - ASSESSING VULNERABILITY: IDENTIFYING ASSETS

Using the best available data, CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the county. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 16 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Bell County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Bell County Critical Infrastructure		*Structures Located in the Floodplain
Location	**Address**	**Replacement Property Value**
City of Pineville		
Bell County Bus Garage	868 Old Bell High Rd. Pineville, KY 40977	$300,000.00
Bell County Detention Center	214 Virginia Ave, Pineville, KY 40977	TBD
Bell County Courthouse	101 Courthouse Sq. Pineville, KY 40977	TBD
Bell County Emergency Mgmt.	101 Courthouse Sq. Pineville, KY 40977	Courthouse
Bell County Health Department	310 Cherry St, Pineville, KY 40977	$150,000.00
Bell County Highway Garage	4096 US Hwy. 119, Pineville, KY 40965	$300,000.00
Bell County Sheriff Department	101 Courthouse Sq. Pineville, KY 40977	Courthouse
Dialysis Services of Pineville	12904 Robert L Madon Bypass, Pineville, KY 40977	TBD
Horizon Adult Care Center	3300 US 25E, Pineville, KY 40977	TBD
CSX	202 S. Pine Street, Pineville, KY 40977	TBD
Mountain View Nursing & Rehabilitation Center	39 Ferndale Apartments Rd. Pineville, KY 40977	TBD
Pineville City Hall	300 W. Virginia Ave. Pineville, KY 40977	$350,000.00
Pineville City Police Department	300 W. Virginia Ave. Pineville, KY 40977	Same as above
Pineville Community Hospital (closed 2019/may reopen)	850 Riverview Ave., Pineville, KY 40977	$7,500,000.00
City of Middlesboro		
Bell County Adult Day Care Center	513 N 15th St. Middlesboro, KY 40965	TBD
Bell County Health Department	112 Lothbury Ave. Middlesboro, KY 40965	TBD
Bell County Rescue Squad	129 N. 17th St. Middlesboro, KY 40965	$35,000.000
Middlesboro ARH Hospital	3600 W. Cumberland Ave., Middlesboro, KY 40965	$4,700,000.00
Middlesboro Nursing & Rehabilitation Center	235 New Wilson Ln. Middlesboro, KY 40965	TBD
Middlesboro Police Department	150 N. 20th Street, Middlesboro, KY 40965	$220,000.00
Fire Departments		
Bell County VFD Anjay Company	4852 Hwy. 66, Anjay, KY 40902	TBD
Bell County VFD Brownies Creek Company	144 David Miracle Rd. Miracle, KY 40856	TBD
Bell County VFD Calloway Station	43 Calloway Rd. E. Pineville, KY 40977	$35,000.00
Fourmile Fire Station	72 Mills Hill Rd. Pineville, KY 40977	$35,000.00
Frakes Fire Department	16764 Hwy. 190, Pineville, KY 40977	$45,000.00
Pineville VFD	106 1/2 Cherry St. Pineville, KY 40977	$170,000.00
Right Fork VFD	5220 Hwy. 221, Kettle Island, KY 40958	$35,000.00
Bell County VFD Colmar Company	2604 Hwy. 188, Middlesboro, KY 40965	$35,000.00
Bell County VFD East Pineville Company	2527 US Hwy. 119, Pineville, KY 40977	TBD

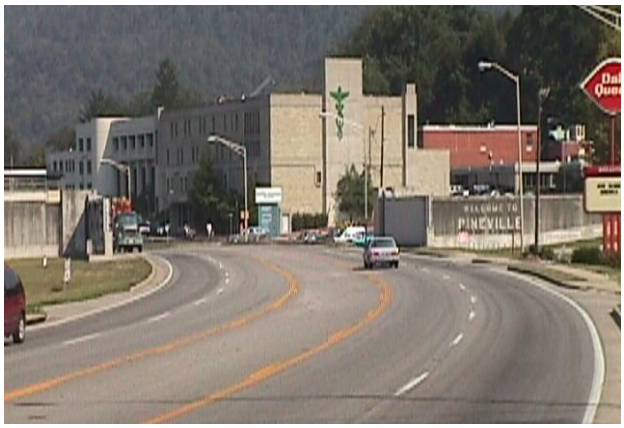
Bell County VFD Harmony Company	2654 Hwy. 190, Pineville, KY 40977	$35,000.00
Bell County VFD Harmony Company	99 Page School Rd. Pineville, KY 40977	$725,000.00
Middlesboro Fire Department	121 Lothbury Ave. Middlesboro, KY 40965	$235,000.00
Schools		
Bell County BOE Administration Building	Virginia Ave, Pineville, KY 40977	TBD
Bell Central School Center	9821 US Hwy. 25 E. Pineville, KY 40977	$ 3,640,000.00
Bell County High School	9824 US Hwy. 25 E. Pineville, KY 40977	$9,500,000.00
Fonde Christian Academy	257 Fonde Christian Academy Rd. Pineville, KY 40977	$40,000.00
Frakes School Center	29 Henderson Settlement Loop, Pineville, KY 40977	$2,600,000.00
Gateway Christian Academy	1110 N. 25th St. Middlesboro, KY 40965	$250,000.00
Gateway Christian Elementary	315 N. 25th St. Middlesboro, KY 40965	TBD
Lone Jack School Center	101 Creech Hollow Rd. Pineville, KY 40977	$3,000,000.00
Middlesboro Elementary School	340 West Cumberland Avenue, Middlesboro, KY 40965	TBD
Middlesboro High School	4404 W. Cumberland Ave. Middlesboro, KY 40965	$2,600,000.00
Middlesboro Independent Schools Central Office	220 N 20th St, Middlesboro, KY 40965	$2,200,000.00
Middlesboro Middle School	4400 W. Cumberland Ave. Middlesboro, KY 40965	$2,100,000.00
Page School Center	239 Page School Rd. Pineville, KY 40977	$2,700,000.00
Pineville School	401 W. Virginia Ave. Pineville, KY 40977	$6,400,000.00
Bell County Alternative School	978 Old Bell High Rd. Pineville, KY 40977	$300,000.00
Right Fork School Center	5296 Hwy. 221, Stoney Fork, KY 40988	$2,700,000.00
Yellow Creek Elementary School	4818 W. Cumberland Ave. Middlesboro, KY 40965	$2,700,000.00
Universities		
Clear Creek Baptist Bible College	300 Clear Creek Rd, Pineville, KY 40977	TBD
Southeast Community College	10350 US Hwy. 25E, Pineville, KY 40977	$21,000,000.00
Bell County Media		
Middlesboro Daily News	110 N. 11th St. Middlesboro, KY 40965	TBD
New Wave Comm	218 E. Park Ave. Pineville, KY 40977	TBD
WXJB-FM	2118 Cumberland Avenue Middlesboro, KY 40965	TBD
WFXY 1490	2118 Cumberland Avenue Middlesboro, KY 40965	TBD
WMIK 560 AM 224 FM	19 N St Middlesboro, KY 40965	TBD
WRIL 106.3	1930 Cumberland Ave Middlesboro, KY 40965	TBD
WANO 1230	2131 Cumberland Ave. Middlesboro, KY 40965	TBD
Area Solid Waste Removal		
Bell County Solid Waste	100 Hwy. 1534 Middlesboro, KY 40965	$37,500.00
Waste Water/Water Treatment		
Bell County Forestry Camp	560 Correctional Drive, Pineville, KY 40977	TBD

Pineville Water System	7409 US Hwy 25E Middlesboro, KY 40965	TBD
Water Service Corporation of Kentucky	102 Water Plant Rd. Middlesboro, KY 40965	TBD
Electrical Infrastructure		
Cumberland Valley Electric, Inc.	6219 North US HWY. 25 East, Gray Kentucky 40734	TBD
Kentucky Utilities	48 KU Drive, Fourmile, KY 40939	TBD
Airports		
Middlesboro Bell County Airport	1420 Dorchester Ave Middlesboro, KY 40965	TBD
Military		
National Guard Armory	605 N Petersborough Ave, Middlesboro, KY 40965	TBD
Dams	**HAZARD CLASS**	
Cheno Lake Dam	(Class C) High	TBD
Fern Lake Dam	(Class C) High	TBD
Pine Mountain State Park Lake Dam	(Class B) Moderate	TBD
Cannon Creek Dam	(Class C) High	TBD
Corum Dam	(Class B) Moderate	TBD
Corum Dam II	(Class A) Low	TBD
Tunnels		
Cumberland Gap Tunnel		TBD
Towers		
Pine Mountain, Log Mountain, White Oak, Hignite		

BELL COUNTY FLOODING

Bell County's 359 square miles of land is made up of rugged hills and wide stream valleys, which increases the likelihood of flooding. Many of the County's communities are located within these stream valleys with one unique exception: Middlesboro is located within a meteorite crater. The Cumberland River flows through Bell County bringing with it the potential for severe flooding.

Bell County's floodwalls, which were built in 1952, run almost parallel along the river to protect the county's vulnerable assets from flooding. However, in April 1977 torrential downfall caused the Cumberland River to breach the floodwalls, inundating the City of Pineville with 15 feet of water. For the 3,000-people living in the City of Pineville at the time, two-thirds had their homes damaged by water. In 1988 the US Army Corps of Engineers upgraded the floodwall to better protect the people living near the Cumberland River.



In order to address systematically the number of previous flooding occurrences, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies on the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from flooding for Bell County, Kentucky and for its incorporated cities. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not

representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Bell County and for its unincorporated and incorporated cities.

The incorporated cities for Bell County include only the City of Middlesboro and the City of Pineville. In order to capture "Flood" and "Flash Flood" events specific to the incorporated cities, the below tables include all "Flood" and "Flash Flood" events having searched the entire date range of available data within the NCEI "Storm Events Database," i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of "probability"), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Bell County and its incorporated cities, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines "probability" in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the "Flood" and "Flash Flood" events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for Bell County as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 1-1: Bell County Flood and Flash Flood Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
	Totals:							0	0	31.818M	1.16K
1	ARJAY	BELL CO.	KY	05/08/1996	07:10	EST	Flash Flood	0	0	10.00K	0.00K
2	BELL (ZONE)	BELL (ZONE)	KY	12/01/1996	00:01	EST	Flood	0	0	5.00K	0.00K
3	BELL (ZONE)	BELL (ZONE)	KY	03/03/1997	07:00	EST	Flood	0	0	5.00K	0.00K
4	COUNTYWIDE	BELL CO.	KY	04/16/1998	20:45	EST	Flash Flood	0	0	15.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	04/17/1998	06:45	EST	Flood	0	0	0.00K	0.00K
	COUNTYWIDE	BELL CO.	KY	04/18/1998	19:00	EST	Flash Flood	0	0	50.00K	0.00K
5	NOETOWN	BELL CO.	KY	01/24/2002	07:50	EST	Flash Flood	0	0	0.00K	0.00K
6	BELL (ZONE)	BELL (ZONE)	KY	03/17/2002	23:45	EST	Flood	0	0	26.500M	0.00K
7	BELL (ZONE)	BELL (ZONE)	KY	02/16/2003	02:00	EST	Flood	0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	02/16/2003	02:03	EST	Flood	0	0	1.130M	0.00K
8	BELL (ZONE)	BELL (ZONE)	KY	04/09/2003	10:09	EST	Flood	0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	04/10/2003	18:54	EST	Flood	0	0	0.00K	0.00K
9	BELL (ZONE)	BELL (ZONE)	KY	02/06/2004	19:00	EST	Flood	0	0	0.00K	0.00K
10	BELL (ZONE)	BELL (ZONE)	KY	03/06/2004	11:39	EST	Flood	0	0	0.00K	0.00K
11	BELL (ZONE)	BELL (ZONE)	KY	09/08/2004	06:30	EST	Flood	0	0	0.00K	0.00K
12	BELL (ZONE)	BELL (ZONE)	KY	09/17/2004	09:30	EST	Flood	0	0	0.00K	0.00K
13	EDGEWOOD	BELL CO.	KY	06/17/2009	15:00	EST-5	Flash Flood	0	0	0.00K	0.00K
	CHENOA	BELL CO.	KY	06/17/2009	15:00	EST-5	Flash Flood	0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
14	PONZA	BELL CO.	KY	12/09/2009	01:00	EST-5	Flood	0	0	5.00K	0.00K
	KETTLE IS	BELL CO.	KY	12/09/2009	02:00	EST-5	Flood	0	0	0.00K	0.00K
15	EDGEWOOD	BELL CO.	KY	05/15/2010	18:12	EST-5	Flash Flood	0	0	0.00K	0.00K
	CALVIN	BELL CO.	KY	05/15/2010	21:00	EST-5	Flood	0	0	4.00K	0.00K
16	PONZA	BELL CO.	KY	08/18/2010	05:00	EST-5	Flash Flood	0	0	0.00K	0.00K
17	SURRAN	BELL CO.	KY	11/30/2010	13:00	EST-5	Flood	0	0	1.00K	1.00K
18	PARAMOUNT	BELL CO.	KY	06/20/2011	04:00	EST-5	Flash Flood	0	0	0.00K	0.00K
19	PAGE	BELL CO.	KY	03/02/2012	13:00	EST-5	Flash Flood	0	0	0.00K	0.00K
	BINGHAMTON	BELL CO.	KY	03/02/2012	13:00	EST-5	Flash Flood	0	0	0.00K	0.00K
20	STONEY FORK	BELL CO.	KY	04/17/2013	09:00	EST-5	Flood	0	0	0.00K	0.00K
21	FRAKES	BELL CO.	KY	09/03/2013	00:40	EST-5	Flash Flood	0	0	1.00K	0.00K
22	CALVIN	BELL CO.	KY	03/04/2015	13:02	EST-5	Flood	0	0	1.00K	0.00K
	BEVERLY	BELL CO.	KY	03/04/2015	20:10	EST-5	Flood	0	0	1.00K	0.00K
23	OAKS	BELL CO.	KY	07/05/2015	18:40	EST-5	Flash Flood	0	0	1.00K	0.00K
24	MIRACLE	BELL CO.	KY	07/14/2015	12:00	EST-5	Flash Flood	0	0	1.00K	0.00K
	CUBAGE	BELL CO.	KY	07/14/2015	14:15	EST-5	Flash Flood	0	0	1.00K	0.00K
	CALVIN	BELL CO.	KY	07/14/2015	21:00	EST-5	Flash Flood	0	0	1.00K	0.00K
	MIRACLE	BELL CO.	KY	07/14/2015	21:00	EST-5	Flash Flood	0	0	1.00K	0.00K
25	BEVERLY	BELL CO.	KY	12/25/2015	12:11	EST-5	Flash Flood	0	0	1.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
	BLANCHE	BELL CO.	KY	12/25/2015	15:00	EST-5	Flood	0	0	1.00K	0.00K
26	BEVERLY	BELL CO.	KY	06/21/2016	21:00	EST-5	Flash Flood	0	0	1.00K	0.10K
27	BEVERLY	BELL CO.	KY	07/08/2016	16:59	EST-5	Flash Flood	0	0	0.10K	0.00K
28	BEVERLY	BELL CO.	KY	08/04/2016	19:00	EST-5	Flash Flood	0	0	1.00K	0.01K
29	SURRAN	BELL CO.	KY	08/08/2016	12:30	EST-5	Flash Flood	0	0	3.00K	0.05K
30	FRAKES	BELL CO.	KY	04/23/2017	15:50	EST-5	Flood	0	0	0.00K	0.00K
	BEVERLY	BELL CO.	KY	04/23/2017	18:10	EST-5	Flood	0	0	0.00K	0.00K
31	BEVERLY	BELL CO.	KY	02/10/2018	17:09	EST-5	Flood	0	0	1.00K	0.00K
32	FERNDALE	BELL CO.	KY	06/26/2018	17:15	EST-5	Flash Flood	0	0	20.00K	0.00K
33	BINGHAMTON	BELL CO.	KY	09/27/2018	16:25	EST-5	Flash Flood	0	0	0.00K	0.00K
34	BEVERLY	BELL CO.	KY	02/12/2019	17:35	EST-5	Flood	0	0	0.00K	0.00K
35	BEVERLY	BELL CO.	KY	02/20/2019	14:30	EST-5	Flood	0	0	0.00K	0.00K
36	CLEAR CREEK SPGS	BELL CO.	KY	05/11/2019	21:00	EST-5	Flood	0	0	0.00K	0.00K
	FERNDALE	BELL CO.	KY	05/11/2019	21:00	EST-5	Flood	0	0	0.00K	0.00K
37	DAVISBURG	BELL CO.	KY	07/07/2019	15:15	EST-5	Flash Flood	0	0	5.00K	0.00K
38	MELDRUM	BELL CO.	KY	07/18/2019	05:45	EST-5	Flash Flood	0	0	0.00K	0.00K
39	STONEY FORK	BELL CO.	KY	02/05/2020	23:06	EST-5	Flood	0	0	16.00K	0.00K
	CLEAR CREEK SPGS	BELL CO.	KY	02/05/2020	23:06	EST-5	Flood	0	0	0.00K	0.00K
	BINGHAMTON	BELL CO.	KY	02/06/2020	00:50	EST-5	Flood	0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
	DORTON BRANCH	BELL CO.	KY	02/06/2020	02:00	EST-5	Flood	0	0	4.000M	0.00K
	BLANCHE	BELL CO.	KY	02/06/2020	02:54	EST-5	Flood	0	0	0.00K	0.00K
	MIRACLE	BELL CO.	KY	02/06/2020	10:21	EST-5	Flood	0	0	11.00K	0.00K
40	BINGHAMTON	BELL CO.	KY	04/13/2020	04:30	EST-5	Flood	0	0	15.00K	0.00K
41	TINSLEY	BELL CO.	KY	05/25/2020	15:30	EST-5	Flash Flood	0	0	10.00K	0.00K

Bell County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate what is assumed to be clusters of discrete events that comprise, in actuality, one event for the purpose of defining a denominator for illustrating frequency. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

That Bell County, unincorporated (and its unincorporated cities) independently experienced 41 flooding events over 25 years yields that Bell County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every seven months (i.e., 41/25). Specifically, Bell County, unincorporated and its unincorporated cities experienced an average of 1.64 flooding events each year. Or, using October 31, 2020 as an endpoint, 41/298 months is 0.1376 events per month. $1/0.1376 = 7.2674 \approx 1$ flooding event an average of every seven (7) months.

Table 1-2: City of Middlesboro Flood and Flash Flood Events, 1996-2020

No.	Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
1	Middlesboro	Bell	KY	11/30/1996	16:00	EST	Flash Flood	0	0	20.00K	0.00K
2	Middlesboro	Bell	KY	03/03/1997	07:00	EST	Flash Flood	0	0	10.00K	0.00K
3	Middlesboro	Bell	KY	04/03/2000	22:24	EST	Flash Flood	0	0	0.00K	0.00K
4	Middlesboro	Bell	KY	03/28/2005	04:00	EST	Flash Flood	0	0	0.00K	0.00K
5	Middlesboro Bell ARP	Bell	KY	06/20/2011	04:00	EST-5	Flash Flood	0	0	0.00K	0.00K
6	Middlesboro Bell ARP	Bell	KY	06/20/2011	07:30	EST-5	Flash Flood	0	0	0.00K	0.00K
7	Middlesboro Bell ARP	Bell	KY	06/20/2011	07:30	EST-5	Flash Flood	0	0	1.000M	0.00K
	TOTALS							0	0	1.030M	0.00K

City of Middlesboro Flooding - Probability as Frequency of Event Occurrence

This assessment assumes that the three (3) discrete events occurring at "Middlesboro Bell ARP" on June 20, 2011 actually are one (1) event: From 4:00 AM to 7:30 AM, there was flash-flooding that ultimately resulted in a broadly estimated $1,000,000.00 in property damage.

That the City of Middlesboro independently experienced five (5) flooding (all "Flash Flood") events over 25 years yields that the City of Middlesboro experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every five (5) years (i.e., 5/25).

Table 1-3: City of Pineville Flooding Events, 1996-2020

No.	Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
1	Pineville	Bell	KY	05/25/ 1998	20:45	EST	Flash Flood	0	0	0.00K	0.00K
2	Pineville	Bell	KY	04/03/ 2000	19:20	EST	Flash Flood	0	0	0.00K	0.00K
3	Pineville	Bell	KY	01/24/ 2002	19:25	EST	Flash Flood	0	0	0.00K	0.00K
4	Pineville	Bell	KY	03/17/ 2002	20:15	EST	Flash Flood	0	0	10.00K	0.00K
5	Pineville	Bell	KY	07/19/ 2005	16:15	EST	Flash Flood	0	0	0.00K	0.00K
6	Pineville	Bell	KY	08/05/ 2005	16:31	EST	Flash Flood	0	0	0.00K	0.00K
7	Pineville	Bell	KY	12/09/ 2009	02:00	EST-5	Flood	0	0	0.00K	0.00K
8	Pineville	Bell	KY	05/14/ 2010	16:59	EST-5	Flash Flood	0	0	0.00K	0.00K
9	Pineville	Bell	KY	02/21/ 2015	17:33	EST-5	Flash Flood	0	0	1.00K	0.00K
10	Pineville	Bell	KY	08/05/ 2015	16:40	EST-5	Flash Flood	0	0	1.00K	0.00K
11	Pineville	Bell	KY	02/10/ 2018	17:09	EST-5	Flood	0	0	100.00K	0.00K
	TOTALS							0	0	112.00K	0.00K

City of Pineville Flooding - Probability as Frequency of Event Occurrence

That the City of Pineville independently experienced eleven (11) discrete flooding events over 25 years yields that the City of Pineville experienced (and, thus, can expect to experience in the future) an average frequency of one (1) flooding event nearly every two (2) years (11/25). Specifically, City of Pineville experienced an average of 0.44 flooding events each year.

Examples of Past Flood Events

In March 2015 heavy rains and snow melt produced widespread flooding across the County. The runoff quickly pushed the creeks and streams over their banks. In February of 2018 heavy rain caused widespread flooding across Bell County. The river areas such as Straight Creek, Newtown, and Arjay were affected. In addition to flooding, landslides created problems across the County.

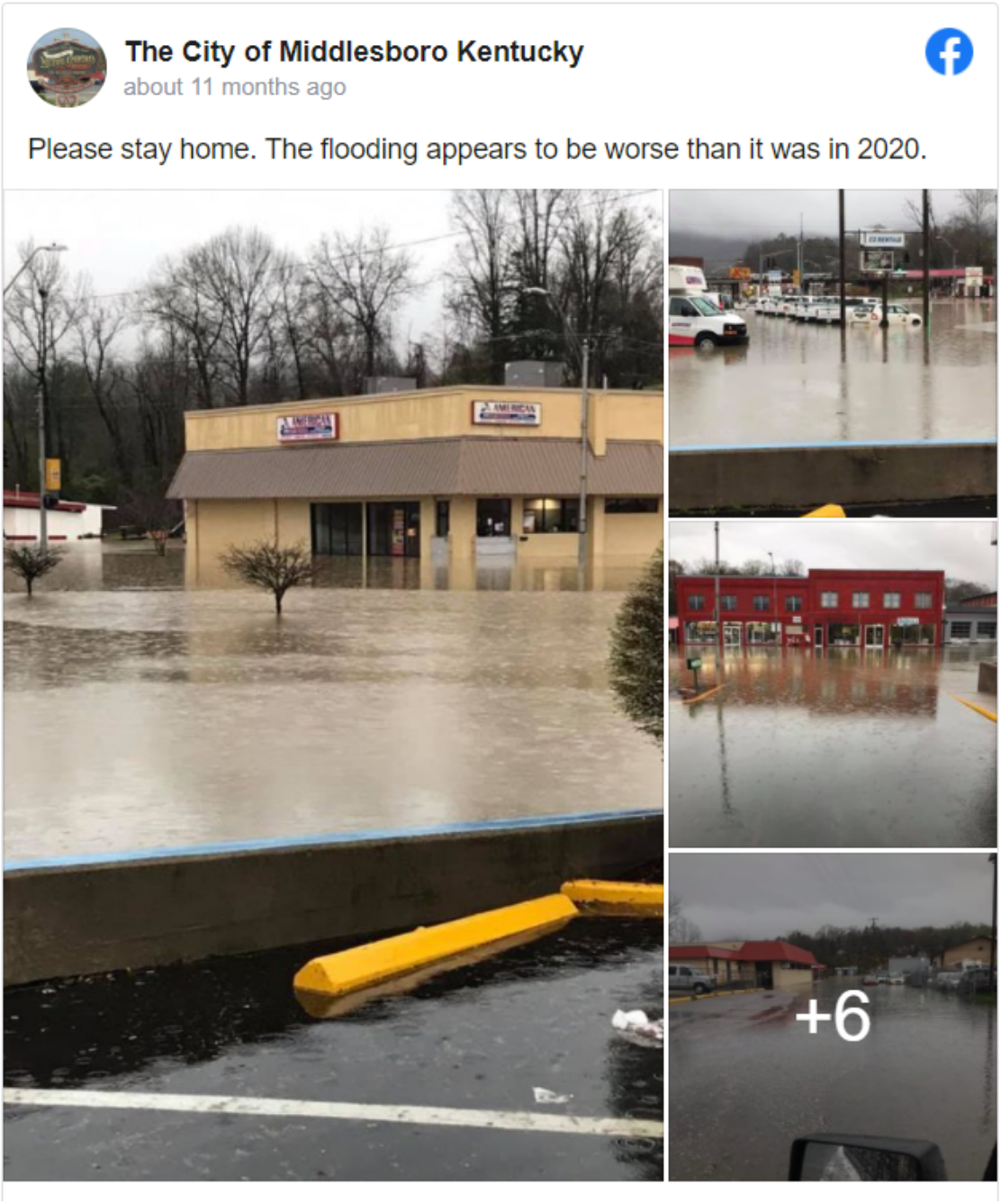
In February 2018 Bell County was hit by a deluge of rain that left many roadways flooded and impassible. Jenson Road, KY-221 near Stoney Fork, the intersection of 17th Street and Cumberland Avenue, Old Pine Pike, KY-1534 near Pineville and KY-2011 near Beverly were all closed due to flood waters.

The pictures on the left demonstrate the extent of flooding that occurred in Bell County. These were taken along Straight Creek. Officials in Bell County declared an emergency.

During the community meetings, it was discussed that when flooding occurs several communities become isolated and inaccessible. Many of the communities have only one entrance; getting the necessary help to these isolated areas can be a daunting task. When the floodgates are closed in the City of Pineville, access to the hospital becomes restricted as the main roads are sealed off. Rescue workers must commander private property located near the gate to be used as an easement.

Severe flooding struck the City of Middlesboro in 2020, but the flooding on March 27-28, 2021, was thought by officials to be even worse. Below are photos of downtown Middlesboro during that flooding event, as published by a local new agency[59]:

[59] Retrieved on 2-8-2022 from "Worse than it was in 2020": Severe flooding strikes Middlesboro, Ky. | wbir.com.



Flooding can cause fatalities or injuries, disrupt or destroy infrastructure (roads, bridges, culverts, water, wastewater, gas, electric), disrupt drinking water supplies, and cause erosion and landslides. Floods can occur anytime during the year and are Kentucky's most costly natural hazard. Reviewing past flood events can identify vulnerabilities within the county and cities enabling emergency management to better prepare for future disasters.

CUMBERLAND RIVER HISTORICAL CRESTS

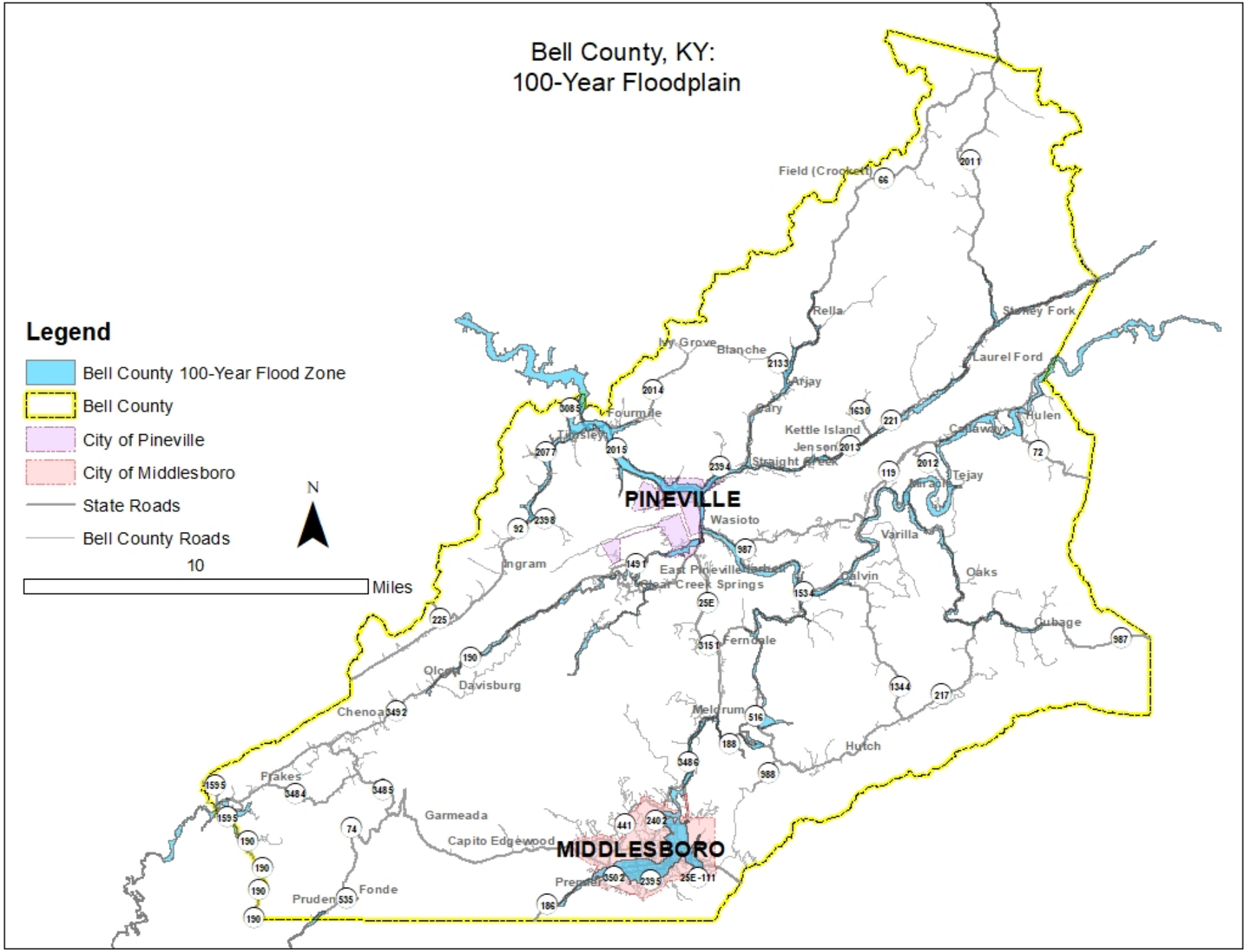
Due to the high probability of flooding, emergency managers watch the Cumberland River closely. NOAA has a flood gauge located at the City of Pineville to assist with the prediction and preparation of flood events. The following is a list of the historic crests of the Cumberland River at Pineville.

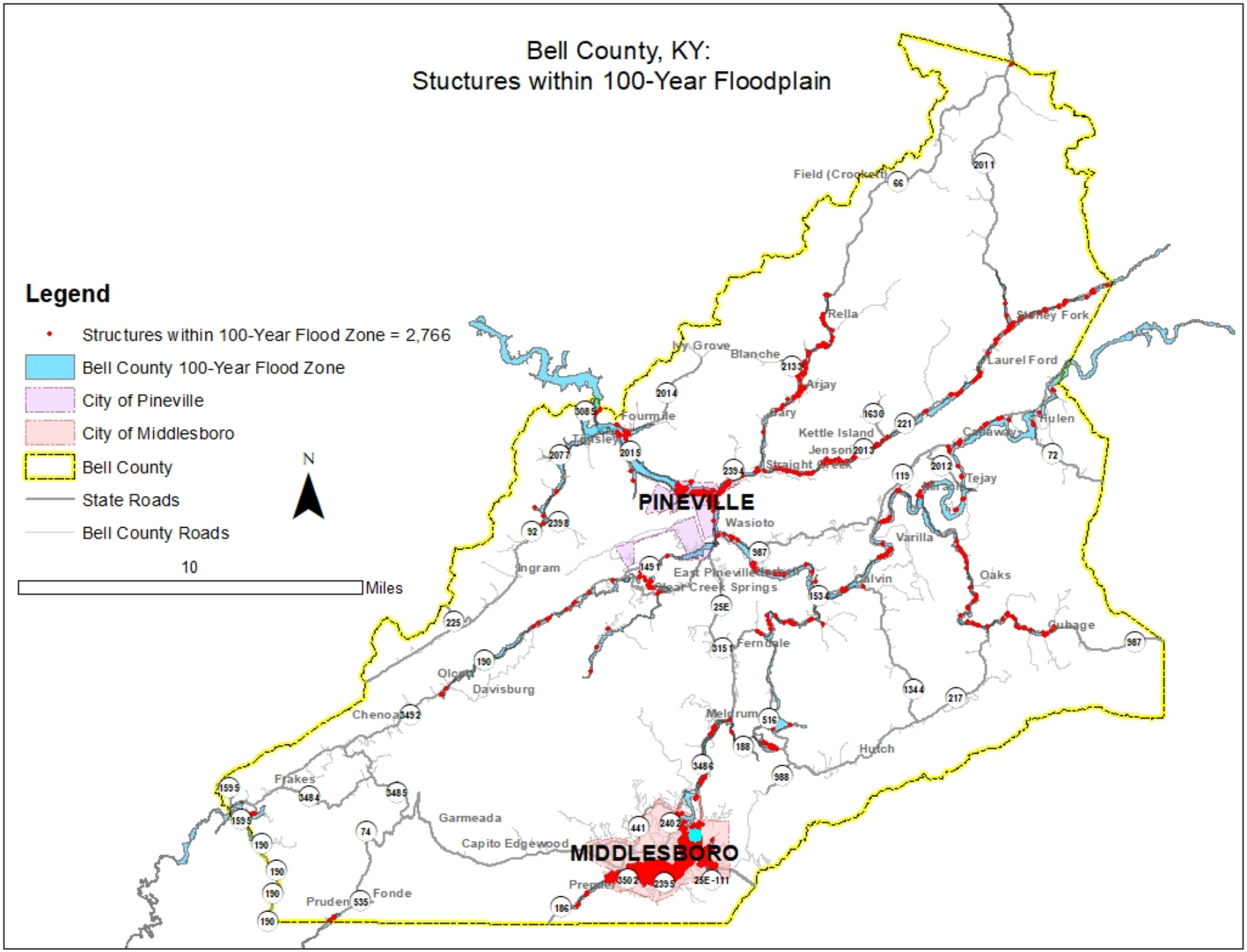
Historic Crests		
1	1,021.80 ft	4/05/1977
2	1,017.32 ft	3/18/2002
3	1.013.67 ft	2/11/1994
4	1,013.52 ft	3/5/2015
5	1,013.22 ft	5/8/1984
6	1,013.22 ft	2/16/2003
7	1,012.70 ft	4/19/1998
8	1,012.70 ft	12/03/1991
9	1,010.20 ft	6/16/1989
10	1,008.90 ft	1/1/1967

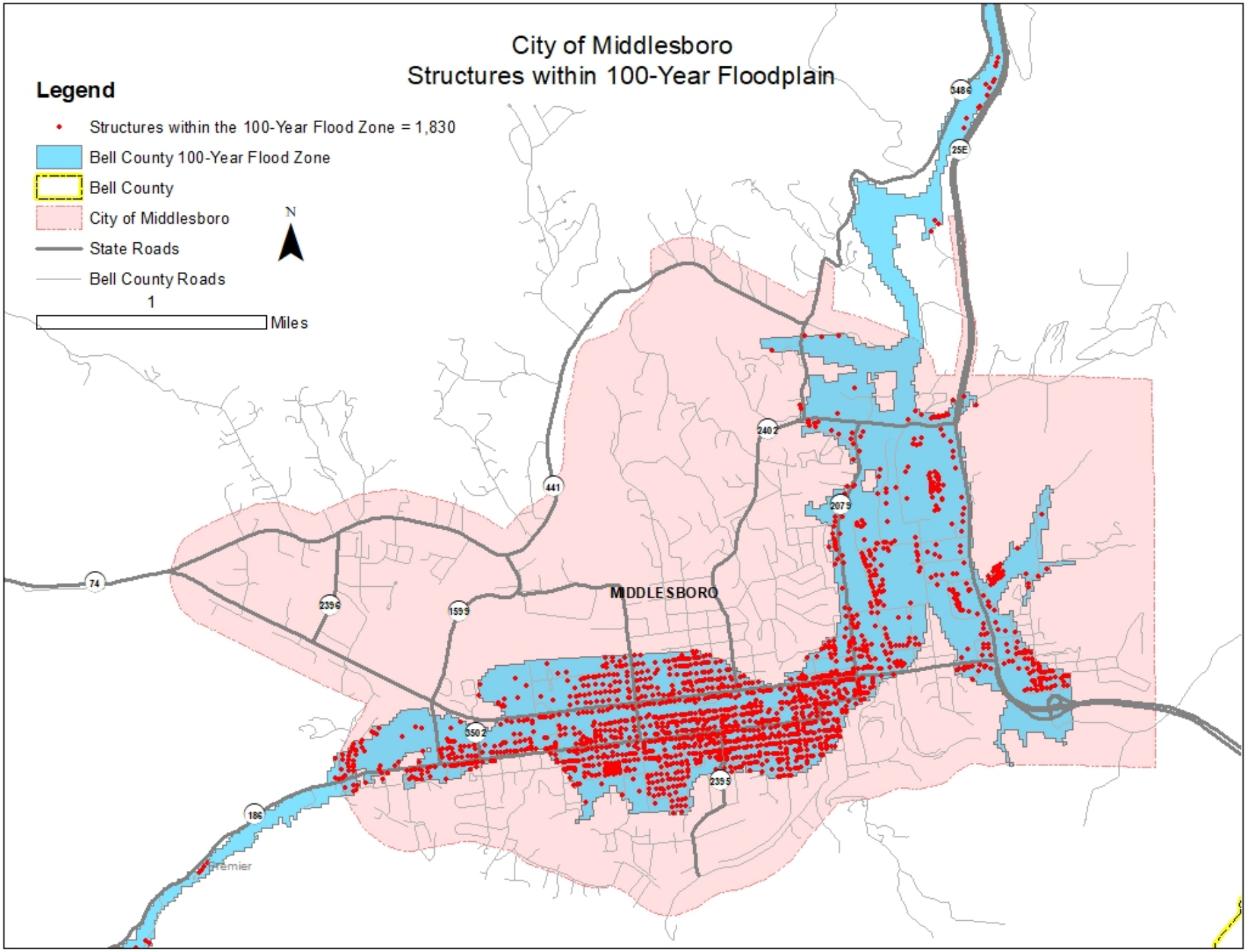
Flood Categories	
Major Flood Stage	1019 ft
Moderate Flood Stage	1010 ft
Flood Stage	1002 ft
Action Stage	995 ft

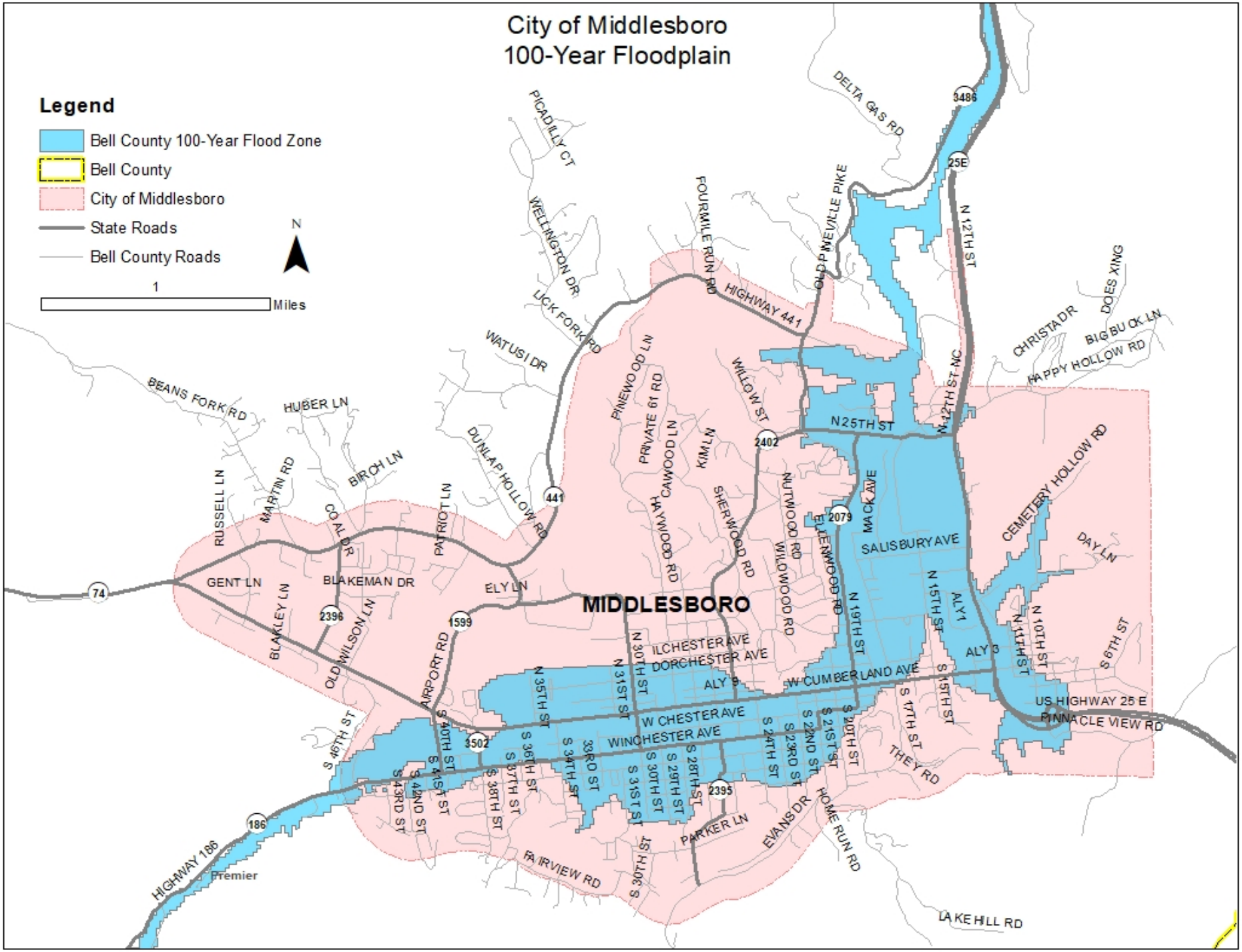
A small change in water level can drastically alter the outcome of a flood event. The following chart explains the possible flood impacts at various crest levels.

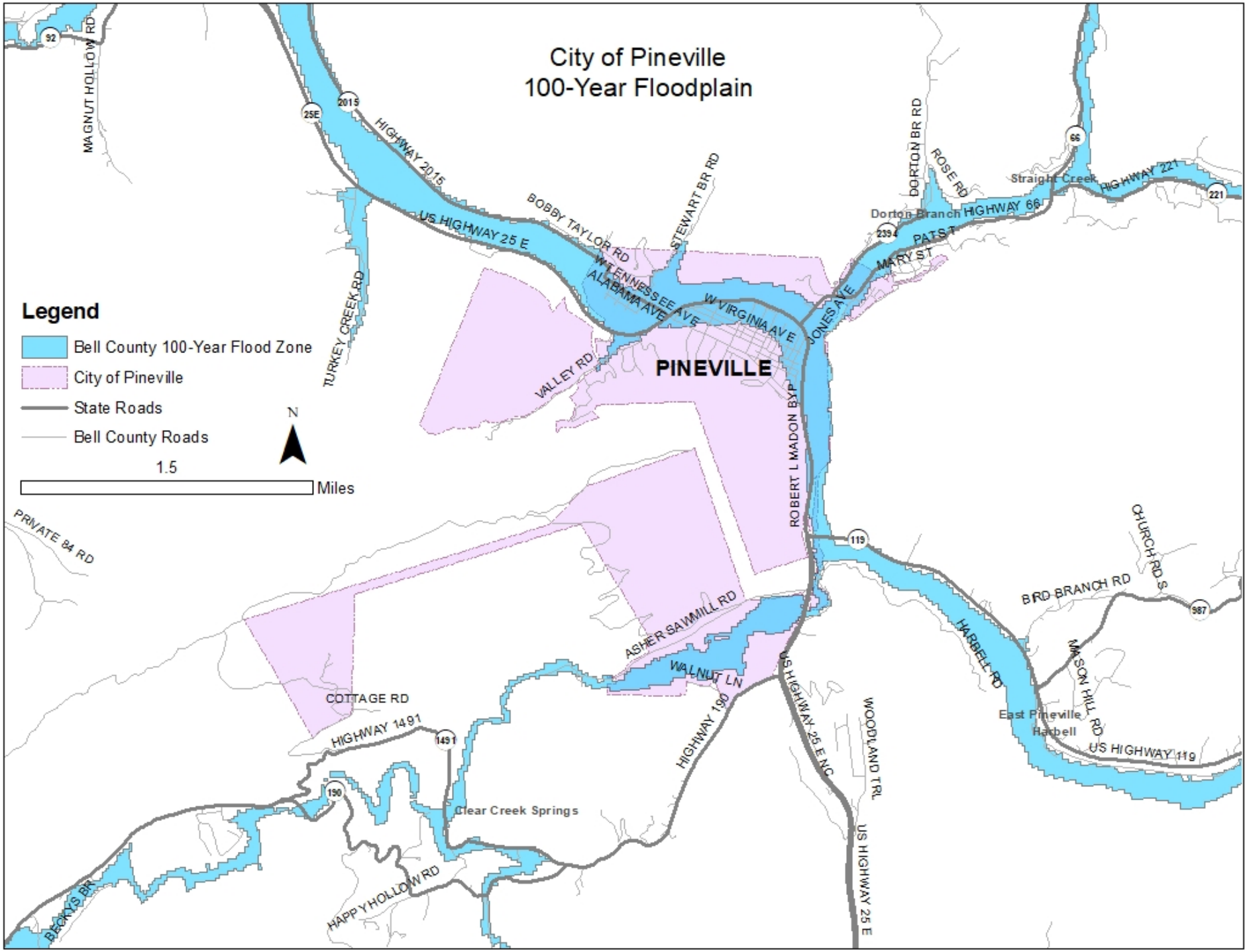
Flood Impacts	
1033	Water will overtop the floodwall. Evacuation of the Pineville central business district is necessary.
1023.5	US-25 E floods
1021.8	Flooding will exceed the highest flood of record
1019	Protected areas of town and US-25 E flood. Floodgates are closed.
1018.2	Homes begin to flood along Fourmile Road.
1016.3	Stewart Branch Road and homes US-25 E begin flooding.
1014.6	Structures begin flooding along Straight Creek
1013	Flooding threatens US 25 E, Stewart Branch Road and Wallsend
1012	Structures begin flooding at Dorton Branch
1006.4	Fourmile Road Floods
1005.7	Dorton Branch Road Floods
1005	KY-66 north of Straight Creek bridge floods
1002	Low lying roads flood, including portions of Straight Creek, Dorton Branch, and Fourmile Road

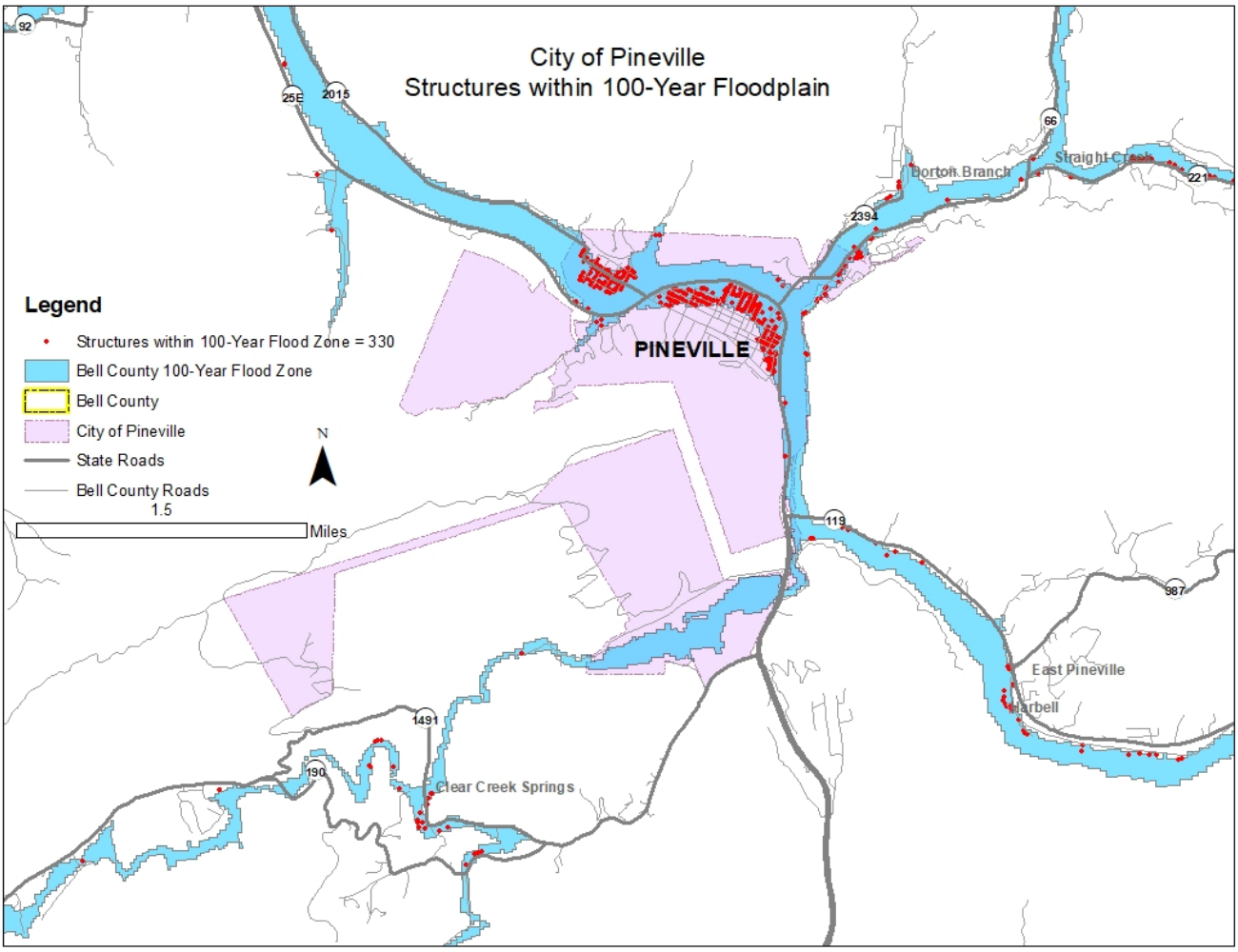

Bell County, KY:
100-Year Floodplain
Legend
Bell County 100-Year Flood Zone
Bell County
City of Pineville
City of Middlesboro
State Roads
Bell County Roads
10
Miles
N
PINEVILLE
MIDDLESBORO
Field (Crockett)
Rella
Stinnett Fork
Ivy Grove
Blanche
Arjay
Laurel Ford
Fourmile
Gary
Kettle Island
Jenson
Straight Creek
Hulen
Calaway
Tejay
Wasioto
Varilla
Ingram
East Pineville
Clear Creek Springs
Calvin
Oaks
Cubage
Ferndale
Olga
Davisburg
Chenoa
Meldrum
Hutch
Frakes
Garmeada
Capito Edgewood
Pruden
Fonde
Premier

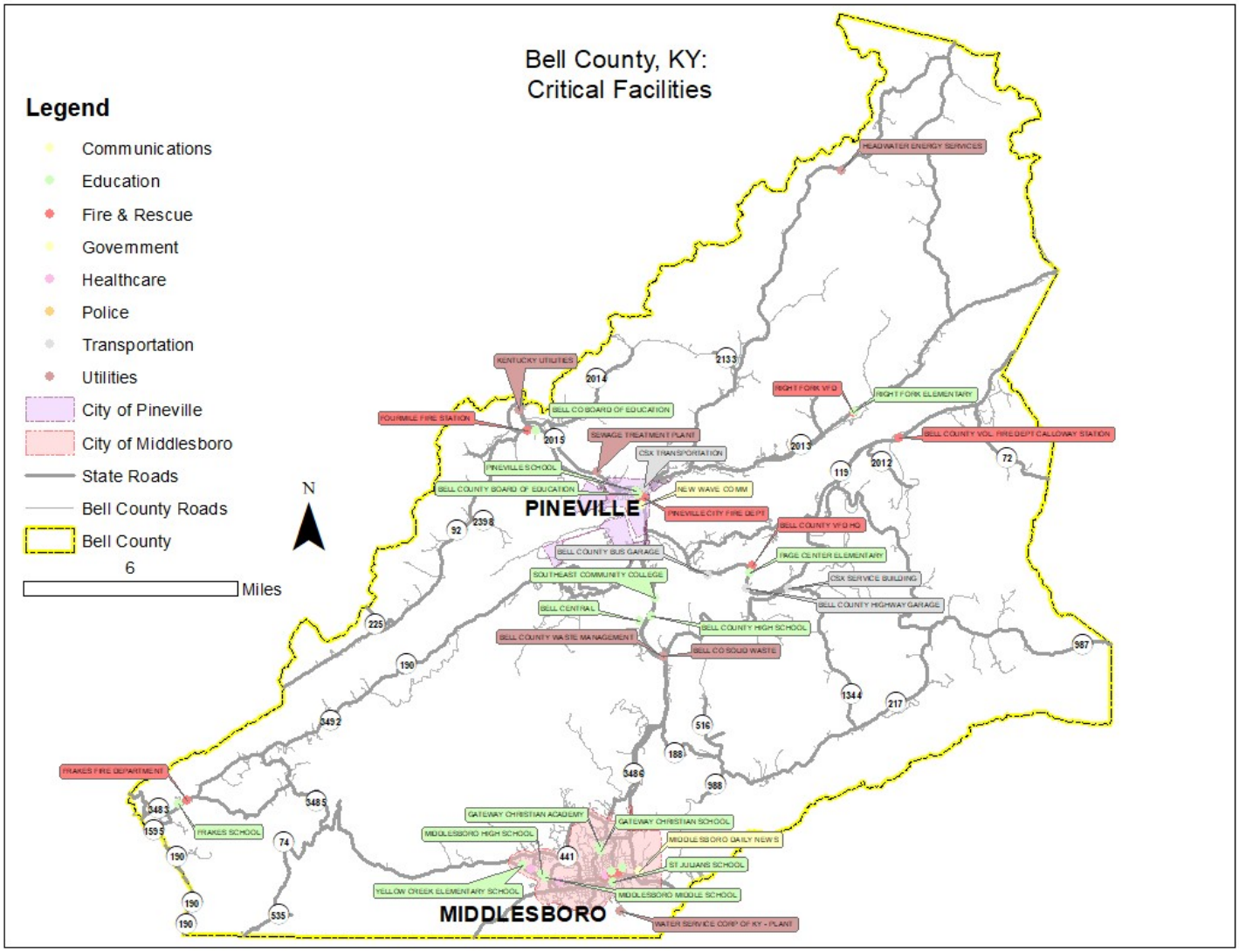

Bell County, KY:
Stuctures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 2,766
Bell County 100-Year Flood Zone
City of Pineville
City of Middlesboro
Bell County
State Roads
Bell County Roads
N
10
Miles
PINEVILLE
MIDDLESBORO
Field (Crockett)
Rella
Ivy Grove
Blanche
Arjay
Fourmile
Kettle Island
Jenson
Straight Creek
Sidney Fork
Laurel Ford
Hulen
Tejay
Wasioto
Varilla
Ingram
East Pineville
Bear Creek Springs
Calvin
Oaks
Cubage
Ferndale
Davisburg
Chenoa
Meldrum
Hutch
Frakes
Garmeada
Capito Edgewood
Pruden
Fonde
Preparel

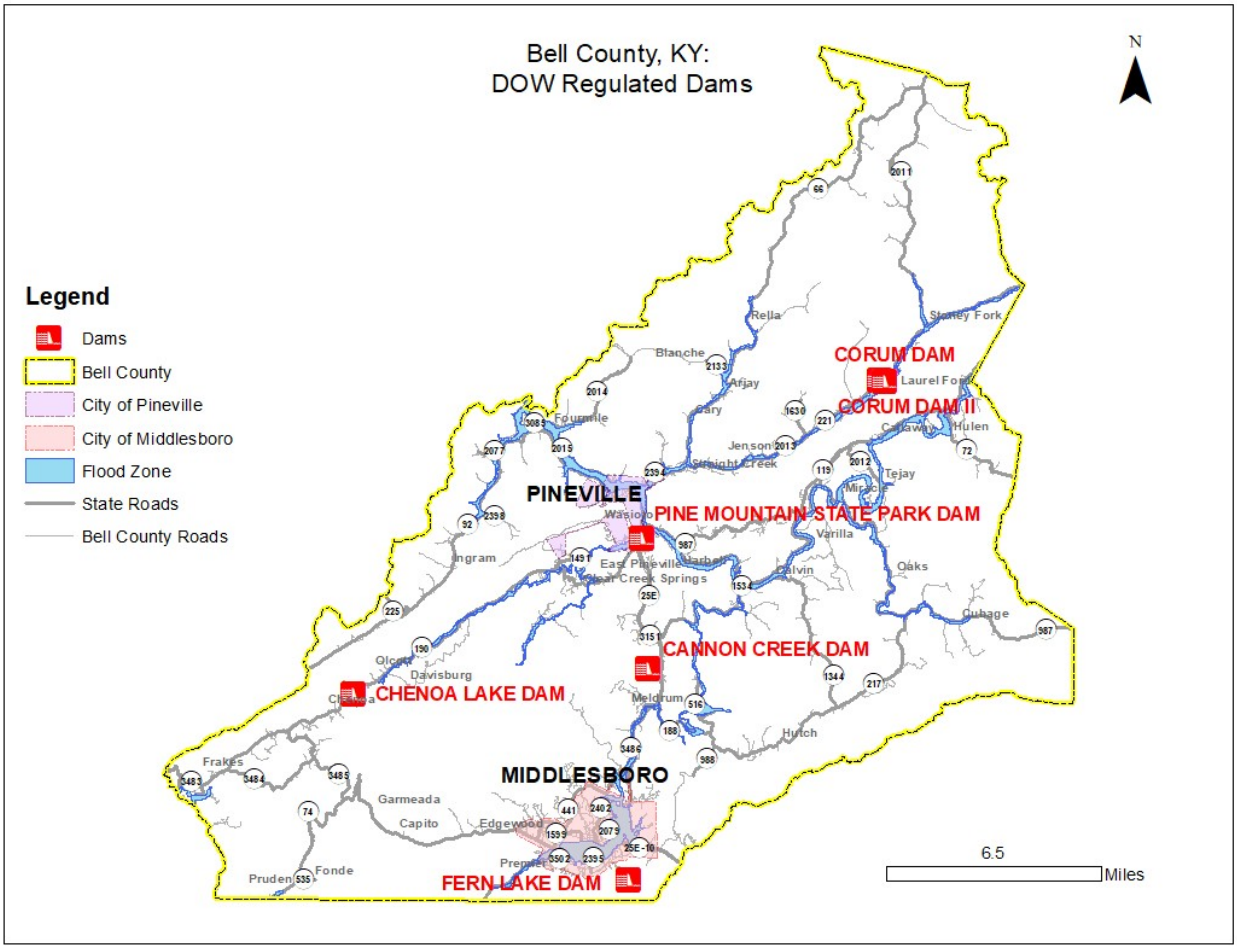

City of Middlesboro
Structures within 100-Year Floodplain
Legend
Structures within the 100-Year Flood Zone = 1,830
Bell County 100-Year Flood Zone
Bell County
City of Middlesboro
State Roads
Bell County Roads
1
Miles
N
MIDDLESBORO
Frémier
74
441
2396
1599
3502
2395
186
2402
2079
25E
3486


City of Middlesboro
100-Year Floodplain
Legend
Bell County 100-Year Flood Zone
Bell County
City of Middlesboro
State Roads
Bell County Roads
N
1
Miles
MIDDLESBORO
DELTA GAS RD
PICADILLY CT
WELLINGTON DR
FOURMILE RUN RD
HIGHWAY 441
OLD PINEVILLE PIKE
N 12TH ST
3486
25E
CHRISTA DR
DOES XING
BIG BUCK LN
HAPPY HOLLOW RD
N 12TH ST NC
LICK FORK RD
WATUSI DR
BEANS FORK RD
HUBER LN
DUNLAP HOLLOW RD
PINEWOOD LN
PRIVATE 61 RD
CAWOOD LN
KIM LN
WILLOW ST
2402
N 25TH ST
MACK AVE
SALISBURY AVE
CEMETERY HOLLOW RD
DAY LN
2079
ELLENWOOD RD
NUTWOOD RD
WILDWOOD RD
SHERWOOD RD
HAYWOOD RD
RUSSELL LN
MARTIN RD
BIRCH LN
COAL DR
PATRIOT LN
441
74
GENT LN
BLAKEMAN DR
ELY LN
BLAKLEY LN
2396
OLD WILSON LN
1599
AIRPORT RD
N 19TH ST
N 15TH ST
ALY 1
ALY 3
N 11TH ST
N 10TH ST
S 6TH ST
N 30TH ST
N 31ST ST
N 35TH ST
ILCHESTER AVE
DORCHESTER AVE
ALY 5
W CUMBERLAND AVE
S 15TH ST
S 17TH ST
US HIGHWAY 25 E
PINNACLE VIEW RD
W CHESTER AVE
WINCHESTER AVE
3502
S 40TH ST
S 46TH ST
S 41ST ST
S 42ND ST
S 43RD ST
S 36TH ST
S 37TH ST
S 38TH ST
33RD ST
S 34TH ST
S 30TH ST
S 31ST ST
S 28TH ST
S 29TH ST
S 24TH ST
S 23RD ST
S 22ND ST
S 21ST ST
S 20TH ST
THEY RD
2395
PARKER LN
EVANS DR
HOME RUN RD
S 30TH ST
FAIRVIEW RD
LAKE HILL RD
HIGHWAY 186
186
Premier


City of Pineville
100-Year Floodplain
Legend
Bell County 100-Year Flood Zone
City of Pineville
State Roads
Bell County Roads
1.5
Miles
N
PINEVILLE
MAGNUT HOLLOW RD
HIGHWAY 2015
US HIGHWAY 25 E
BOBBY TAYLOR RD
STEWART BR RD
TURKEY CREEK RD
TENNESSEE AVE
ALABAMA AVE
W VIRGINIA AVE
VALLEY RD
DORTON BR RD
ROSE RD
Straight Creek
HIGHWAY 221
Dorton Branch
HIGHWAY 66
PATS T
MARY ST
JONES AVE
ROBERT L MADON BYP
PRIVATE 84 RD
ASHER SAWMILL RD
WALNUT LN
COTTAGE RD
HIGHWAY 1491
HIGHWAY 190
US HIGHWAY 25 E NC
WOODLAND TRL
US HIGHWAY 25 E
Clear Creek Springs
HAPPY HOLLOW RD
BECKS BR
CHURCH RD S
BRD BRANCH RD
HARBELL RD
MASON HILL RD
East Pineville
Harbell
US HIGHWAY 119


City of Pineville
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 330
Bell County 100-Year Flood Zone
Bell County
City of Pineville
State Roads
Bell County Roads
1.5
Miles
N
PINEVILLE
Borton Branch
Straight Creek
East Pineville
Harbell
Clear Creek Springs
92
25E
2015
66
2394
221
119
987
1491
190


Bell County, KY:
Critical Facilities
Legend
Communications
Education
Fire & Rescue
Government
Healthcare
Police
Transportation
Utilities
City of Pineville
City of Middlesboro
State Roads
Bell County Roads
Bell County
6
Miles
N
PINEVILLE
MIDDLESBORO
KENTUCKY UTILITIES
HEADWATER ENERGY SERVICES
FOURMILE FIRE STATION
BELL CO BOARD OF EDUCATION
SEWAGE TREATMENT PLANT
CSX TRANSPORTATION
PINEVILLE SCHOOL
BELL COUNTY BOARD OF EDUCATION
NEW WAVE COMM
PINEVILLE CITY FIRE DEPT
BELL COUNTY VFD HQ
BELL COUNTY BUS GARAGE
SOUTHEAST COMMUNITY COLLEGE
BELL CENTRAL
BELL COUNTY WASTE MANAGEMENT
BELL CO SOLID WASTE
BELL COUNTY HIGH SCHOOL
RIGHT FORK VFD
RIGHT FORK ELEMENTARY
BELL COUNTY VOL FIRE DEPT CALLOWAY STATION
PAGE CENTER ELEMENTARY
CSX SERVICE BUILDING
BELL COUNTY HIGHWAY GARAGE
PRAKES FIRE DEPARTMENT
PRAKES SCHOOL
GATEWAY CHRISTIAN ACADEMY
GATEWAY CHRISTIAN SCHOOL
MIDDLESBORO HIGH SCHOOL
MIDDLESBORO DAILY NEWS
ST JUJANS SCHOOL
YELLOW CREEK ELEMENTARY SCHOOL
MIDDLESBORO MIDDLE SCHOOL
WATER SERVICE CORP OF KY - PLANT



FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation. Following are the floodplain coordinators for Bell County.

Floodplain Coordinator(s)				
	Name	**Job Title**	**Address**	**Phone Number**
Bell County	Tim Rader	Floodplain Admin.	P.O. Box 339 Pineville, KY 40977	606-337-1012
City of Middlesboro	Tim Kelley	Code Enforcement Officer	P.O. Box 756 Middlesboro, KY 40965	606-248-5670 Ex. 109
City of Pineville	James Miracle	Codes Enforcement	P.O. Box 688 Pineville, KY 40977	606-337-7000

ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Bell County	2766	$59,800.00	$165,406,800.00
City of Middlesboro	1830		$109,434,000.00
City of Pineville	330		$19,734,000.00

NATIONAL FLOOD INSURANCE PROGRAM

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov. The following is an overview of the County's participation with the National Flood Insurance Program.

FEMA Community Status Book – Communities Participating in NFIP						
CID	Community Name	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210010B	Bell County	12/06/74	02/18/81	03/16/15	02/18/81	No
215190B	Middlesboro	12/04/70	05/28/71	03/16/15	05/28/71	No
210012B	Pineville	02/22/74	06/01/78	(NSFHA)	06/01/78	No

Community Status Book Reference Guide	
CID	A different community identification number is assigned for the incorporated city versus the unincorporated county.
Community Name	Incorporated city or unincorporated county, parish, or borough.
Init FHBM Identified	This data tells when the Flood Hazard Boundary Map was created. This map is only a factor in communities that do not have Flood Insurance Rate Map.
Init FIRM Identified	This date represents the community's first Flood Insurance Rate Map.
Curr Eff Map Date	This is the date of the map currently in effect.
Reg-Emer Date	The date the community first joined the NFIP.
Tribal	A "yes" in this column indicates that the participating community is a tribal nation.

NFIP FINANCIAL CLAIMS

Since 1978 a total of 535 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $6,325,751 in claims. To put it in perspective that is an average of $11,823.83 per claim or $158,143.73 per year spent on repairing flood damages. There are only 363 flood policies in effect as of March 2018 and 2,766 identified structures located within the 100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

BELL COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

The following data, charts, and narratives were accessed, formatted, and written by Nick Grinstead, MMP, Planning Grants Manager/Program Coordinator in the Hazard Mitigation Grants Program Office. The data are not available for general access.

Bell County, Unincorporated possesses three (3) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The three (3) properties in Bell County, Unincorporated are disaggregated as follows:

Bell County, Uninc., RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Bell County	Single-Family Occupancy	3	3	0	3	3
Bell County	2-4 Family Occupancy	0	0	0	0	0
Bell County	Other Non-Residential	0	0	0	0	0
TOTAL		***3***	***3***	***0***	***3***	***3***

The City of Middlesboro possesses seven (7) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The seven (7) properties in City of Middlesboro are disaggregated as follows:

City of Middlesboro RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Middlesboro, City of	Single-Family Occupancy	1	1	0	1	1
Middlesboro, City of	2-4 Family Occupancy	0	0	0	0	0
Middlesboro, City of	Other Non-Residential	6	6	0	6	6
TOTAL		***7***	***7***	***0***	***7***	***7***

The City of Pineville possesses three (3) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The three (3) properties in City of Pineville are disaggregated as follows:

City of Pineville RL and SRL Properties by Type and by RL/SRL Definition Category

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Bell County	48,259	19	61	80	2,721	5,402	8,123	75	111	186	261,975	970,236	1,232,211
Middlesboro	345,607	49	223	272	7,259	33,469	40,728	102	190	292	1,765,893	30,007,026	4,772,919
Pineville	4,405	1	10	11	85	1,368	1,453	33	24	57	121,516		6,325,751
Total	398,271	69	294	363	10,065	40,239	50,304	210	325	535	2,149,384	4,176,367	6,325,751
Nfipservices.floodsmart.gov													

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Pineville, City of	Single-Family Occupancy	2	2	0	2	2
Pineville, City of	2-4 Family Occupancy	0	0	0	0	0
Pineville, City of	Other Non-Residential	1	1	0	1	1
TOTAL		***3***	***3***	***0***	***3***	***3***

SEVERE WINTER WEATHER

Mountains dominate the topography in Bell County. Pine Mountain extends in a northeast direction from Whitley County to Pike County, passing through northern Bell. The crest of Pine Mountain peaks at 2,500 ft. The Cumberland Mountain, which marks the boundary between Bell County and the State of Virginia runs parallel to Pine Mountain. Elevations on the peaks of the Cumberland Mountain along the Kentucky-Virginia boundary range from 2,200 ft to more than 3,500 ft. The sides of these mountain peaks and ridges are quite steep. Elevation changes can be as drastic as 1,500 over a horizontal distance of ½ mile in the area south of Pine Mountain. The mountainous terrain can make traveling during winter weather nearly impossible.

Winter storms can range from a moderate snow over a few hours to a **blizzard** with blinding, wind-driven snow that lasts for several days. Some winter storms are large enough to affect several states, while others affect only a single community. Many winter storms are accompanied by dangerously low temperatures and sometimes by **strong winds**, icing, sleet, **hail**, and freezing rain.

In order to address systematically the number of previous severe winter weather events, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from severe winter weather for Bell County. The tables include what the National Weather Service (NWS) labels "Heavy Snow", "Ice Storm", "Winter Storm", and "Winter Weather" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the severe winter weather event. Still, it is the best available data for a systematic illustration of severe winter weather events for CVADD counties.

Finally, it should also be noted that a portion of the severe winter weather events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for all counties as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include:

“PrD” is “Property Damage Estimated Amount.” “CrD” is “Crop Damage Estimated Amount.” “Dth” is “Deaths Reported.” “Inj” is “Injuries Reported.”

Bell County Severe Winter Weather Profile

Table 1-4. Bell County Severe Winter Weather Events, 1950-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	0.00K	0.00K
1	BELL (ZONE)	BELL (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	BELL (ZONE)	BELL (ZONE)	KY	1/11/1996	20:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	BELL (ZONE)	BELL (ZONE)	KY	2/1/1996	16:00	EST	Heavy Snow		0	0	0.00K	0.00K
4	BELL (ZONE)	BELL (ZONE)	KY	3/20/1996	4:00	EST	Heavy Snow		0	0	0.00K	0.00K
5	BELL (ZONE)	BELL (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	BELL (ZONE)	BELL (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
7	BELL (ZONE)	BELL (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
8	BELL (ZONE)	BELL (ZONE)	KY	1/25/2000	20:30	EST	Heavy Snow		0	0	0.00K	0.00K
9	BELL (ZONE)	BELL (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
10	BELL (ZONE)	BELL (ZONE)	KY	1/6/2002	5:00	EST	Heavy Snow		0	0	0.00K	0.00K
11	BELL (ZONE)	BELL (ZONE)	KY	1/19/2002	6:00	EST	Winter Storm		0	0	0.00K	0.00K
12	BELL (ZONE)	BELL (ZONE)	KY	12/4/2002	11:48	EST	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/4/2002	11:48	EST	Heavy Snow		0	0	0.00K	0.00K
13	BELL (ZONE)	BELL (ZONE)	KY	1/16/2003	18:30	EST	Heavy Snow		0	0	0.00K	0.00K
14	BELL (ZONE)	BELL (ZONE)	KY	1/23/2003	1:30	EST	Heavy Snow		0	0	0.00K	0.00K
15	BELL (ZONE)	BELL (ZONE)	KY	1/9/2004	13:45	EST	Heavy Snow		0	0	0.00K	0.00K
16	BELL (ZONE)	BELL (ZONE)	KY	3/9/2004	12:05	EST	Heavy Snow		0	0	0.00K	0.00K
17	BELL (ZONE)	BELL (ZONE)	KY	1/22/2005	22:00	EST	Heavy Snow		0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
18	BELL (ZONE)	BELL (ZONE)	KY	1/14/2006	8:00	EST	Heavy Snow		0	0	0.00K	0.00K
19	BELL (ZONE)	BELL (ZONE)	KY	2/18/2006	2:20	EST	Heavy Snow		0	0	0.00K	0.00K
20	BELL (ZONE)	BELL (ZONE)	KY	2/26/2008	15:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
21	BELL (ZONE)	BELL (ZONE)	KY	2/2/2009	7:50	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/3/2009	16:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/3/2009	18:30	EST-5	Winter Weather		0	0	0.00K	0.00K
22	BELL (ZONE)	BELL (ZONE)	KY	2/21/2009	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
23	BELL (ZONE)	BELL (ZONE)	KY	12/5/2009	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/5/2009	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/5/2009	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
24	BELL (ZONE)	BELL (ZONE)	KY	12/18/2009	13:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/18/2009	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/18/2009	14:15	EST-5	Winter Weather		0	0	0.00K	0.00K
25	BELL (ZONE)	BELL (ZONE)	KY	1/7/2010	11:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/11/2010	23:42	EST-5	Winter Weather		0	0	0.00K	0.00K
26	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/29/2010	16:05	EST-5	Heavy Snow		0	0	0.00K	0.00K
27	BELL (ZONE)	BELL (ZONE)	KY	2/9/2010	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/9/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/9/2010	22:30	EST-5	Winter Weather		0	0	0.00K	0.00K
28	BELL (ZONE)	BELL (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/15/2010	7:00	EST-5	Winter Weather		0	0	0.00K	0.00K
29	BELL (ZONE)	BELL (ZONE)	KY	2/24/2010	17:51	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/24/2010	19:50	EST-5	Winter Weather		0	0	0.00K	0.00K
30	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	10:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	10:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	20:44	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	21:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	21:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	21:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	21:44	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/12/2010	21:45	EST-5	Heavy Snow		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
31	BELL (ZONE)	BELL (ZONE)	KY	12/15/2010	21:00	EST-5	Ice Storm		0	0	0.00K	0.00K
32	BELL (ZONE)	BELL (ZONE)	KY	12/24/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/24/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	12/25/2010	0:00	EST-5	Winter Weather		0	0	0.00K	0.00K
33	BELL (ZONE)	BELL (ZONE)	KY	1/7/2011	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/7/2011	5:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/7/2011	6:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/7/2011	8:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/7/2011	13:14	EST-5	Winter Weather		0	0	0.00K	0.00K
34	BELL (ZONE)	BELL (ZONE)	KY	1/10/2011	0:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/10/2011	4:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/10/2011	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
35	BELL (ZONE)	BELL (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
36	BELL (ZONE)	BELL (ZONE)	KY	1/26/2011	3:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/26/2011	3:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	1/26/2011	3:00	EST-5	Winter Storm		0	0	0.00K	0.00K
37	BELL (ZONE)	BELL (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	BELL (ZONE)	BELL (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
38	BELL (ZONE)	BELL (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
39	BELL (ZONE)	BELL (ZONE)	KY	1/17/2013	12:00	EST-5	Heavy Snow		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
40	BELL (ZONE)	BELL (ZONE)	KY	1/25/2013	5:30	EST-5	Winter Storm		0	0	0.00K	0.00K
41	BELL (ZONE)	BELL (ZONE)	KY	3/24/2013	23:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
42	BELL (ZONE)	BELL (ZONE)	KY	2/12/2014	17:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
43	BELL (ZONE)	BELL (ZONE)	KY	3/3/2014	4:00	EST-5	Winter Storm		0	0	0.00K	0.00K
44	BELL (ZONE)	BELL (ZONE)	KY	11/1/2014	3:00	EST-5	Winter Weather		0	0	0.00K	0.00K
45	BELL (ZONE)	BELL (ZONE)	KY	2/16/2015	7:00	EST-5	Winter Storm		0	0	0.00K	0.00K
46	BELL (ZONE)	BELL (ZONE)	KY	2/18/2015	11:45	EST-5	Winter Weather		0	0	0.00K	0.00K
47	BELL (ZONE)	BELL (ZONE)	KY	2/20/2015	23:00	EST-5	Winter Storm		0	0	0.00K	0.00K
48	BELL (ZONE)	BELL (ZONE)	KY	3/5/2015	4:00	EST-5	Winter Storm		0	0	0.00K	0.00K
49	BELL (ZONE)	BELL (ZONE)	KY	1/20/2016	5:30	EST-5	Winter Weather		0	0	0.00K	0.00K
50	BELL (ZONE)	BELL (ZONE)	KY	1/22/2016	1:00	EST-5	Winter Storm		0	0	0.00K	0.00K
51	BELL (ZONE)	BELL (ZONE)	KY	2/14/2016	15:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
52	BELL (ZONE)	BELL (ZONE)	KY	1/8/2018	9:38	EST-5	Winter Weather		0	0	0.00K	0.00K
53	BELL (ZONE)	BELL (ZONE)	KY	1/16/2018	8:00	EST-5	Winter Weather		0	0	0.00K	0.00K
54	BELL (ZONE)	BELL (ZONE)	KY	12/8/2018	23:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
55	BELL (ZONE)	BELL (ZONE)	KY	12/10/2019	19:00	EST-5	Winter Weather		0	0	0.00K	0.00K
56	BELL (ZONE)	BELL (ZONE)	KY	2/7/2020	5:45	EST-5	Winter Weather		0	0	0.00K	0.00K
57	BELL (ZONE)	BELL (ZONE)	KY	12/24/2020	15:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	Totals:	57 events							0	0	0.00K	0.00K

Bell County Severe Winter Weather - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Bell County experienced 57 severe winter weather events over 25 years yields that Bell County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every five months (i.e., 57/300). Specifically, Bell County experienced an average of 2.3 severe winter weather events each year. Or, using December 31, 2020 as an endpoint, this is 0.19 events per month. $1/0.19 = 5.26 \approx 1$ severe winter storm event an average of every five (5) months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through October. This indicates that the winter months for Bell County are November through March, a total of 5 months. When the frequency is calculated using the five winter months only (57/125), it reveals that Bell County experienced an average of 2.32 events per winter period, or 0.456 events per winter month. $1/0.456 = 2.19$ or about 1 severe winter storm events an average of every 2 winter months.

Below are the details of winter storm event extents in each county in the district, as well as a brief narrative about one specific snow event in late January 2016 that involved all district jurisdictions. The narrative helps provide context as well as an opportunity to compare how various counties fare comparatively during the same storm event.

Bell County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Three to six inches of snow was reported across [Bell C]ounty with ice amounts varying from a few hundredths of an inch up to nearly a quarter of an inch."[60]

Bell County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

[60] "Storm Events Database Event Details – Bell County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	BELL (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	BELL (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	BELL (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	BELL (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	BELL (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
6	BELL (ZONE)	12/23/1998	12/24/1998	Winter Storm	
7	BELL (ZONE)	1/22/2000	1/22/2000	Winter Storm	
8	BELL (ZONE)	1/25/2000	1/26/2000	Heavy Snow	Snowfall totaled between 4 and 6 inches across the mountains of Southeastern Kentucky.
9	BELL (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
10	BELL (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
11	BELL (ZONE)	1/19/2002	1/19/2002	Winter Storm	
12	BELL (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
	BELL (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
13	BELL (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 6 inches of snow were reported.
14	BELL (ZONE)	1/23/2003	1/23/2003	Heavy Snow	A maximum of 8 inches of snow were reported along with up to 4 foot drifts at the Hensley Settlement of Cumberland National Park.
15	BELL (ZONE)	1/9/2004	1/9/2004	Heavy Snow	Five inches of snow were reported in the Frakes area.
16	BELL (ZONE)	3/9/2004	3/9/2004	Heavy Snow	Six inches of snow fell at Fonde.
17	BELL (ZONE)	1/22/2005	1/23/2005	Heavy Snow	
18	BELL (ZONE)	1/14/2006	1/14/2006	Heavy Snow	Four inches of snow fell in Arjay and Red Bird and 5 inches fell on Fonde Mountain.
19	BELL (ZONE)	2/18/2006	2/18/2006	Heavy Snow	3 to 6 inches of snow fell on county roads at middle elevations. 6 to 7 inches of snow fell on Fonde Mountain.
20	BELL (ZONE)	2/26/2008	2/27/2008	Heavy Snow	The State Highway Garage reported that 5 to 6 inches of snow had fallen along the higher terrain on Highways 74 and 66 in the Fonde area.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
21	BELL (ZONE)	2/2/2009	2/2/2009	Winter Weather	The public reported that two and a half inches of snow h
	BELL (ZONE)	2/3/2009	2/3/2009	Heavy Snow	Six inches of snow fell on Fonde and Red Bird mountain Fonde. Two to three inches of snow fell at the lower elev
	BELL (ZONE)	2/3/2009	2/4/2009	Winter Weather	The Bell County Dept of Highways estimated 2 to 3 inch and 5 to 6 inches on ridgetops around the county.
22	BELL (ZONE)	2/21/2009	2/22/2009	Winter Weather	Three inches of snow fell in Arjay.
23	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	Two and a half inches of snow fell 1 mile west of Middl
	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch and a half of snow fell in Middlesboro.
	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	Three inches of snow fell in Middlesboro.
24	BELL (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two and a half inches of snow was reported on the grou
	BELL (ZONE)	12/18/2009	12/18/2009	Heavy Snow	Bell county dispatch estimated 6 to 7 inches of snow on County courthouse in Pineville.
	BELL (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two inches of snow was reported on the ground by the N

Count	County	Begin Date	End Date	Type	Exte
25	BELL (ZONE)	1/7/2010	1/8/2010	Winter Weather	An inch or less of snow fell in the elevations around the county.
	BELL (ZONE)	1/11/2010	1/12/2010	Winter Weather	One inch of snow fell in Pineville
26	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snowfall was measu
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Four and a half inches of snow ha
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Three and a half inches of snow h
	BELL (ZONE)	1/29/2010	1/30/2010	Winter Weather	Two to three inches of snow had a
	BELL (ZONE)	1/29/2010	1/30/2010	Winter Weather	The Bell County Dept of Highway countywide.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow had fallen on I
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow fell in Pinevill
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept estimated that Cumberland Gap Tunnel.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A retired NWS employee measure Pineville.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public measured Middlesboro.
27	BELL (ZONE)	2/9/2010	2/10/2010	Winter Weather	Three inches of snow was reporte falling.
	BELL (ZONE)	2/9/2010	2/10/2010	Winter Weather	Two to three inches of snow fell i
	BELL (ZONE)	2/9/2010	2/9/2010	Winter Weather	An inch of snow with blowing sno
28	BELL (ZONE)	2/15/2010	2/15/2010	Winter Weather	The snow began falling around 5 a and 530 am. Two inches of snow accumulating on trees and area ro
	BELL (ZONE)	2/15/2010	2/16/2010	Winter Weather	Around an inch of snow fell in Mi total snowfall was 1.5 inches.

Count	County	Begin Date	End Date	Type	Exte
29	BELL (ZONE)	2/24/2010	2/24/2010	Winter Weather	An inch of new snow fell in Pinev
	BELL (ZONE)	2/24/2010	2/25/2010	Winter Weather	Two inches of snow fell in Clear
30	BELL (ZONE)	12/12/2010	12/12/2010	Winter Weather	A snow depth of 3 inches was rep around 10 am.
	BELL (ZONE)	12/12/2010	12/13/2010	Winter Weather	A trained spotter reported a snowf
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A trained spotter measured 7.5 inc
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 12 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 7.5 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 10 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A foot of snow fell in Calvin.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	Ten inches of snow fell 2 miles so
31	BELL (ZONE)	12/15/2010	12/16/2010	Ice Storm	A half of an inch of ice accumulat
32	BELL (ZONE)	12/24/2010	12/26/2010	Winter Weather	Five and a half inches of snow ha of that having accumulated overni
	BELL (ZONE)	12/24/2010	12/26/2010	Winter Weather	Five and a half inches of snow ha inches of this snowfall occurred o
	BELL (ZONE)	12/25/2010	12/25/2010	Winter Weather	Two and a half inches of snow fel

Count	County	Begin Date	End Date	Type	Exte
33	BELL (ZONE)	1/7/2011	1/7/2011	Winter Weather	Four inches of snow had accumul
	BELL (ZONE)	1/7/2011	1/7/2011	Heavy Snow	An inch and a half of snow had fa had occurred since 5 am in Fonde
	BELL (ZONE)	1/7/2011	1/7/2011	Winter Weather	Two inches of snow fell in Fonde
	BELL (ZONE)	1/7/2011	1/8/2011	Heavy Snow	Six inches of snow had fallen 2 m
	BELL (ZONE)	1/7/2011	1/8/2011	Winter Weather	Four and a half inches of snow ha
34	BELL (ZONE)	1/10/2011	1/10/2011	Heavy Snow	Four inches of snow fell overnigh inches.
	BELL (ZONE)	1/10/2011	1/10/2011	Winter Weather	A half an inch of snow fell in Fon
	BELL (ZONE)	1/10/2011	1/10/2011	Winter Weather	Two inches of snow had fallen 1 r
35	BELL (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estima Pineville. Secondary roads were b
36	BELL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 1.5 inches
	BELL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 3 inches.
	BELL (ZONE)	1/26/2011	1/26/2011	Winter Storm	The snow accumulated 5 inches.
37	BELL (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
	BELL (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
38	BELL (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Eight inches of snow fell in Frake
39	BELL (ZONE)	1/17/2013	1/17/2013	Heavy Snow	Up to 4 of snow was reported fron numerous accidents reported on H
40	BELL (ZONE)	1/25/2013	1/25/2013	Winter Storm	A combination of freezing rain an up to 1/10 of ice and sleet reporte
41	BELL (ZONE)	3/24/2013	3/26/2013	Heavy Snow	Snowfall amounts ranged from an inches reported over the higher m

Count	County	Begin Date	End Date	Type	Exte
42	BELL (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Snowfall amounts across the coun Middlesboro up to over seven inch
43	BELL (ZONE)	3/3/2014	3/3/2014	Winter Storm	The Highway Dept. reported that the county. One quarter of an inch Redbird Mountain areas. There w on top of Fonde Mountain.
44	BELL (ZONE)	11/1/2014	11/1/2014	Winter Weather	Most locations only recorded a du measured on Fonde Mountain.
45	BELL (ZONE)	2/16/2015	2/17/2015	Winter Storm	One to four inches of snow had al 1145 am. By 530 pm, 6.5 inches o inches of snow as of 930 pm. Thr county by the time the snow exite
46	BELL (ZONE)	2/18/2015	2/18/2015	Winter Weather	Up to 3 inches of snow accumulat
47	BELL (ZONE)	2/20/2015	2/21/2015	Winter Storm	The first snowfall report out of Be little before 8 am, Middlesboro ha 6 inches on the ground as of 855 a Bell county occurred at Fonde and estimated to have fallen by noon o an already significant snow pack o
48	BELL (ZONE)	3/5/2015	3/5/2015	Winter Storm	Three to four inches of snow and
49	BELL (ZONE)	1/20/2016	1/20/2016	Winter Weather	Around three inches of snow was
50	BELL (ZONE)	1/22/2016	1/23/2016	Winter Storm	Three to six inches of snow was r varying from a few hundredths of
51	BELL (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 6 to 7 inche also mixed in but amounts were in
52	BELL (ZONE)	1/8/2018	1/8/2018	Winter Weather	A trained spotter observed several Middlesboro.
53	BELL (ZONE)	1/16/2018	1/16/2018	Winter Weather	
54	BELL (ZONE)	12/8/2018	12/9/2018	Heavy Snow	
55	BELL (ZONE)	12/10/2019	12/11/2019	Winter Weather	

Count	County	Begin Date	End Date	Type	Exte
56	BELL (ZONE)	2/7/2020	2/7/2020	Winter Weather	
57	BELL (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Nearly 10 inches of snow fell acro a 9.8 inch storm total in Beverly a
58	BELL (ZONE)	2/7/2021	2/7/2021	Winter Weather	A resident of Beverly reported tha
	BELL (ZONE)	2/7/2021	2/7/2021	Heavy Snow	The 24 hour warning point in Pine and that it was still snowing heavi coming down so fast that snow pl
	BELL (ZONE)	2/7/2021	2/7/2021	Winter Weather	A member of the public reported t
59	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 3 inches of snow fel
	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	Three inches of snow was reporte
	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 3 inches of snow fel
	BELL (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Five inches of snow was reported
	BELL (ZONE)	2/17/2021	2/17/2021	Winter Weather	An inch of snow was measured in

Count	County	Begin Date	End Date	Type	Exte
1	BELL (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	BELL (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	BELL (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	BELL (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	BELL (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
6	BELL (ZONE)	12/23/1998	12/24/1998	Winter Storm	
7	BELL (ZONE)	1/22/2000	1/22/2000	Winter Storm	
8	BELL (ZONE)	1/25/2000	1/26/2000	Heavy Snow	Snowfall totaled between 4 and 6 Kentucky.
9	BELL (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
10	BELL (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
11	BELL (ZONE)	1/19/2002	1/19/2002	Winter Storm	
12	BELL (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
	BELL (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
13	BELL (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 6 inches of snow
14	BELL (ZONE)	1/23/2003	1/23/2003	Heavy Snow	A maximum of 8 inches of snow Hensley Settlement of Cumberlan
15	BELL (ZONE)	1/9/2004	1/9/2004	Heavy Snow	Five inches of snow were reporte
16	BELL (ZONE)	3/9/2004	3/9/2004	Heavy Snow	Six inches of snow fell at Fonde.
17	BELL (ZONE)	1/22/2005	1/23/2005	Heavy Snow	

Count	County	Begin Date	End Date	Type	Exte
18	BELL (ZONE)	1/14/2006	1/14/2006	Heavy Snow	Four inches of snow fell in Arjay Mountain.
19	BELL (ZONE)	2/18/2006	2/18/2006	Heavy Snow	3 to 6 inches of snow fell on coun snow fell on Fonde Mountain.
20	BELL (ZONE)	2/26/2008	2/27/2008	Heavy Snow	The State Highway Garage report higher terrain on Highways 74 an
21	BELL (ZONE)	2/2/2009	2/2/2009	Winter Weather	The public reported that two and a
	BELL (ZONE)	2/3/2009	2/3/2009	Heavy Snow	Six inches of snow fell on Fonde Fonde. Two to three inches of sno
	BELL (ZONE)	2/3/2009	2/4/2009	Winter Weather	The Bell County Dept of Highway and 5 to 6 inches on ridgetops aro
22	BELL (ZONE)	2/21/2009	2/22/2009	Winter Weather	Three inches of snow fell in Arjay
23	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	Two and a half inches of snow fel
	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch and a half of snow fell in
	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	Three inches of snow fell in Midd
24	BELL (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two and a half inches of snow wa
	BELL (ZONE)	12/18/2009	12/18/2009	Heavy Snow	Bell county dispatch estimated 6 t County courthouse in Pineville.
	BELL (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two inches of snow was reported

Count	County	Begin Date	End Date	Type	Exte
25	BELL (ZONE)	1/7/2010	1/8/2010	Winter Weather	An inch or less of snow fell in the elevations around the county.
	BELL (ZONE)	1/11/2010	1/12/2010	Winter Weather	One inch of snow fell in Pineville
26	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snowfall was measu
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Four and a half inches of snow ha
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Three and a half inches of snow h
	BELL (ZONE)	1/29/2010	1/30/2010	Winter Weather	Two to three inches of snow had a
	BELL (ZONE)	1/29/2010	1/30/2010	Winter Weather	The Bell County Dept of Highway countywide.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow had fallen on I
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow fell in Pinevill
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept estimated that Cumberland Gap Tunnel.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A retired NWS employee measure Pineville.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public measured Middlesboro.
27	BELL (ZONE)	2/9/2010	2/10/2010	Winter Weather	Three inches of snow was reporte falling.
	BELL (ZONE)	2/9/2010	2/10/2010	Winter Weather	Two to three inches of snow fell i
	BELL (ZONE)	2/9/2010	2/9/2010	Winter Weather	An inch of snow with blowing sno
28	BELL (ZONE)	2/15/2010	2/15/2010	Winter Weather	The snow began falling around 5 a and 530 am. Two inches of snow accumulating on trees and area ro
	BELL (ZONE)	2/15/2010	2/16/2010	Winter Weather	Around an inch of snow fell in Mi total snowfall was 1.5 inches.

Count	County	Begin Date	End Date	Type	Exte
29	BELL (ZONE)	2/24/2010	2/24/2010	Winter Weather	An inch of new snow fell in Pinev
	BELL (ZONE)	2/24/2010	2/25/2010	Winter Weather	Two inches of snow fell in Clear
30	BELL (ZONE)	12/12/2010	12/12/2010	Winter Weather	A snow depth of 3 inches was rep around 10 am.
	BELL (ZONE)	12/12/2010	12/13/2010	Winter Weather	A trained spotter reported a snowf
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A trained spotter measured 7.5 inc
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 12 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 7.5 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 10 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A foot of snow fell in Calvin.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	Ten inches of snow fell 2 miles so
31	BELL (ZONE)	12/15/2010	12/16/2010	Ice Storm	A half of an inch of ice accumulat
32	BELL (ZONE)	12/24/2010	12/26/2010	Winter Weather	Five and a half inches of snow had of that having accumulated overni
	BELL (ZONE)	12/24/2010	12/26/2010	Winter Weather	Five and a half inches of snow had inches of this snowfall occurred o
	BELL (ZONE)	12/25/2010	12/25/2010	Winter Weather	Two and a half inches of snow fel

Count	County	Begin Date	End Date	Type	Exte
33	BELL (ZONE)	1/7/2011	1/7/2011	Winter Weather	Four inches of snow had accumul
	BELL (ZONE)	1/7/2011	1/7/2011	Heavy Snow	An inch and a half of snow had fa had occurred since 5 am in Fonde
	BELL (ZONE)	1/7/2011	1/7/2011	Winter Weather	Two inches of snow fell in Fonde
	BELL (ZONE)	1/7/2011	1/8/2011	Heavy Snow	Six inches of snow had fallen 2 m
	BELL (ZONE)	1/7/2011	1/8/2011	Winter Weather	Four and a half inches of snow ha
34	BELL (ZONE)	1/10/2011	1/10/2011	Heavy Snow	Four inches of snow fell overnigh inches.
	BELL (ZONE)	1/10/2011	1/10/2011	Winter Weather	A half an inch of snow fell in Fon
	BELL (ZONE)	1/10/2011	1/10/2011	Winter Weather	Two inches of snow had fallen 1 r
35	BELL (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estima Pineville. Secondary roads were b
36	BELL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 1.5 inches
	BELL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 3 inches.
	BELL (ZONE)	1/26/2011	1/26/2011	Winter Storm	The snow accumulated 5 inches.
37	BELL (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
	BELL (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
38	BELL (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Eight inches of snow fell in Frake
39	BELL (ZONE)	1/17/2013	1/17/2013	Heavy Snow	Up to 4 of snow was reported fron numerous accidents reported on H
40	BELL (ZONE)	1/25/2013	1/25/2013	Winter Storm	A combination of freezing rain an up to 1/10 of ice and sleet reporte
41	BELL (ZONE)	3/24/2013	3/26/2013	Heavy Snow	Snowfall amounts ranged from an inches reported over the higher m

Count	County	Begin Date	End Date	Type	Exte
42	BELL (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Snowfall amounts across the coun Middlesboro up to over seven incl
43	BELL (ZONE)	3/3/2014	3/3/2014	Winter Storm	The Highway Dept. reported that the county. One quarter of an inch Redbird Mountain areas. There w on top of Fonde Mountain.
44	BELL (ZONE)	11/1/2014	11/1/2014	Winter Weather	Most locations only recorded a du measured on Fonde Mountain.
45	BELL (ZONE)	2/16/2015	2/17/2015	Winter Storm	One to four inches of snow had al 1145 am. By 530 pm, 6.5 inches o inches of snow as of 930 pm. Thr county by the time the snow exite
46	BELL (ZONE)	2/18/2015	2/18/2015	Winter Weather	Up to 3 inches of snow accumulat
47	BELL (ZONE)	2/20/2015	2/21/2015	Winter Storm	The first snowfall report out of Be little before 8 am, Middlesboro ha 6 inches on the ground as of 855 a Bell county occurred at Fonde and estimated to have fallen by noon o an already significant snow pack o
48	BELL (ZONE)	3/5/2015	3/5/2015	Winter Storm	Three to four inches of snow and
49	BELL (ZONE)	1/20/2016	1/20/2016	Winter Weather	Around three inches of snow was
50	BELL (ZONE)	1/22/2016	1/23/2016	Winter Storm	Three to six inches of snow was r varying from a few hundredths of
51	BELL (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 6 to 7 inche also mixed in but amounts were in
52	BELL (ZONE)	1/8/2018	1/8/2018	Winter Weather	A trained spotter observed several Middlesboro.
53	BELL (ZONE)	1/16/2018	1/16/2018	Winter Weather	
54	BELL (ZONE)	12/8/2018	12/9/2018	Heavy Snow	
55	BELL (ZONE)	12/10/2019	12/11/2019	Winter Weather	

Count	County	Begin Date	End Date	Type	Exte
56	BELL (ZONE)	2/7/2020	2/7/2020	Winter Weather	
57	BELL (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Nearly 10 inches of snow fell acro a 9.8 inch storm total in Beverly a
58	BELL (ZONE)	2/7/2021	2/7/2021	Winter Weather	A resident of Beverly reported tha
	BELL (ZONE)	2/7/2021	2/7/2021	Heavy Snow	The 24 hour warning point in Pine and that it was still snowing heavi coming down so fast that snow pl
	BELL (ZONE)	2/7/2021	2/7/2021	Winter Weather	A member of the public reported t
59	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 3 inches of snow fel
	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	Three inches of snow was reporte
	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 3 inches of snow fel
	BELL (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Five inches of snow was reported
	BELL (ZONE)	2/17/2021	2/17/2021	Winter Weather	An inch of snow was measured in

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	BELL (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	BELL (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	BELL (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	BELL (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	BELL (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
6	BELL (ZONE)	12/23/1998	12/24/1998	Winter Storm	
7	BELL (ZONE)	1/22/2000	1/22/2000	Winter Storm	
8	BELL (ZONE)	1/25/2000	1/26/2000	Heavy Snow	Snowfall totaled between 4 and 6 inches across the mountains of Southeastern Kentucky.
9	BELL (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
10	BELL (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
11	BELL (ZONE)	1/19/2002	1/19/2002	Winter Storm	
12	BELL (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
	BELL (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
13	BELL (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 6 inches of snow were reported.
14	BELL (ZONE)	1/23/2003	1/23/2003	Heavy Snow	A maximum of 8 inches of snow were reported along with up to 4 foot drifts at the Hensley Settlement of Cumberland National Park.
15	BELL (ZONE)	1/9/2004	1/9/2004	Heavy Snow	Five inches of snow were reported in the Frakes area.
16	BELL (ZONE)	3/9/2004	3/9/2004	Heavy Snow	Six inches of snow fell at Fonde.
17	BELL (ZONE)	1/22/2005	1/23/2005	Heavy Snow	

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
18	BELL (ZONE)	1/14/2006	1/14/2006	Heavy Snow	Four inches of snow fell in Arjay and Red Bird and 5 inches fell on Fonde Mountain.
19	BELL (ZONE)	2/18/2006	2/18/2006	Heavy Snow	3 to 6 inches of snow fell on county roads at middle elevations. 6 to 7 inches of snow fell on Fonde Mountain.
20	BELL (ZONE)	2/26/2008	2/27/2008	Heavy Snow	The State Highway Garage reported that 5 to 6 inches of snow had fallen along the higher terrain on Highways 74 and 66 in the Fonde area.
21	BELL (ZONE)	2/2/2009	2/2/2009	Winter Weather	The public reported that two and a half inches of snow had fallen in Frakes.
	BELL (ZONE)	2/3/2009	2/3/2009	Heavy Snow	Six inches of snow fell on Fonde and Red Bird mountains 4 miles northeast of Fonde. Two to three inches of snow fell at the lower elevations around the county.
	BELL (ZONE)	2/3/2009	2/4/2009	Winter Weather	The Bell County Dept of Highways estimated 2 to 3 inches of snow in the valleys and 5 to 6 inches on ridgetops around the county.
22	BELL (ZONE)	2/21/2009	2/22/2009	Winter Weather	Three inches of snow fell in Arjay.
23	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	Two and a half inches of snow fell 1 mile west of Middlesboro.
	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch and a half of snow fell in Middlesboro.
	BELL (ZONE)	12/5/2009	12/5/2009	Winter Weather	Three inches of snow fell in Middlesboro.
24	BELL (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two and a half inches of snow was reported on the ground in Pineville.
	BELL (ZONE)	12/18/2009	12/18/2009	Heavy Snow	Bell county dispatch estimated 6 to 7 inches of snow on the ground at the Bell County courthouse in Pineville.
	BELL (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two inches of snow was reported on the ground by the Middlesboro rescue squad.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
25	BELL (ZONE)	1/7/2010	1/8/2010	Winter Weather	An inch or less of snow fell in the valleys with up to 5 inches reported in the higher elevations around the county.
	BELL (ZONE)	1/11/2010	1/12/2010	Winter Weather	One inch of snow fell in Pineville.
26	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snowfall was measured in Middlesboro by a member of the public.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Four and a half inches of snow had fallen in Middlesboro.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Three and a half inches of snow had fallen in Middlesboro.
	BELL (ZONE)	1/29/2010	1/30/2010	Winter Weather	Two to three inches of snow had accumulated in Middlesboro.
	BELL (ZONE)	1/29/2010	1/30/2010	Winter Weather	The Bell County Dept of Highways estimates between 1 and 2 inches of snow countywide.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow had fallen on Middlesboro.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow fell in Pineville.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept estimated that 6 to 8 inches of snow had fallen at the Cumberland Gap Tunnel.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A retired NWS employee measure 6.75 inches of snow 2 miles southwest of Pineville.
	BELL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public measured a storm total snowfall of 9 inches in Middlesboro.
27	BELL (ZONE)	2/9/2010	2/10/2010	Winter Weather	Three inches of snow was reported on the ground in Pineville with light snow still falling.
	BELL (ZONE)	2/9/2010	2/10/2010	Winter Weather	Two to three inches of snow fell in Ferndale at the lower elevations.
	BELL (ZONE)	2/9/2010	2/9/2010	Winter Weather	An inch of snow with blowing snow was reported in the Calvin area.
28	BELL (ZONE)	2/15/2010	2/15/2010	Winter Weather	The snow began falling around 5 am. A half inch of snow accumulated between 5 and 530 am. Two inches of snow were on the ground by 730 am. The snow was accumulating on trees and area roadways.
	BELL (ZONE)	2/15/2010	2/16/2010	Winter Weather	Around an inch of snow fell in Middlesboro since Monday morning. The storm total snowfall was 1.5 inches.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
29	BELL (ZONE)	2/24/2010	2/24/2010	Winter Weather	An inch of new snow fell in Pineville over a 2 hour period.
	BELL (ZONE)	2/24/2010	2/25/2010	Winter Weather	Two inches of snow fell in Clear Creek Springs.
30	BELL (ZONE)	12/12/2010	12/12/2010	Winter Weather	A snow depth of 3 inches was reported in Fonde. The snow began accumulating around 10 am.
	BELL (ZONE)	12/12/2010	12/13/2010	Winter Weather	A trained spotter reported a snowfall of 2.1 inches in Calvin.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A trained spotter measured 7.5 inches of snow in Fonde.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 12 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 7.5 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 10 inches.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A foot of snow fell in Calvin.
	BELL (ZONE)	12/12/2010	12/13/2010	Heavy Snow	Ten inches of snow fell 2 miles southwest of Pineville.
31	BELL (ZONE)	12/15/2010	12/16/2010	Ice Storm	A half of an inch of ice accumulated in Pineville.
32	BELL (ZONE)	12/24/2010	12/26/2010	Winter Weather	Five and a half inches of snow had fallen in Fonde since Friday night, with 3 inches of that having accumulated overnight.
	BELL (ZONE)	12/24/2010	12/26/2010	Winter Weather	Five and a half inches of snow had fallen in Fonde since Friday evening. Three inches of this snowfall occurred overnight.
	BELL (ZONE)	12/25/2010	12/25/2010	Winter Weather	Two and a half inches of snow fell in Fonde.

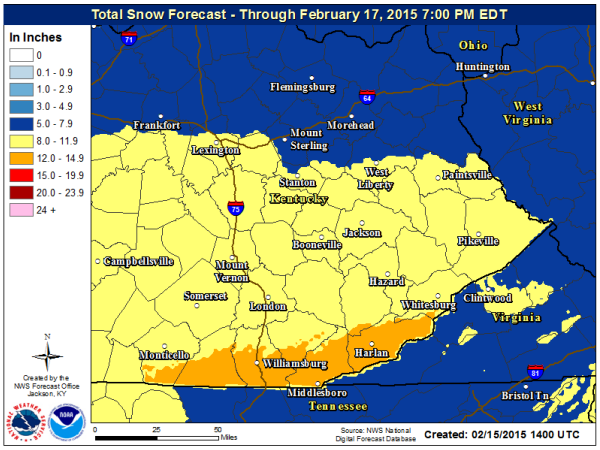
Count	County	Begin Date	End Date	Type	Extent: Event Narrative
33	BELL (ZONE)	1/7/2011	1/7/2011	Winter Weather	Four inches of snow had accumulated in Fonde.
	BELL (ZONE)	1/7/2011	1/7/2011	Heavy Snow	An inch and a half of snow had fallen since 114 pm. A total snow fall of 3.5 inches had occurred since 5 am in Fonde.
	BELL (ZONE)	1/7/2011	1/7/2011	Winter Weather	Two inches of snow fell in Fonde since 630 am.
	BELL (ZONE)	1/7/2011	1/8/2011	Heavy Snow	Six inches of snow had fallen 2 miles southwest of Pineville.
	BELL (ZONE)	1/7/2011	1/8/2011	Winter Weather	Four and a half inches of snow had fallen in Fonde since yesterday afternoon.
34	BELL (ZONE)	1/10/2011	1/10/2011	Heavy Snow	Four inches of snow fell overnight in Middlesboro, with a total snow depth of 9 inches.
	BELL (ZONE)	1/10/2011	1/10/2011	Winter Weather	A half an inch of snow fell in Fonde.
	BELL (ZONE)	1/10/2011	1/10/2011	Winter Weather	Two inches of snow had fallen 1 mile southwest of Pineville.
35	BELL (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estimated that a quarter of an inch of snow had fallen in Pineville. Secondary roads were becoming slick.
36	BELL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 1.5 inches.
	BELL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 3 inches.
	BELL (ZONE)	1/26/2011	1/26/2011	Winter Storm	The snow accumulated 5 inches.
37	BELL (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
	BELL (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
38	BELL (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Eight inches of snow fell in Frakes.
39	BELL (ZONE)	1/17/2013	1/17/2013	Heavy Snow	Up to 4 of snow was reported from near Pineville south to Middlesboro with numerous accidents reported on Highway 25E, 119 and 190.
40	BELL (ZONE)	1/25/2013	1/25/2013	Winter Storm	A combination of freezing rain and sleet accumulated up to 1/2 in Middlesboro with up to 1/10 of ice and sleet reported in Pineville.
41	BELL (ZONE)	3/24/2013	3/26/2013	Heavy Snow	Snowfall amounts ranged from an inch or less in the lower valleys with 4 to 7 inches reported over the higher mountains near Fonde and Red Bird Mountain.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
42	BELL (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Snowfall amounts across the county ranged from four and a half inches near Middlesboro up to over seven inches near Frakes.
43	BELL (ZONE)	3/3/2014	3/3/2014	Winter Storm	The Highway Dept. reported that only about half an inch of snow had fallen around the county. One quarter of an inch of ice had accumulated in the Stoney Fork and Redbird Mountain areas. There was also a quarter inch of ice accumulation reported on top of Fonde Mountain.
44	BELL (ZONE)	11/1/2014	11/1/2014	Winter Weather	Most locations only recorded a dusting of snow, however, three inches was measured on Fonde Mountain.
45	BELL (ZONE)	2/16/2015	2/17/2015	Winter Storm	One to four inches of snow had already fallen across Bell county between 1140 and 1145 am. By 530 pm, 6.5 inches of snow had fallen in Beverly. Beverly had 7.6 inches of snow as of 930 pm. Three to 8 inches of snow had fallen across the county by the time the snow exited the area.
46	BELL (ZONE)	2/18/2015	2/18/2015	Winter Weather	Up to 3 inches of snow accumulated in Pineville.
47	BELL (ZONE)	2/20/2015	2/21/2015	Winter Storm	The first snowfall report out of Bell county was measure in Beverly at 137 am. By a little before 8 am, Middlesboro had already picked up 6 inches of snow. Hutch had 6 inches on the ground as of 855 am. The highest storm total snowfall amounts in Bell county occurred at Fonde and Fern Lake, where 12 inches of snow was estimated to have fallen by noon on the 21st. The heavy wet snow, falling on top of an already significant snow pack cause several roof collapses across the county.
48	BELL (ZONE)	3/5/2015	3/5/2015	Winter Storm	Three to four inches of snow and sleet accumulated across portions of Bell county.
49	BELL (ZONE)	1/20/2016	1/20/2016	Winter Weather	Around three inches of snow was reported to have fallen in the county.
50	BELL (ZONE)	1/22/2016	1/23/2016	Winter Storm	Three to six inches of snow was reported across the county with ice amounts varying from a few hundredths of an inch up to nearly a quarter of an inch.
51	BELL (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 6 to 7 inches across the county. Some freezing rain and sleet also mixed in but amounts were inconsequential.
52	BELL (ZONE)	1/8/2018	1/8/2018	Winter Weather	A trained spotter observed several accidents due to icy roads in and around Middlesboro.
53	BELL (ZONE)	1/16/2018	1/16/2018	Winter Weather	
54	BELL (ZONE)	12/8/2018	12/9/2018	Heavy Snow	
55	BELL (ZONE)	12/10/2019	12/11/2019	Winter Weather	

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
56	BELL (ZONE)	2/7/2020	2/7/2020	Winter Weather	
57	BELL (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Nearly 10 inches of snow fell across portions of the county. The highest report was a 9.8 inch storm total in Beverly at 6 pm EST 12/25.
58	BELL (ZONE)	2/7/2021	2/7/2021	Winter Weather	A resident of Beverly reported that 2.5 inches of snow had fallen at his location.
	BELL (ZONE)	2/7/2021	2/7/2021	Heavy Snow	The 24 hour warning point in Pineville reported that 3.5 inches of snow had fallen and that it was still snowing heavily at the time of this report. The snow was coming down so fast that snow plows could not keep the area roads clear.
	BELL (ZONE)	2/7/2021	2/7/2021	Winter Weather	A member of the public reported that 6 to 7 inches of snow had fallen in Frakes.
59	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 3 inches of snow fell near Pineville.
	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	Three inches of snow was reported just south of Pineville.
	BELL (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 3 inches of snow fell in Middlesboro.
	BELL (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Five inches of snow was reported in Fonde.
	BELL (ZONE)	2/17/2021	2/17/2021	Winter Weather	An inch of snow was measured in Beverly.

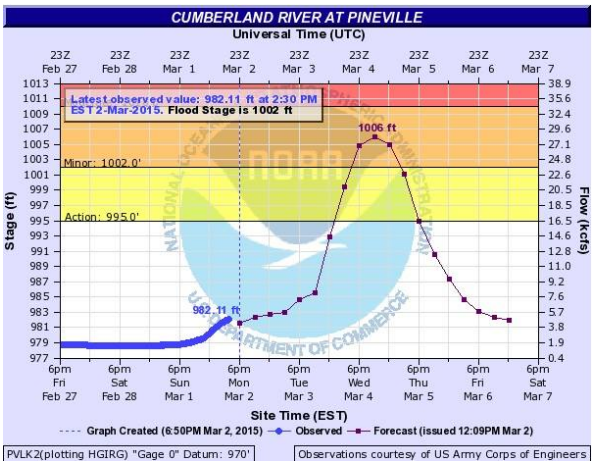
PAST WINTER STORMS

In February 2015, Fonde and Fern Lake communities in Bell County experienced 12 inches of snow. The heavy wet snow falling on top of an already significant snowpack created issues across the County. There were reports of several roof collapses.



A few weeks later another major winter storm hit. The rain, coupled with melting high elevation snowpack, caused extensive runoff and produced widespread flooding of small creeks and streams, pushing them over their banks.

Top Left: Total Snow Forecast
Bottom Left: Picture of Yellow Creek out of its bank at KY-1534 on March 4th
Bottom Right: Cumberland River Crest March 4th



Severe winter weather threatens utilities, critical facilities, and vulnerable populations. People who live in rural areas have become trapped at home; unable to travel due to the hazardous road conditions. These individuals have relied on the emergency workers to get them to and from the hospital for treatment. Emergency personnel and road crews work diligently to assist and manage the winter weather dangers. The Bell County Courthouse has been used as a warming shelter for those in need. Reviewing past severe winter storms can reveal vulnerabilities within the County and Cities enabling emergency management to better plan and prepare for future winter weather.

WILDFIRE

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[61]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

[61] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

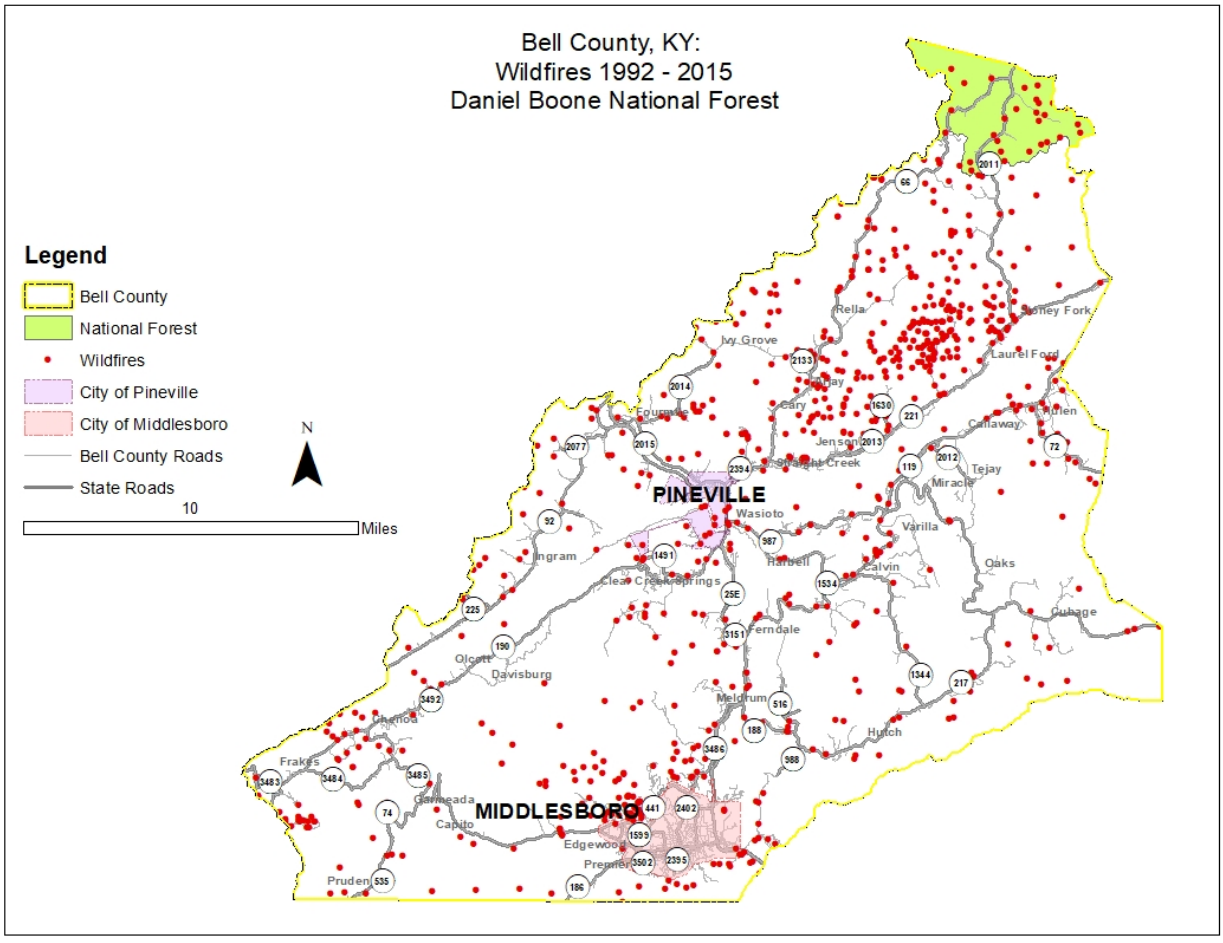
Table 1-2: Bell County Summary of Fire Occurrences, Extent, 2019-2020				
Fire Class	**Class Descriptor**	**#Fires**	**Acreage Burned**	**% of Total Fire Type**
Class A	>0.25 Acres	1	0.1	2.222%
Class B	0.25 to 9 Acres Burned	30	54.3	66.667%
Class C	10 to 99 Acres Burned	13	550.0	28.889%
Class D	100 to 299 Acres Burned	1	108.0	2.222%
Class E	300 to 999 Acres Burned	0	0.0	0.000%
Class F	1,000 to 4,999 Acres Burned	0	0.0	0.000%
Class G	5,000 or More Acres Burned	0	0.0	0.000%

Table 1-3: Bell County Wildfire Occurrences, Extent, Vulnerability 2013-2020			
Year	**# of Fires**	**# Acres Burned**	**# Acres Vulnerable**
2013	22	813.0	109,670
2014	39	956.0	
2015	17	184.0	
2016	49	6197.5	
2017	18	379.0	
2018	9	11.3	
2019	33	391.9	
2020	12	320.5	

Table 1-4 Bell County Summary of Impacts From Wildfires, 2019-2020		
# of Fires		45
Injuries		0
Fatalities		0
Suppression Costs	$	51,335
# Houses Saved		3
Value of Houses Saved	$	178,500
# Houses Lost		0
Value of Houses Lost	$	-
# Structures Saved		1
Value of Structures Saved	$	2,000
# Structures Lost		2
Value of Structures Lost	$	6,000

In 2019-2020 (the last years for which data is available), Bell County suffered 45 wildfires of all class types. Two years equals 730 days. Thus, there were 45/730 fires per day, or 0.0616 fires per day, or 1 wildfire of all class types every 16.23 days (1/0.0616). Within particular wildfire classes, there was one (1) Class A wildfire between 2019-2020. This translates to 1/730 fires where less than 0.25 acres were burned, or 0.0014 Class A fires per day, or 1 Class A wildfire about every 714.28 days (1/0.0014). There were 30 Class B wildfires between 2019-2020. This translates to 30/730 fires where between 0.25 to 9 acres were burned, or 0.0411 Class B fires per day, or one (1) Class B wildfire about every 24.33 days (1/0.0411). There were 13 Class C wildfires between 2019-2020. This translates to 13/730 fires where between 10 to 99 acres were burned, or 0.0178 Class C fires per day, or one (1) Class C wildfire about every 56.18 days (1/0.0178). There was 1 Class D wildfire between 2019-2020. This translates to 1/730 fires where between 100 to 299 acres were burned, or 0.0014 Class D fires per day, or one (1) Class D wildfire about every 714.28 days (1/0.0014). There were no Class E to Class G wildfires – fires where 300 to 5,000 or more acres were burned – in 2019-2020 in Bell County.

All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current. The DOF does not collect data about wildfires in incorporated areas; therefore, there is no information available regarding wildfires in Pineville and Middlesboro.



SEVERE THUNDERSTORMS, HAIL, & TORNADOS

Severe thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm, including hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures.[62]

Severe Thunderstorms have at least one of the following:

- Wind gusts of at least 58 mph or higher, i.e. 50 knots;
- Tornado;
- Hail that is one inch or larger, i.e. at minimum the size of a quarter.

This analysis will focus on the wind profile for Bell County; later sections will assess hail and tornados.[63]

Thunderstorms can be categorized by their physical characteristics, i.e., the presence or absence of rotation, the number or location of updrafts and downdrafts present. There is a continuous spectrum of storms in the sky and a storm may move from one category along this spectrum to another. The five (5) types are:

- **Ordinary or Single-Cell Storm:** Single cell storms are short-lived and usually not severe.
    - Short life, generally 30-45 minutes
    - Downdraft that forms within 15-20 minutes after cell initiation
    - Updraft that weakens in 25-30 minutes; outflow stabilizes
    - Gusty winds, usually not severe
- **Pulse Storm:** A Pulse Storm is a single-cell thunderstorm that is usually not strong; when it is of substantial intensity, it produces severe weather for short periods of time. Such a storm weakens and then generates another short burst or pulse.
    - Short life, generally 30-45 minutes
    - Usually not severe, but given the right environmental conditions, these storms can create:
        - Downburst winds, usually less than 70 mph
        - A weak tornado
    - Damage is isolated.

[62] National Severe Storms Service. *Severe Weather: Thunderstorm Basics 101*. Retrieved on 6/16/2020 from https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/

[63] The TYPES section is adapted from the National Weather Service. (2011). "Weather Spotter's Field Guide." Department of Commerce. As presented in the Kentucky Hazard Mitigation Plan published by the University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP). (2018)

- **Multicellular Cluster:** This type is the most common storm, consisting of a group of ordinary cells at various stages of the thunderstorm life cycle.
    - Most common type of thunderstorm
    - May last for several hours
    - Consists of a group of cells moving as a single unit
    - Contains cells in different stage of the thunderstorm life cycle
    - Occasionally may contain supercells
    - Given the right conditions, the cells can become severe within the multicellular cluster producing:
        - Downburst winds;
        - Weak tornadoes; and
        - Heavy rainfall in a short time.
- **Multicellular Line:** This category is a long line of storms with a continuous, well developed gust front along the leading edge.
    - Frequently called squall line
    - A long line of storms with individual storm outflows merging to produce a continuous, well-developed gust front marking the leading edge of rain-cooled air
    - Line of storms often oriented north-south or northeast-southwest and usually move toward the northeast, east, or southeast
    - May be embedded along the line
    - Given the right environmental conditions, multicell line storms can produce:
        - Strong downburst winds;
        - Heavy rainfall; and
        - Occasional tornadoes
- **Supercell:** A supercell is a highly organized thunderstorm with an extremely strong updraft. They exhibit persistent storm-scale rotation of the updraft-downdraft couplet or mesocyclone.
    - Classifying supercellular storms is subjective. Still, the following is generally acknowledged about supercells:
        - Highly organized storm with rotation inside
        - Updrafts can attain speeds more than 100 mph
        - Can produce strong, violent tornadoes
        - Rear-flank downdraft can produce damaging outflow winds in excess of 100 mph.
    - Supercells can produce the following elements:
        - Potentially torrential rainfall immediately adjacent to the storm updraft
        - Lighter rainfall at greater distances from the updraft
        - Rear-Flank Downdrafts (RFDs) producing strong, sometimes damaging outflows
        - Tornadoes

Damaging Winds: National Weather Service issues warnings when the winds from a thunderstorm are expected to be 58 mph (50 knots) or higher.

Downburst: This term refers to an area of strong, often damaging winds produced by air rapidly descending in a thunderstorm. Downbursts are sometimes described as a microburst when it covers an area of less than 2.5 square miles and lasts three to seven minutes. Downbursts can be referred to as microburst when they cover larger areas or last for more than seven (7) minutes. On rare occasions, downbursts can have wind speeds in excess of 150 mph.

Bow Echo: A bow-shaped line of convective cells – best seen on radar – is often associated with swaths of damaging straight-line winds and small tornadoes.

Derecho: A derecho is a widespread and usually fast-moving convectively-induced episode of damaging winds. Derechos can result from bow echoes, supercells, multicell clusters or lines, or a blend of any of these. They can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across. Due to the large area extent, an episode is usually not classified as a derecho until it is complete.

Note: When reviewing the types and impacts of thunderstorms and winds, it is important to realize that while tornadoes are typically more destructive when they occur, straightline winds can also be highly destructive and occur much more frequently. In the final analysis, straightline winds cause more damage in both injuries/deaths and property damage in the United States than do tornadoes.

Table 1-5: Bell County Thunderstorm/Wind Events, 1996-2020

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	503.01K	0.10K
1	BELL (ZONE)	BELL (ZONE)	KY	1/3/2000	21:30	EST	High Wind	58 kts. E	0	0	0.00K	0.00K
2	PINEVILLE	BELL CO.	KY	7/21/2003	13:20	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	FOURMILE	BELL CO.	KY	7/21/2003	13:20	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
3	BELL (ZONE)	BELL (ZONE)	KY	11/24/2003	6:15	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
4	COUNTY WIDE	BELL CO.	KY	5/26/2004	15:35	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
5	COUNTY WIDE	BELL CO.	KY	5/31/2004	1:15	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	PINEVILLE	BELL CO.	KY	5/31/2004	2:00	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
6	COUNTY WIDE	BELL CO.	KY	7/5/2004	18:10	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
7	MIDDLES-BORO	BELL CO.	KY	7/13/2004	22:55	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
8	BELL (ZONE)	BELL (ZONE)	KY	12/7/2004	8:14	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
9	CARY	BELL CO.	KY	5/19/2005	23:00	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
10	MIDDLES-BORO	BELL CO.	KY	7/1/2005	12:55	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
11	PINEVILLE	BELL CO.	KY	8/5/2005	16:40	EST	Thunderstorm Wind	55 kts. EG	0	0	5.00K	0.00K

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
12	PINEVILLE	BELL CO.	KY	4/2/2006	19:35	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00 K	0.00 K
	MIRACLE	BELL CO.	KY	4/2/2006	19:43	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00 K	0.00 K
13	MIDDLES-BORO	BELL CO.	KY	5/18/2006	18:10	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00 K	0.00 K
14	MIDDLES-BORO	BELL CO.	KY	6/11/2006	19:08	EST	Thunderstorm Wind	55 kts. EG	0	0	5.00 K	0.00 K
15	PINEVILLE	BELL CO.	KY	7/4/2006	15:03	EST	Thunderstorm Wind	55 kts. EG	0	0	3.00 K	0.00 K
16	PINEVILLE	BELL CO.	KY	7/28/2006	14:23	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00 K	0.00 K
17	MIDDLES-BORO	BELL CO.	KY	8/10/2006	18:53	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00 K	0.00 K
18	BELL (ZONE)	BELL (ZONE)	KY	12/1/2006	7:58	EST-5	High Wind	55 kts. EG	0	0	0.00 K	0.00 K
19	PINEVILLE	BELL CO.	KY	4/3/2007	21:08	EST-5	Thunderstorm Wind	58 kts. EG	0	0	8.00 K	0.00 K
	MIDDLES-BORO	BELL CO.	KY	4/3/2007	21:58	EST-5	Thunderstorm Wind	58 kts. EG	0	0	100.00K	0.00 K
20	CUBAGE	BELL CO.	KY	7/23/2007	16:24	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00 K	0.00 K
21	MIDDLES-BORO	BELL CO.	KY	11/14/2007	18:05	EST-5	Thunderstorm Wind	54 kts. EG	0	0	2.00 K	0.00 K
	HUTCH	BELL CO.	KY	11/14/2007	18:10	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00 K	0.00 K
22	PINEVILLE	BELL CO.	KY	1/29/2008	23:07	EST-5	Thunderstorm Wind	58 kts. EG	0	0	50.00K	0.00 K
	CUBAGE	BELL CO.	KY	1/29/2008	23:22	EST-5	Thunderstorm Wind	54 kts. EG	0	0	6.00 K	0.00 K

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
23	BLACK SNAKE	BELL CO.	KY	2/6/2008	7:54	EST -5	Thunderstorm Wind	50 kts. EG	0	0	1.00 K	0.00 K
	MIDDLES-BORO	BELL CO.	KY	2/6/2008	7:59	EST -5	Thunderstorm Wind	53 kts. EG	0	0	8.00 K	0.00 K
24	MELDRUM	BELL CO.	KY	3/4/2008	15:35	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00 K	0.00 K
	BEVERLY	BELL CO.	KY	3/4/2008	15:42	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00 K	0.00 K
25	PINEVILLE	BELL CO.	KY	3/19/2008	15:20	EST -5	Thunderstorm Wind	54 kts. EG	0	0	3.00 K	0.00 K
	PINEVILLE	BELL CO.	KY	3/19/2008	17:01	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00 K	0.00 K
26	PINEVILLE	BELL CO.	KY	5/11/2008	9:38	EST -5	Thunderstorm Wind	55 kts. EG	0	0	40.00K	0.00 K
27	ARJAY	BELL CO.	KY	7/20/2008	17:22	EST -5	Thunderstorm Wind	51 kts. EG	0	0	1.00 K	0.00 K
28	PINEVILLE	BELL CO.	KY	6/16/2009	16:58	EST -5	Thunderstorm Wind	51 kts. EG	0	0	4.00 K	0.00 K
29	PINEVILLE	BELL CO.	KY	8/4/2009	16:20	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00 K	0.00 K
30	PINEVILLE	BELL CO.	KY	10/9/2009	17:06	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00 K	0.00 K
31	BELL (ZONE)	BELL (ZONE)	KY	12/9/2009	11:15	EST -5	High Wind	56 kts. EG	0	0	0.00 K	0.00 K
32	CALVIN	BELL CO.	KY	5/14/2010	15:35	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
	MIDDLES-BORO	BELL CO.	KY	5/15/2010	17:55	EST -5	Thunderstorm Wind	53 kts. EG	0	0	2.00 K	0.00 K
33	CALVIN	BELL CO.	KY	6/15/2010	14:56	EST -5	Thunderstorm Wind	56 kts. EG	0	0	0.00 K	0.00 K
34	CLEAR CREEK SPGS	BELL CO.	KY	7/19/2010	18:07	EST -5	Thunderstorm Wind	50 kts. EG	0	0	2.00 K	0.00 K

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
35	MELDRUM	BELL CO.	KY	8/5/2010	14:35	EST -5	Thunderstorm Wind	55 kts. EG	0	0	4.00 K	0.00 K
36	MIDDLES-BORO	BELL CO.	KY	2/28/2011	9:30	EST -5	Thunderstorm Wind	50 kts. EG	0	0	8.00 K	0.00 K
37	MIDDLES-BORO	BELL CO.	KY	4/25/2011	18:35	EST -5	Thunderstorm Wind	52 kts. EG	0	0	6.00 K	0.00 K
	MIDDLES-BORO	BELL CO.	KY	4/25/2011	18:35	EST -5	Thunderstorm Wind	52 kts. EG	0	0	5.00 K	0.00 K
	CALVIN	BELL CO.	KY	4/25/2011	19:45	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
38	FERNDALE	BELL CO.	KY	5/24/2011	15:33	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00 K	0.00 K
39	MIDDLES-BORO	BELL CO.	KY	6/9/2011	14:15	EST -5	Thunderstorm Wind	50 kts. EG	0	0	3.00 K	0.00 K
40	WASIOTO	BELL CO.	KY	6/20/2011	1:58	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00 K	0.00 K
41	PINEVILLE	BELL CO.	KY	2/29/2012	16:44	EST -5	Thunderstorm Wind	60 kts. EG	0	0	5.00 K	0.00 K
	DORTON BRANCH	BELL CO.	KY	2/29/2012	16:46	EST -5	Thunderstorm Wind	60 kts. EG	0	0	5.00 K	0.00 K
	BEVERLY	BELL CO.	KY	2/29/2012	16:48	EST -5	Thunderstorm Wind	60 kts. EG	0	0	5.00 K	0.00 K
	CALLA-WAY	BELL CO.	KY	2/29/2012	16:52	EST -5	Thunderstorm Wind	60 kts. EG	0	0	5.00 K	0.00 K
42	MIDDLES-BORO	BELL CO.	KY	3/2/2012	18:30	EST -5	Thunderstorm Wind	50 kts. EG	0	0	15.00K	0.00 K
	PINEVILLE	BELL CO.	KY	3/2/2012	18:35	EST -5	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00 K
	MIRACLE	BELL CO.	KY	3/2/2012	18:40	EST -5	Thunderstorm Wind	60 kts. EG	0	0	10.00K	0.00 K
	ARJAY	BELL CO.	KY	3/2/2012	20:00	EST -5	Thunderstorm Wind	60 kts. EG	0	0	10.00K	0.00 K

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
43	FRAKES	BELL CO.	KY	4/3/2012	14:17	EST -5	Thunderstorm Wind	60 kts. EG	0	0	25.00K	0.00K
44	ARJAY	BELL CO.	KY	7/5/2012	15:20	EST -5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	CLEAR CREEK SPGS	BELL CO.	KY	7/5/2012	15:30	EST -5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	MIDDLES-BORO	BELL CO.	KY	7/5/2012	15:40	EST -5	Thunderstorm Wind	60 kts. EG	0	0	50.00K	0.00K
45	JAYEM	BELL CO.	KY	7/8/2012	20:25	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
46	MIDDLES-BORO	BELL CO.	KY	1/30/2013	8:34	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
47	FOURMILE	BELL CO.	KY	5/21/2013	16:30	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
48	WASIOTO	BELL CO.	KY	7/17/2013	15:23	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
49	MIDDLES-BORO	BELL CO.	KY	4/28/2014	13:58	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
	CARDINAL	BELL CO.	KY	4/28/2014	14:05	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
50	BEVERLY	BELL CO.	KY	5/21/2014	21:44	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	DAVISBURG	BELL CO.	KY	5/21/2014	21:44	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	CUBAGE	BELL CO.	KY	5/21/2014	21:53	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	CUBAGE	BELL CO.	KY	5/21/2014	21:55	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
51	EDGEWOOD	BELL CO.	KY	6/10/2014	17:25	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
52	MIDDLES-BORO	BELL CO.	KY	6/18/2014	14:05	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
53	WASIOTO	BELL CO.	KY	8/20/2014	15:36	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
	EAST PINEVILLE	BELL CO.	KY	8/20/2014	18:00	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
54	RELLA	BELL CO.	KY	9/2/2014	17:52	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
55	KETTLE IS	BELL CO.	KY	9/2/2014	17:55	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
56	BEVERLY	BELL CO.	KY	10/7/2014	16:45	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
57	JAYBEE	BELL CO.	KY	6/8/2015	15:00	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
58	MIDDLES-BORO	BELL CO.	KY	6/21/2015	16:03	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
59	BEVERLY	BELL CO.	KY	7/13/2015	16:15	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
	CARY	BELL CO.	KY	7/14/2015	6:18	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
	CUBAGE	BELL CO.	KY	7/14/2015	20:15	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
60	CLEAR CREEK SPGS	BELL CO.	KY	8/5/2015	15:55	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
61	ARJAY	BELL CO.	KY	5/7/2016	18:56	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
62	WASIOTO	BELL CO.	KY	6/21/2016	15:41	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
63	STRAIGHT CREEK	BELL CO.	KY	7/8/2016	16:10	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
64	HULEN	BELL CO.	KY	5/27/2017	19:00	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
65	CALVIN	BELL CO.	KY	4/4/2018	0:02	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00 K	0.00 K

No.	Location	County / Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
66	STONEY FORK	BELL CO.	KY	6/24/2018	17:29	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
	CALVIN	BELL CO.	KY	6/25/2018	12:13	EST -5	Thunderstorm Wind	50 kts. EG	0	0	25.0 0K	0.00 K
	WESSELL	BELL CO.	KY	6/25/2018	12:35	EST -5	Thunderstorm Wind	51 kts. EG	0	0	5.00 K	0.00 K
	FRAKES	BELL CO.	KY	6/25/2018	13:30	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00 K	0.00 K
67	PINEVILLE	BELL CO.	KY	7/20/2018	19:52	EST -5	Thunderstorm Wind	53 kts. EG	0	0	0.00 K	0.00 K
68	EAST PINEVILLE	BELL CO.	KY	8/8/2018	14:26	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
69	CLEAR CREEK SPGS	BELL CO.	KY	6/21/2019	22:32	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00 K	0.00 K
70	PINEVILLE	BELL CO.	KY	7/3/2019	15:34	EST -5	Thunderstorm Wind	52 kts. EG	0	0	55.0 0K	0.00 K
71	JAYBEE	BELL CO.	KY	8/20/2019	18:48	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
	Totals:								0	0	503. 01K	0.10 K

Bell County Thunderstorms/Wind - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually “next” to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/3/2000. Therefore, the denominator is set at 20 years because those are the only years available for these weather events in the database.

That Bell County experienced 71 severe thunderstorm/wind events over 20 years yields that Bell County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every three months (i.e., 71/240). Specifically, Bell County experienced an average of 2.3 severe thunderstorm/wind events each year. Or, using December

31, 2020 as an endpoint, this is 0.3 events per month. 1/.3 = 3.3 ≈ 1 severe winter storm event an average of every three months.

Table 1-6: Bell County Hailstorm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	5.00K	0.00K
1	STONEY FORK	BELL CO.	KY	6/4/2001	16:35	EST	Hail	1.00 in.	0	0	0.00K	0.00K
2	MIDDLES-BORO	BELL CO.	KY	11/10/2002	19:40	EST	Hail	1.75 in.	0	0	0.00K	0.00K
	MIDDLES-BORO	BELL CO.	KY	11/10/2002	21:15	EST	Hail	1.00 in.	0	0	0.00K	0.00K
3	FERNDALE	BELL CO.	KY	4/3/2006	23:51	EST	Hail	1.00 in.	0	0	0.00K	0.00K
4	PINEVILLE	BELL CO.	KY	4/19/2006	3:58	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	FERNDALE	BELL CO.	KY	4/19/2006	3:58	EST	Hail	1.25 in.	0	0	0.00K	0.00K
5	JAYBEE	BELL CO.	KY	10/11/2006	17:08	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
6	STONY FORK JCT	BELL CO.	KY	6/15/2007	13:23	EST-5	Hail	1.00 in.	0	0	5.00K	0.00K
7	PINEVILLE	BELL CO.	KY	5/14/2010	15:58	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	FRAKES	BELL CO.	KY	5/15/2010	17:20	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
	MIDDLES-BORO	BELL CO.	KY	5/15/2010	17:50	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
8	ARJAY	BELL CO.	KY	4/1/2011	21:08	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
9	PINEVILLE	BELL CO.	KY	2/29/2012	16:50	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
10	FRAKES	BELL CO.	KY	3/2/2012	18:15	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
11	MIDDLES-BORO	BELL CO.	KY	3/2/2012	18:30	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
	HULEN	BELL CO.	KY	3/2/2012	18:42	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	BLACK SNAKE	BELL CO.	KY	3/2/2012	18:45	EST-5	Hail	2.75 in.	0	0	0.00K	0.00K
	NOETOWN	BELL CO.	KY	3/2/2012	19:15	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	FONDE	BELL CO.	KY	3/2/2012	20:10	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
	MIDDLES-BORO	BELL CO.	KY	3/2/2012	20:25	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K

	MIDDLES-BORO	BELL CO.	KY	3/2/2012	20:40	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
12	PINEVILLE	BELL CO.	KY	4/26/2012	17:44	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	WASIOTO	BELL CO.	KY	4/26/2012	17:50	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
13	WASIOTO	BELL CO.	KY	7/17/2013	15:05	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	5.00K	0.00K

Bell County Hailstorms - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 6/4/2001. Although the last date recorded for a hailstorm in Bell County is 7/17/2013, the denominator is set at 20 years to maintain comparability across counties.

That Bell County experienced 13 events with hail 1" or larger over 20 years yields that Bell County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 20 months (i.e., 13/240). Specifically, Bell County experienced an average of 1.2 severe hailstorm events every two years. Or, using December 31, 2020 as an endpoint, this is 0.05 events per month. $1/.05 = 20 \approx 1$ severe hailstorm event an average of every 20 months.

Table 1-7: Bell County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	463.00K	0.00K
1	MIDDLES-BORO	BELL CO.	KY	6/13/1997	17:54	EST	Tornado	F0	0	0	3.00K	0.00K
	PINEVILLE	BELL CO.	KY	6/13/1997	17:55	EST	Tornado	F0	0	0	10.00K	0.00K
2	FONDE	BELL CO.	KY	5/31/1998	21:48	EST	Tornado	F1	0	0	200.00K	0.00K
3	CHENOA	BELL CO.	KY	6/18/2003	10:03	EST	Tornado	F0	0	0	0.00K	0.00K
4	MIDDLES-BORO BELL ARP	BELL CO.	KY	10/26/2010	17:10	EST-5	Tornado	EF1	0	0	250.00K	0.00K
	Totals:								0	0	463.00K	0.00K

Bell County Tornados - Probability as Frequency of Event Occurrence

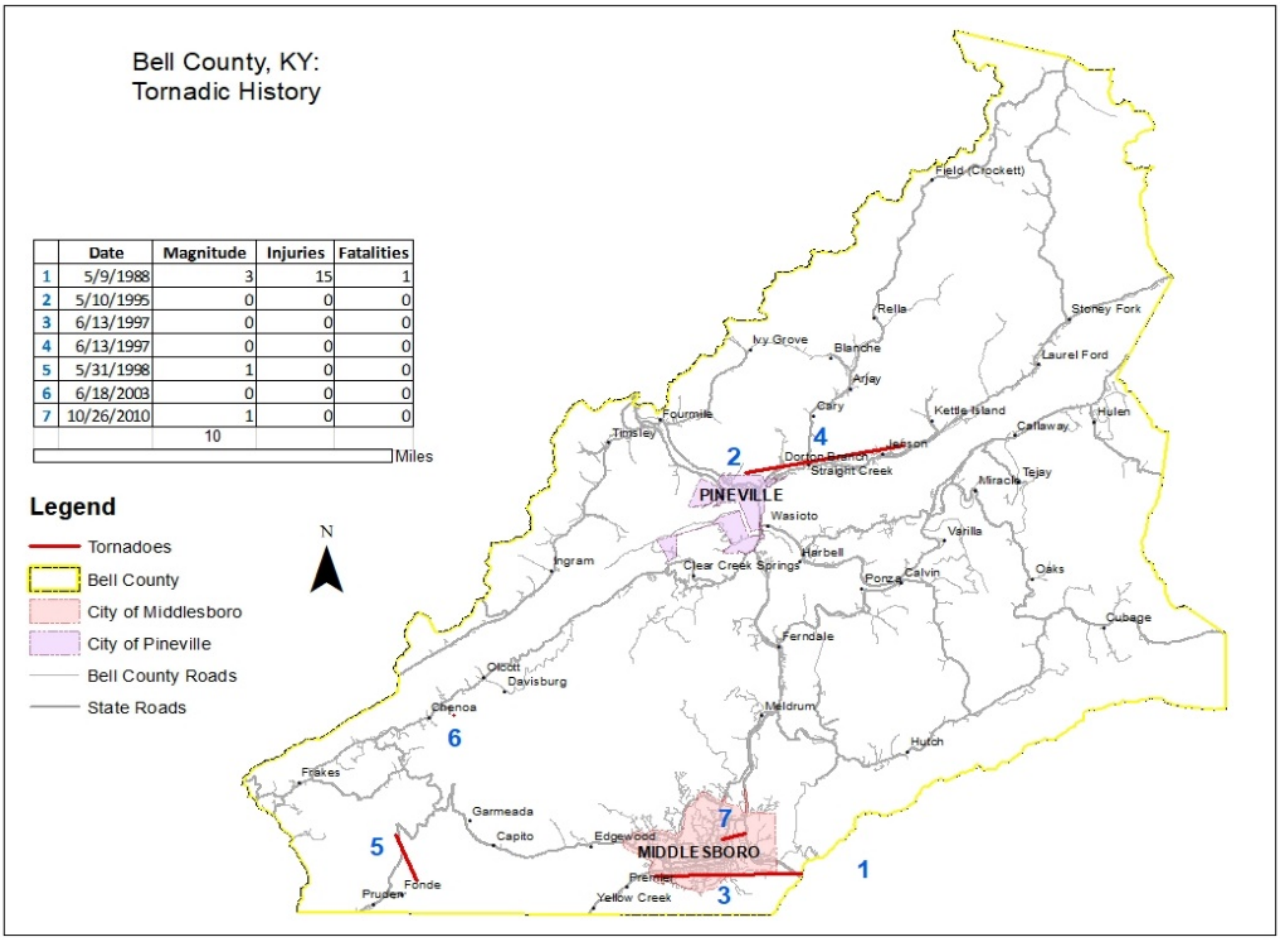
The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 6/13/1997. Although the last date recorded for a tornado in Bell County is 10/26/2010, the denominator is set at 20 years to maintain comparability across counties. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen.

That Bell County experienced 4 events with tornados over 20 years yields that Bell County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 4.9 years (i.e., 4/240). Specifically, Bell County experienced an average of one tornado event just under every five years. Or, using December 31, 2020 as an endpoint, this is 0.017 events per month. $1/.017 = 58.8 \approx 1$ tornado event an average of every 4.9 years.

Local History of Tornados

On October 26, 2010 an EF1 **tornado** touched down in the City of Middlesboro. The tornado carved a path from 19th street to 12th street leaving a trail of damage; part of the roof on the mall was damaged, 2 cinder block buildings at a lumber yard were demolished, a roof was blown off from a building supplier, and 2 large steel doors were blown off a business. The outcome of this tornado could have been a lot worse if it had hit a more vulnerable area. Currently, Bell County

does not have any storm shelters. During previous severe thunderstorms people have sought shelter in nearby churches or homeless shelters.



	Date	Magnitude	Injuries	Fatalities
1	5/9/1988	3	15	1
2	5/10/1995	0	0	0
3	6/13/1997	0	0	0
4	6/13/1997	0	0	0
5	5/31/1998	1	0	0
6	6/18/2003	0	0	0
7	10/26/2010	1	0	0

LANDSLIDES

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope.[64] Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field. Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils.

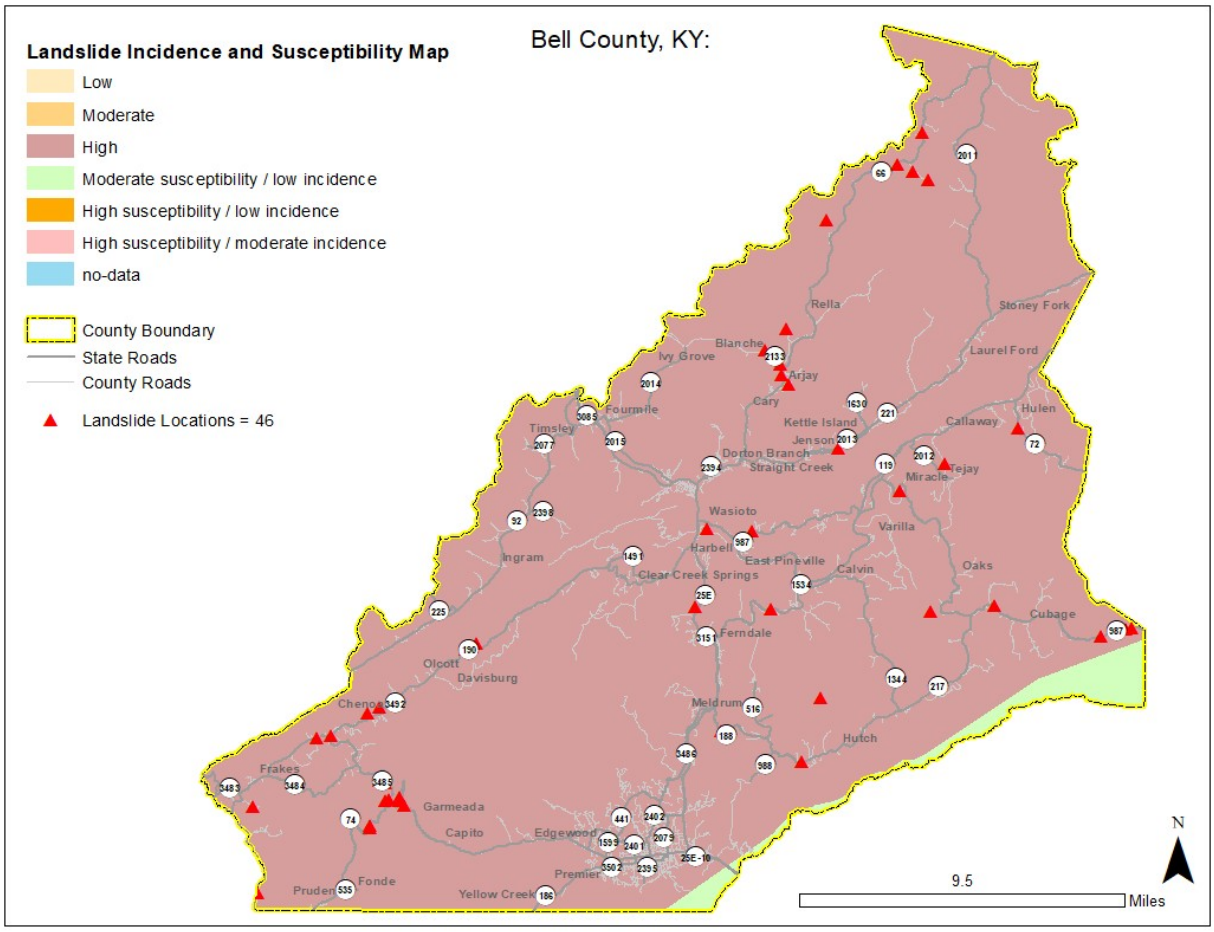
The picture above shows a landslide that occurred April 23, 2017 on KY-1344 approximately 2.5 miles from US-119. The road was completely blocked, closing the road until state highway crews could clear the debris. Traffic had to be diverted.

On February 11, 2018 another large landslide occurred at KY-74 going through Middlesboro across Fonde Mountain which shut down the road for a couple of weeks.

The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.

All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

[64] Lynch, Mike. Landslide Hazards in Kentucky. Retrieved on 6/16/2020 from https://www.uky.edu/KGS/education/factsheet/landslide_factsheet.pdf.


Landslide Incidence and Susceptibility Map
Low
Moderate
High
Moderate susceptibility / low incidence
High susceptibility / low incidence
High susceptibility / moderate incidence
no-data
County Boundary
State Roads
County Roads
Landslide Locations = 46
Bell County, KY:
Rella
Stoney Fork
Blanche
Ivy Grove
Laurel Ford
Arjay
Cary
Fourmile
Kettle Island
Callaway
Hulen
Timsley
Jenson
Dorton Branch
Straight Creek
Tejay
Miracle
Wasioto
Varilla
Harbell
East Pineville
Calvin
Oaks
Ingram
Clear Creek Springs
Cubage
Ferndale
Olcott
Davisburg
Meldrum
Hutch
Frakes
Garmeada
Capito
Edgewood
Premier
Fonde
Pruden
Yellow Creek
N
9.5
Miles

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Bell	Frakes	KY 190	Above Road	1992	Land-slide	Siltstone; Shale; Sandstone; Coal								
2	Bell	Beverly	KY 66		2003	Land-slide	Sandstone; Siltstone; Shale; Coal; Underclay								
3	Bell	Eagan	KY 190		6/19/2012	Land-slide	Siltstone; Shale; Sandstone; Coal; Underclay								$ 234,000
4	Bell	Balkan	KY 987	Below Road; Stream at Bottom	5/7/2013	Land-slide	Shale; Siltstone; Sandstone; Coal							Yes	$ 89,175
5	Bell	Kayjay	KY 3485	Below Road	12/19/2013	Land-slide	Siltstone; Sandstone; Claystone; Coal							Yes	
6	Bell	Kayjay	KY 3485	Below Road	12/19/2013	Land-slide	Siltstone; Sandstone; Claystone; Coal								

7	Bell	Kayjay	KY 3485	Below Road	12/19/2013	Land-slide	Siltstone; Sandstone; Claystone; Coal								
8	Bell	Ewing	KY 987	Above and Below Road; Stream at Bottom	2014		Shale; Sandstone; Siltstone; Coal; Underclay								
9	Bell	Balkan	KY 2012		2016		Shale; Siltstone; Sandstone; Coal		250 feet						
10	Bell	Kayjay	KY 74	Above and Below Road	2/10/2018	De-bris Flow	Siltstone; Sandstone; Claystone; Coal							Road Failure	
11	Bell	Balkan	KY 987		2019		Sandstone							Road Failure	
12	Bell	Balkan	KY 987		2019		Shale; Siltstone; Sandstone; Coal								
13	Bell	Balkan	US 119		2019		Shale; Siltstone; Sandstone; Coal								
14	Bell	Balkan	US 119		2019		Shale; Siltstone; Sandstone; Coal								
15	Bell	Ewing	KY 987		2019		Shale								
16	Bell	Varilla	KY 987		2019		Sandstone								
17	Bell	Varilla	KY 987		2019		Sandstone								

18	Bell	Kayjay	KY 3485		2020		Sandstone; Siltstone; Claystone; Coal								
19	Bell	Balkan	KY 221				Shale							Break in Pave-ment	
20	Bell	Balkan	KY 72				Shale; Siltstone; Sandstone; Coal								
21	Bell	Balkan	(36.87389, -83.6219)												
22	Bell	Beverly	KY 66				Shale; Sandstone; Siltstone; Coal; Underclay								
23	Bell	Beverly	(36.89, 83.5678)												$ 107,208
24	Bell	Beverly	(36.89361, -83.5758)												
25	Bell	Ewing	KY 987												
26	Bell	Ewing	(36.69528, -83.4831)												
27	Bell	Ewing	KY 987				Sandstone; Shale								
28	Bell	Fork Ridge	KY 74												
29	Bell	Fork Ridge	KY 74	Above and Below Road			Shale; Coal; Siltstone; Underclay								

30	Bell	Frakes	KY 190				Siltstone; Shale; Sandstone; Coal					39		Yes	
31	Bell	Frakes	(36.63111, -83.9303)												
32	Bell	Kayjay	KY 74	Above and Below Road			Siltstone; Sandstone; Claystone; Coal								
33	Bell	Kayjay	KY 74								12-20 feet			Yes	$ 200,000
34	Bell	Kayjay	KY 74				Siltstone; Sandstone; Claystone; Coal								
35	Bell	Kayjay	KY 74				Siltstone; Sandstone; Claystone; Coal		160 feet						
36	Bell	Kayjay	KY 3485				Siltstone; Sandstone; Claystone; Coal		100 feet						
37	Bell	Kayjay	KY 225				Siltstone; Sandstone; Claystone; Coal		200 feet						
38	Bell	Kayjay	KY 74				Sandstone; Shale; Coal								
39	Bell	Kayjay	KY 3485				Sandstone; Siltstone; Clay								

							Shale; Coal								
40	Bell	Varilla	(36.70917, -83.5381)												
41	Bell	Varilla	(36.68, -83.5903)												
42	Bell	Varilla	(36.7075, -83.5722)												
43	Bell	Varilla	KY 1344				Sandstone; Shale								

Bell County Landslides - Probability as Frequency of Event Occurrence

Bell County, unincorporated (and its unincorporated cities) independently experienced 43 landslide events over 30 years. Thus, Bell County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every eight months (i.e., 43/30). Specifically, Bell County, unincorporated and its unincorporated cities experienced an average of 1.5 landslide events each year. Or, using December 31, 2021, as an endpoint, 43/360 months is 0.1194 events per month. $1/0.1194 = 8.3752 \approx 1$ landslide event an average of every eight (8) months.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
1	Bell	Middlesboro North	KY 188		7/20/2012	Landslide	Sandstone; Siltstone; Coal							Yes	
2	Bell	Middlesboro North	KY 1534	Above and Below Road	2014	Landslide	Siltstone; Sandstone; Coal							Yes	
3	Bell	Middlesboro	US 25E		2019		Siltstone; Sandstone; Coal								
4	Bell	Middlesboro North	KY 1534	Above and Below Road; Stream at Bottom	2020		Sandstone; Siltstone; Coal								
5	Bell	Middlesboro North	(36.67194, -83.6306)												
6	Bell	Middlesboro North	US 25E	Above Road		Landslide	Siltstone; Sandstone; Coal							Yes	$2,000,000
7	Bell	Middlesboro North	Bird Branch Rd			Landslide	Sandstone; Siltstone; Coal								
8	Bell	Middlesboro North	Harbell Station Rd			Landslide	Sandstone; Siltstone; Coal								

9	Bell	Middles-boro North	KY 217				Siltstone; Sandstone; Coal		185 feet					Road Failure	

Middlesboro Landslides - Probability as Frequency of Event Occurrence

Incorporated Middlesboro independently experienced 9 landslide events within its city limits over 30 years. Therefore, Middlesboro experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every three years (i.e., 9/30). Specifically, Middlesboro experienced an average of 0.3 landslide events each year. Or, using December 31, 2021, as an endpoint, 9/360 months is 0.025 events per month. $1/0.025 = 40 \approx 1$ landslide event an average of every forty (40) months, or one every 3.3 years.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Bell	Pineville	Long Branch Rd	Above Home	3/11/2014	Land-slide	Shale; Siltstone; Sandstone; Coal							Yes	
2	Bell	Pineville	Bradford Town Right Road		2/24/2019		Sandstone; Siltstone; Carbona-ceous Shale; Coal								
3	Bell	Pineville	(36.81944, -83.6561)												
4	Bell	Pineville	(36.805, -83.6439)												
5	Bell	Pineville	(36.81361, -83.6478)												
6	Bell	Pineville	(36.80889, -83.6478)												

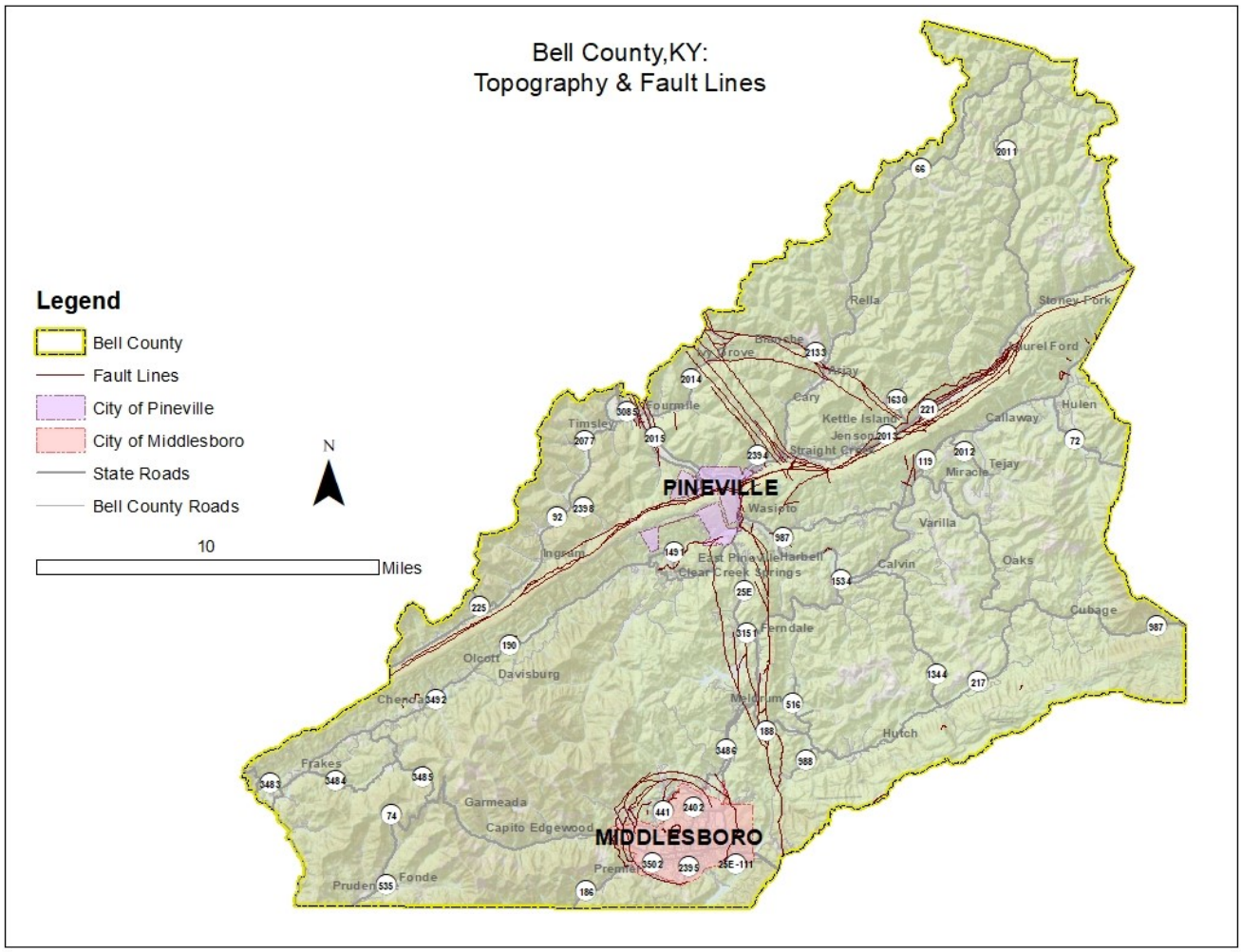
Pineville Landslides - Probability as Frequency of Event Occurrence

Incorporated Pineville independently experienced 6 landslide events within its city limits over 30 years. Therefore, Pineville experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every five years (i.e., 6/30). Specifically, Pineville experienced an average of 0.2 landslide events each year. Or, using December 31, 2021, as an endpoint, 6/360 months is 0.0167 events per month. $1/0.0167 = 59.88 \approx 1$ landslide event an average of every 60 months, or one every five (5) years.

EARTHQUAKES

Earthquakes can happen any time of the year and without warning. The risk in Kentucky is higher in identified seismic zones such as the New Madrid Fault Zone in the western part of the state. Although there is a dearth of activity in Bell County, it would experience shaking from potential future, larger earthquakes in the region, particularly from the Eastern Tennessee seismic zones. The largest known earthquake in Bell County occurred in 1954 and had a magnitude of 4.1. There were five earthquakes total in Bell County from 1900 to the present, according to the USGS database. The following is a list of the recorded earthquakes from 1900 to January 31, 2018.

Bell County Historical Earthquakes 1/1/1900 - 1/31/2018				
Location	**Magnitude**	**Depth**	**Date**	**Time**
0.18 km S of Middlesboro	4.1	0km	1/2/1954	03:25:00 (UTC)
9.3 km SW of Pineville	3	18km	8/28/1983	22:44:07 (UTC)
7.4 km E of Pineville	2.4	13.4km	7/31/2005	12:49:04 (UTC)
6.7 km W of Middlesboro	1.8	18.23km	4/8/2007	11:44:52 (UTC)
1.2 km E of Pineville	2.29	19.96km	5/2/2015	12:02:27 (UTC)
5.7 km S of Pineville	2	11.3km	12/15/2015	10:38:25 (UTC)
15.4 km W of Middlesboro	2.31	21.07km	11/2/2017	10:49:28 (UTC)



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Bell County was about 80 persons in 2010 (the latest data available in Census Quickfacts[1]). This small population size and commensurate low density of structures suggest that the impact of an earthquake would be at the lower end of the range estimated for a given earthquake magnitude. The US Geological Survey states[2]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…

“Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake in written history occurred in 1960 off the coast of Chile and had a magnitude of 9.5.

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

The Michigan Technological University’s Earthquake Magnitude Scale[3] puts a number to the potential for damage: All five Bell County earthquakes fall in the 2.5-5.4 magnitude on the Earthquake Magnitude Scale, which identifies the extent as “often felt, but only causes minor damage”. Since few earthquakes have occurred in Bell County, the occurrence of an earthquake of 5.5 or above in magnitude, where damage to structures typically begins, would be very rare.[4] There have been no recorded events at 5.5 or above on the Richter Scale and thus there are no recorded past damages and impacts from earthquakes for Bell County and its incorporated cities.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Bell County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Bell County is not on or near an ocean coastline.

Volcano: This is a point on the earth’s crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Bell County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Bell County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Bell County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Bell County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

BELL COUNTY HAZARD MITIGATION GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

Objective(s)

1.1 Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive areas.

Goal #2 *Protect Bell County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

Objective(s)

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Bell County's most vulnerable populations and structures.

2.2 Decrease the number of FEMA-identified "repetitive loss properties."

Goal #3 *Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

Objective(s)

3.1 Increase the level of knowledge and awareness for Bell County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

Hazards	Goal #1	Goal #2	Goal#3
Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Replace bridge on North Lane		✓			
Soil stabilization to repair slide on Ann Street	✓				
Replace wooden bridges in County.			✓		2 wooden bridges remain in County.
Implement warning siren system in Bell County				✓	Has not been implemented. Continue to seek funding sources.
Purchase weather radios for all residents.				✓	
Construct tornado safe rooms in outlying communities.				✓	Has not been implemented. Continue to seek funding.
Purchase generator for water plant & 4 portables to service pump stations.				✓	Has not been purchased. Continue to seek funding.
Purchase generator for road department.				✓	Has not been purchased. Continue to seek funding.
Purchase generator for Community Action Agency.				✓	Has not been purchased. Continue to seek funding.
Purchase generator for jail.				✓	Has not been purchased. Continue to seek funding.
City of Pineville					
Install Warning Siren System				✓	Has not been implemented. Continue to seek funding.
Construct tornado safe rooms.				✓	Has not been implemented. Continue to seek funding.
Purchase weather radios for residents.					

Purchase generator for City Hall.				✓	Has not been implemented. Continue to seek funding.
City of Middlesboro					
Install Warning Siren System				✓	Has not been implemented. Continue to seek funding.
Construct tornado safe rooms.				✓	Has not been implemented. Continue to seek funding.
Purchase weather radios for residents.					
Purchase generator for City Hall.				✓	Has not been purchased. Continue to seek funding.
Purchase generator for Street Department.				✓	Has not been purchased. Continue to seek funding.

Prioritization of Mitigation Projects

After completing the risk assessment, community members developed mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially thought after further study.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

BELL COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Purchase generators for critical facilities.	All	County and/or City		X			Short Term	1	5	1	KYEM & KOHS Grant	1
Culverts need to be cleaned of debris.	Flood	County and/or City		X			Continuous	1	5	1	County/City	4
Dorton Branch Road needs to be elevated.	Flood	KYTC	X				Long Term	1	1	1	PDM, FMA, HMGP grants	2
Drains and tiles throughout county needs to be repaired and or replaced with larger sizes.	Flood	County and/or City	X				Continuous	1	3	1	County	3
Purchase backup floodwall pump.	Flood	County and/or City		X			Long Term	1	1	1	KOHS, PDM, FMA, HMGP grants	1
Purchase a boat for rescues.	Flood	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Purchase 2 amphibious vehicles for rescues.	Flood	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Purchase a UTV for search and rescues.	All	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Road needs to be widen at Smithfield Factory at Hebrew Cemetery Road.	All	Smithfield & or City	X				Long Term	1	1	1	City and/or Grants	1
Restore Middlesboro canal/levee to original flood capacity.	Flood	U.S. Corps of Army Engineers	X				Long Term	1	1	1	Grants, City and/or County	1
Review equipment at fire departments, rescue squads, police departments, and EMS for ERIL. Purchase supplies that are needed.	All	City & County Fire Departments, EMS, Police Departments.		X			Continuous	3	5	3	Grants	5
Identify gaps with hazmat response at Smithfield Factory.	Chemical	Fire Departments, EMS, Smithfield		X			Continuous	1	5	1	Grants	1

Add communication towers and purchase necessary equipment such as radios to increase communication capabilities.	All	County and/or City	X				Long Term	1	1	1	County Budget and/or Grants	1
Purchase new emergency vehicles to better assist with rescue operations.	All	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Purchase wildfire equipment and turn out gear.	Wildfire	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Purchase a brush truck to better access remote areas.	Wildfire	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Highway 1534 near the Page Community is low lying and needs to be elevated for better access.	Flood	State and/or County	X				Long Term	1	1	1	KYTC, PDM, FMA, HMGP Grants	3
County needs decontamination equipment to better triage hazardous events.	Chemical	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Purchase leaf blowers for fire departments.	Wildfire	County and/or City		X			Short Term	1	5	1	KOHS grant	1
Brownies Creek water line system needs to be repaired and raised out of water.	Flood	Utility Commission and/or County	X				Long Term	1	1	1	Grants and/or State Budget	1
Around a 300ft section of 1344 Frog Pond Road needs to be elevated.	Flood	State and/or County	X				Long Term	1	1	1	KYTC and/or Grants	3
Old Bell High water main line busts 3 to 4 times a year. Line needs to be replaced.	Winter Storm	Utility Commission and/or County	X				Long Term	1	1	1	Grants and/or State Budget	1
Need to purchase 3 road sign message boards.	All	County, City, and/or Fire Dept.	X				Short Term	1	5	1	Grants	3
Wildfire training for emergency personnel.	Wildfire	County, City, and/or Fire Dept.				X	Short Term	1	5	1	Grants	3
Add traffic light signal at Bell County High School. Build right-a-way/merging lane to safely access onto the main road or build a bridge crossing over main road for safer access. Several casualties have occurred due to	All	County and/or KYTC	X				Long Term	1	1	1	KYTC	1

dangerous road configuration and lack of traffic signal.												
Replace wooden bridges within the County.	All	KYTC/County	X				Continuous	1	1	1	Grants, KYTC	1
When floodgates are closed access to hospital is restricted. Purchase property near flood wall/flood gate to create an access road for emergency personnel.	Flood	City	X				Long Term	1	5	1	PDM, FMA, HMGP grants	1
Railroad crossing at floodgate needs to be fixed with rubber stopper to prevent leaks under floodwall/gate.	Flood	CSX	X				Short Term	1	5	1	Grants	1
Purchase and install flood gauges for the Cumberland River to monitor water level and flow data.	Flood	County and/or City		X			Continuous	1	5	1	PDM, FMA, HMGP Grants	1
Purchase a 4-wheel drive ambulance.	Winter Storm	County and/or City		X			Short Term	1	5	1	Grants	1
Purchase and install tornado warning sirens for densely populated mobile homes areas and areas with limited cell service.	All Hazards	County and/or City	X				Long Term	1	1	1	Grants	1
Build safe rooms at vulnerable areas within the County.	Severe Storm & Tornado	County and/or City	X				Long Term	1	1	1	Grants	3
Interoperability between emergency responders.	All Hazards	Count & City Fire Dept., EMS, and Police.		X			Continuous	1	5	1	Grants	1
KY-92 needs to be elevated.	Flood	County/City & KYTC	X				Continuous	1	5	1	PDM, FMA, HMGP Grants	1
Acquire homes at Old Bell High & Dorton Branch Road due to severe repetitive loss.	Flood	County/City	X				Short Term	1	5	1	PDM, FMA, HMGP Grants	1

Clay County, KY:
Hazard Mitigation Overview

VI. CLAY COUNTY OVERVIEW

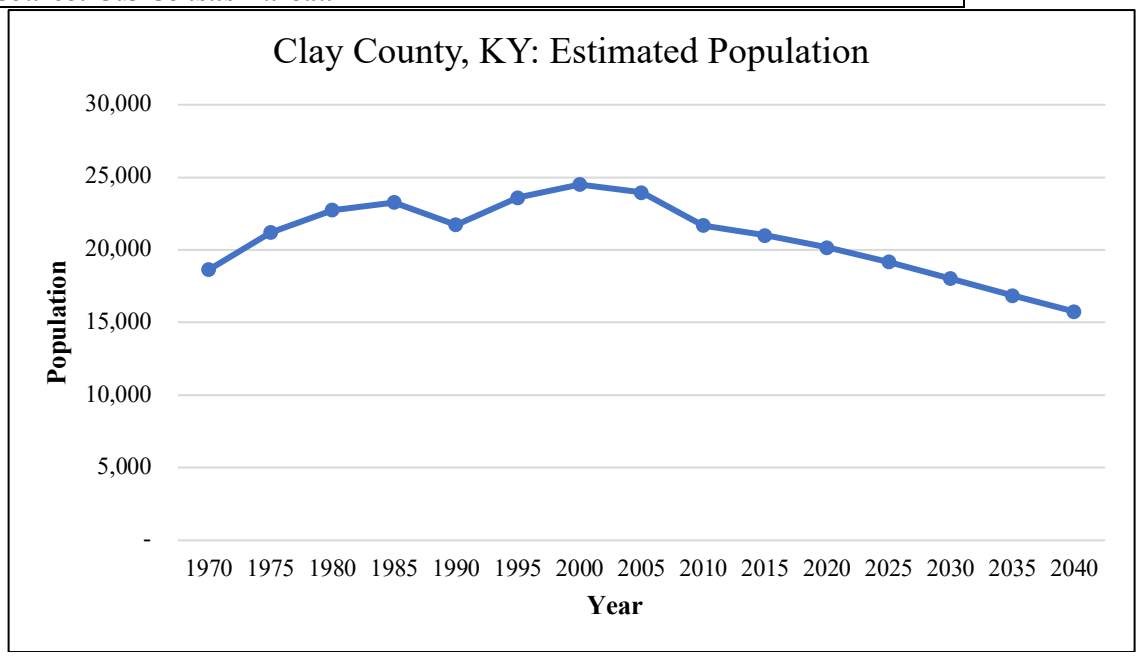
Clay County is located in the foothills of the Cumberland Mountains and is known as the Land of the Swinging Bridges. Its 469.25 squares miles are heavily wooded with 61,000 acres falling within the Redbird Purchase Unit of the Daniel Boone National Forest.

Clay County, KY: Quick Facts	
Total Population, July 1, 2019	19,901
Population per Square Miles, 2010	46.3
Land Area in Square Miles, 2010	469.25
Housing Units, July 1, 2016	8,866
Persons in Poverty, percent	42.1%
Median Value of Owner-Occupied Housing Units, 2012-2016	$54,500
Median Household Income, 2012-2016	$22,174
Total Employment, 2015	2,801
Total Employer Establishments, 2015	243
Source: U.S Census Bureau	

CLAY COUNTY POPULATION

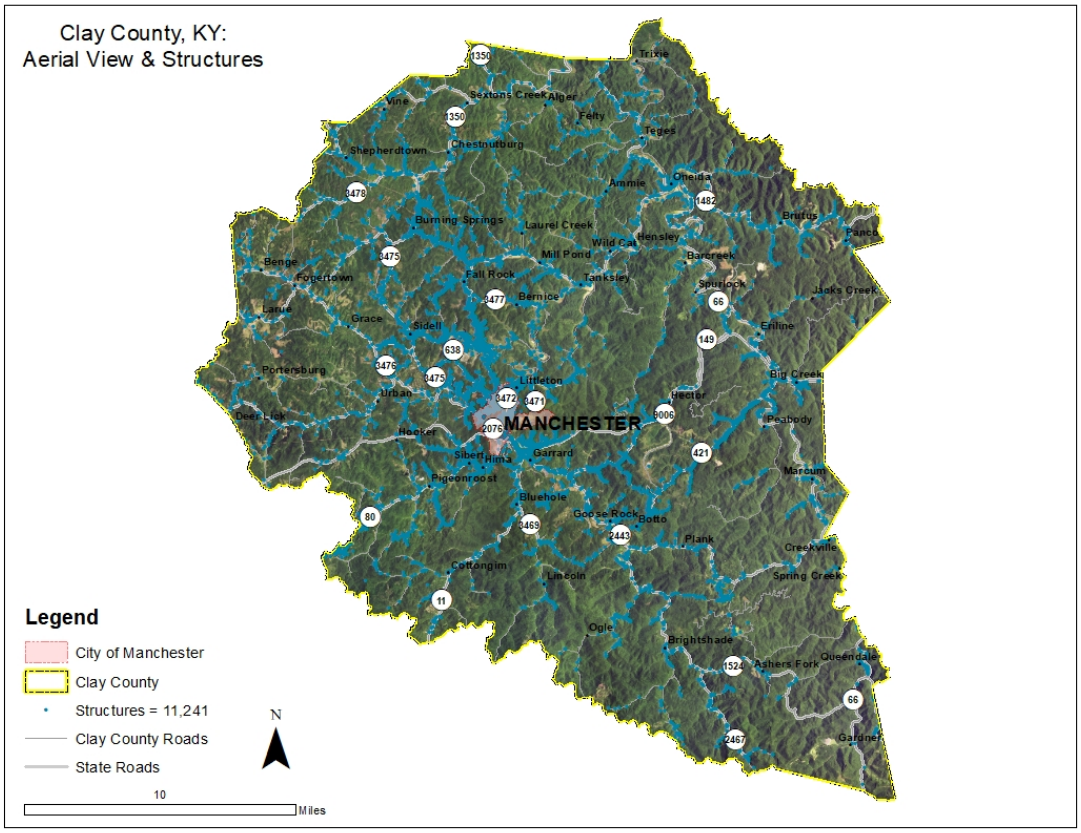
In 2019, Clay County had a total population of 20,368. The County's largest city is Manchester, which is also the County seat. It had a population of 1,391 in 2019. The county population has decreased by 8.4% between 2010 and 2019. The population of Clay County is predicted to continue to decline.

Population Estimates 2012-2019					
County- City	**2012**	**2016**	**2019**	**Change**	
Clay County	21,565	20,766	20,368	5.6% fewer	
City of Manchester	1,434	1,417	1,391	3% fewer	
Source: U.S Census Bureau					



Source: U.S. Census Bureau & KY State Data Center

According to the United States Census there were 8,866 housing units located in Clay County in 2016. The following map illustrates where the 11,241 residential & commercial structures are located based on CVADD ArcGIS database.



COMMUNITY CAPABILITIES

The Clay County Fiscal Court is comprised of a Judge Executive and 6 Magistrates. The City of Manchester is a Home Rule class city and is governed by a Mayor-Council government. Both the Fiscal Court and City Council have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation.

Clay County Plans & Programs									
	Emergency Operations Plan	Zoning Ordinances	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Clay County	✓		✓	✓	✓	✓	✓	N/A	
City of Manchester	✓	✓	✓	✓	✓	✓	✓	N/A	
Community of Fogertown									✓

Lockards Creek VFD, Hacker VFD, Horsecreek VFD and Burning Springs VFD have all participated in the KY Mitigation Grant program but have yet to earn Firewise/USA recognition.

EMERGENCY MANAGEMENT

To prepare for future natural hazards Clay County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is a list of the most prominent threats listed in the Clay County THIRA.

THIRA Hazard Ranking	
1	Snow Storm
2	Flooding
3	Wildfire

The Clay County Emergency Management also participates with a Local Emergency Planning Committee (LEPC) that meets quarterly and promotes emergency planning and preparedness. The LEPC includes members from various professions and is open to the public. For more information about Clay County's THIRA and LEPC meetings contact the Emergency Management Director.

CLAY COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. The following chart summarizes the natural hazards that have had a negative impact on the people and places of Clay County. These hazards were discussed and reviewed during the community meetings.

Rank	Natural Hazards
1	Severe Winter Weather
2	Flood
3	Wildfire
4	Severe Thunderstorms
5	Drought

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

SEVERE WINTER WEATHER

Clay County's terrain is hilly to mountainous with elevations generally increasing from north to south. Elevations in the county range from a low of 690 feet where the South Fork of the Kentucky River leaves the county, to 2,235 feet atop a mountain near the junction of Clay, Bell, and Knox Counties. The highest elevations are in the southern part of the county along or near the divide between the drainage basins of the Cumberland and Kentucky Rivers. Elevations are commonly more than 2,000 feet. Mountains and valleys occupying almost equal areas of the County. The mountainous terrain makes traveling during winter weather nearly impossible.

In order to address systematically the number of previous severe winter weather events, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan

document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below is a table relaying previous occurrences, locations, and impacts from severe winter weather for Clay County. The tables include what the National Weather Service (NWS) labels "Heavy Snow", "Ice Storm", "Winter Storm", and "Winter Weather" events. The below list of events should not be considered exhaustive, and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the severe winter weather event. Still, it is the best available data for a systematic illustration of severe winter weather events for CVADD counties.

Finally, it should also be noted that a portion of the severe winter weather events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for all counties as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 2-1: Clay County Severe Winter Storm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								1	0	17.40K	0.00K
1	CLAY (ZONE)	CLAY (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	CLAY (ZONE)	CLAY (ZONE)	KY	1/11/1996	20:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	CLAY (ZONE)	CLAY (ZONE)	KY	2/1/1996	16:00	EST	Heavy Snow		0	0	0.00K	0.00K
4	CLAY (ZONE)	CLAY (ZONE)	KY	3/20/1996	4:00	EST	Heavy Snow		0	0	0.00K	0.00K
5	CLAY (ZONE)	CLAY (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	CLAY (ZONE)	CLAY (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
7	CLAY (ZONE)	CLAY (ZONE)	KY	12/24/1999	9:00	EST	Heavy Snow		0	0	0.00K	0.00K
8	CLAY (ZONE)	CLAY (ZONE)	KY	1/17/2000	21:00	EST	Winter Storm		0	0	0.00K	0.00K
9	CLAY (ZONE)	CLAY (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
10	CLAY (ZONE)	CLAY (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
11	CLAY (ZONE)	CLAY (ZONE)	KY	1/6/2002	6:00	EST	Heavy Snow		0	0	0.00K	0.00K
12	CLAY (ZONE)	CLAY (ZONE)	KY	1/19/2002	6:30	EST	Winter Storm		0	0	0.00K	0.00K
13	CLAY (ZONE)	CLAY (ZONE)	KY	12/4/2002	14:30	EST	Heavy Snow		0	0	3.70K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	12/4/2002	14:30	EST	Heavy Snow		0	0	3.70K	0.00K
14	CLAY (ZONE)	CLAY (ZONE)	KY	1/16/2003	17:55	EST	Heavy Snow		0	0	0.00K	0.00K
15	CLAY (ZONE)	CLAY (ZONE)	KY	1/25/2004	11:00	EST	Ice Storm		0	0	0.00K	0.00K
16	CLAY (ZONE)	CLAY (ZONE)	KY	1/27/2009	3:00	EST-5	Ice Storm		0	0	0.00K	0.00K
17	CLAY (ZONE)	CLAY (ZONE)	KY	2/4/2009	4:54	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
18	CLAY (ZONE)	CLAY (ZONE)	KY	12/5/2009	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
19	CLAY (ZONE)	CLAY (ZONE)	KY	12/18/2009	14:30	EST-5	Winter Weather		0	0	0.00K	0.00K
20	CLAY (ZONE)	CLAY (ZONE)	KY	1/29/2010	16:20	EST-5	Heavy Snow		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	1/29/2010	16:20	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	1/29/2010	16:20	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	1/29/2010	16:20	EST-5	Winter Weather		0	0	0.00K	0.00K
21	CLAY (ZONE)	CLAY (ZONE)	KY	2/9/2010	21:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	2/9/2010	21:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
22	CLAY (ZONE)	CLAY (ZONE)	KY	2/15/2010	5:15	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	2/15/2010	5:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	2/15/2010	5:30	EST-5	Winter Weather		0	0	0.00K	0.00K
23	CLAY (ZONE)	CLAY (ZONE)	KY	12/15/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
24	CLAY (ZONE)	CLAY (ZONE)	KY	12/24/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
25	CLAY (ZONE)	CLAY (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
26	CLAY (ZONE)	CLAY (ZONE)	KY	2/9/2011	14:00	EST-5	Winter Weather		0	0	0.00K	0.00K
27	CLAY (ZONE)	CLAY (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
28	CLAY (ZONE)	CLAY (ZONE)	KY	1/2/2012	21:00	EST-5	Winter Weather		0	0	0.00K	0.00K
29	CLAY (ZONE)	CLAY (ZONE)	KY	1/14/2012	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K
30	CLAY (ZONE)	CLAY (ZONE)	KY	2/10/2012	18:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	2/11/2012	11:00	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
31	CLAY (ZONE)	CLAY (ZONE)	KY	2/19/2012	10:15	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	10.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
32	CLAY (ZONE)	CLAY (ZONE)	KY	1/25/2013	6:30	EST-5	Winter Storm		0	0	0.00K	0.00K
33	CLAY (ZONE)	CLAY (ZONE)	KY	1/2/2014	5:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	1/2/2014	8:00	EST-5	Winter Weather		0	0	0.00K	0.00K
34	CLAY (ZONE)	CLAY (ZONE)	KY	1/21/2014	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
35	CLAY (ZONE)	CLAY (ZONE)	KY	2/12/2014	17:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
36	CLAY (ZONE)	CLAY (ZONE)	KY	3/2/2014	23:00	EST-5	Winter Storm		0	0	0.00K	0.00K
37	CLAY (ZONE)	CLAY (ZONE)	KY	2/16/2015	6:30	EST-5	Winter Storm		1	0	0.00K	0.00K
38	CLAY (ZONE)	CLAY (ZONE)	KY	2/20/2015	23:00	EST-5	Winter Storm		0	0	0.00K	0.00K
39	CLAY (ZONE)	CLAY (ZONE)	KY	3/5/2015	1:30	EST-5	Winter Storm		0	0	0.00K	0.00K
40	CLAY (ZONE)	CLAY (ZONE)	KY	1/22/2016	2:00	EST-5	Winter Storm		0	0	0.00K	0.00K
41	CLAY (ZONE)	CLAY (ZONE)	KY	2/14/2016	16:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
42	CLAY (ZONE)	CLAY (ZONE)	KY	1/16/2018	6:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
43	CLAY (ZONE)	CLAY (ZONE)	KY	12/8/2018	23:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
44	CLAY (ZONE)	CLAY (ZONE)	KY	12/24/2020	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	Totals: 44								1	0	17.40K	0.00K

Clay County Severe Winter Weather - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than

one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Clay County experienced 44 severe winter weather events over 25 years yields that Clay County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every seven months (i.e., 44/300). Specifically, Clay County experienced an average of 1.76 severe winter weather events each year. Or, using December 31, 2020 as an endpoint, this is 0.1467 events per month. $1/0.1467 = 6.82 \approx 1$ severe winter storm event an average of every 7 months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through October. This indicates that the winter months for Clay County are November through March, a total of 5 months. When the frequency is calculated using the five winter months only (44/125), it reveals that Clay County experienced an average of 1.76 events per winter period, or 0.352 events per winter month. 1/0.352 = or about 1 severe winter storm event an average of every 3 winter months.

Clay County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Storm total snowfall accumulations around Clay County varied from 6 to 13 inches. The highest amount was recorded in Hensley, where 13 inches ended up accumulating. Manchester picked up 10 inches of snow by storms end. Up to 2/10 inch of freezing rain also fell prior to the complete changeover to snow."[65]

[65] "Storm Events Database Event Details – Clay County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Clay County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	CLAY (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	CLAY (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	CLAY (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	CLAY (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	CLAY (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
6	CLAY (ZONE)	12/23/1998	12/24/1998	Winter Storm	
7	CLAY (ZONE)	12/24/1999	12/24/1999	Heavy Snow	
8	CLAY (ZONE)	1/17/2000	1/18/2000	Winter Storm	Heavy snow fell across a large portion of Eastern Kentucky. Totals ranged from 2 to 5 inches. In addition to these snowfall amounts...freezing rain and sleet were also reported which produced a crust of ice on top of the snow.
9	CLAY (ZONE)	1/22/2000	1/22/2000	Winter Storm	
10	CLAY (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
11	CLAY (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
12	CLAY (ZONE)	1/19/2002	1/19/2002	Winter Storm	
13	CLAY (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported. Power lines were down.
	CLAY (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported. Power lines were down.
14	CLAY (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 7 inches of snow were reported.
15	CLAY (ZONE)	1/25/2004	1/25/2004	Ice Storm	
16	CLAY (ZONE)	1/27/2009	1/27/2009	Ice Storm	Clay county dispatch in Manchester estimated that one quarter of an inch of ice from freezing rain had accumulated in their parking lot.
17	CLAY (ZONE)	2/4/2009	2/4/2009	Winter Weather	One inch of snow accumulated in Manchester. Three to four inches of snow had accumulated on the surrounding ridgetops.
18	CLAY (ZONE)	12/5/2009	12/5/2009	Winter Weather	One and a third inches of snow fell in Bush.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
19	CLAY (ZONE)	12/18/2009	12/18/2009	Winter Weather	An inch of snow fell in Manchester.
20	CLAY (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Clay county dispatch reports that field units estimate 6 inches of snowfall countywide.
	CLAY (ZONE)	1/29/2010	1/30/2010	Winter Weather	The Clay county dispatch and Highway Dept reported around 2 inches of snow accumulation countywide.
	CLAY (ZONE)	1/29/2010	1/30/2010	Winter Weather	One and a half inches of snow had fallen in Bush and it was still snowing heavily.
	CLAY (ZONE)	1/29/2010	1/30/2010	Winter Weather	Eight tenths of an inch of snow had fallen in Bush.
21	CLAY (ZONE)	2/9/2010	2/10/2010	Winter Weather	Three inches of snow fell in Manchester.
	CLAY (ZONE)	2/9/2010	2/10/2010	Heavy Snow	Three to four inches of snow fell in Oneida since late on February 9th.
22	CLAY (ZONE)	2/15/2010	2/15/2010	Winter Weather	Law enforcement in Manchester reported that about 1 inch of new had fallen mostly between 730 and 830 am. The snow began falling between 5 and 530 am and it was still snow lightly when this report was phoned in.
	CLAY (ZONE)	2/15/2010	2/16/2010	Winter Weather	The 24 hour snowfall total since early Monday morning was 1 inch. A total of 2 inches of snow fell since around dawn on Monday.
	CLAY (ZONE)	2/15/2010	2/16/2010	Winter Weather	One inch of snow fell in Manchester.
23	CLAY (ZONE)	12/15/2010	12/16/2010	Winter Weather	A quarter of an inch of ice accumulated in Manchester.
24	CLAY (ZONE)	12/24/2010	12/26/2010	Winter Weather	KG4SXT reported that 5 inches of snow was on the ground in Manchester.
25	CLAY (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estimated that an inch of snow had fallen in Manchester. Secondary roads were becoming slick.
26	CLAY (ZONE)	2/9/2011	2/9/2011	Winter Weather	Two and three tenths of an inch of snow fell in Bush.
27	CLAY (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 3 inches.
28	CLAY (ZONE)	1/2/2012	1/2/2012	Winter Weather	A driver on the Hal Rogers Parkway reported that east of Manchester, he encountered a heavy snow squall that reduced visibility to less than a quarter of a mile and that there was 1-2 inches of snow on the road. The roads were slick and hazardous, causing some drivers to lose control of their cars.
29	CLAY (ZONE)	1/14/2012	1/15/2012	Winter Weather	An inch of snow fell in Oneida.
30	CLAY (ZONE)	2/10/2012	2/11/2012	Winter Weather	An inch and a half of snow fell in Manchester between 7pm on the 10th and 8am on the 11th.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
	CLAY (ZONE)	2/11/2012	2/12/2012	Winter Weather	An inch and a half of snow fell in Manchester.
31	CLAY (ZONE)	2/19/2012	2/19/2012	Winter Weather	Three inches of snow fell 5 miles northwest of Manchester. The main and secondary roads in the area were slick and hazardous.
	CLAY (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Five inches of heavy wet snow had fallen in Manchester.
	CLAY (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Five and half inches of heavy wet snow had fallen in Big Creek. The snow brought down trees which in turn were blocking area roadways.
32	CLAY (ZONE)	1/25/2013	1/25/2013	Winter Storm	A mix of sleet and freezing rain fell across the county. Up to 1/2 of sleet was reported with up to 4/10 of freezing rain observed around Manchester.
33	CLAY (ZONE)	1/2/2014	1/2/2014	Winter Weather	Police were working several crashes along the Hal Rogers Parkway near Manchester. The roads were slick due to freezing rain.
	CLAY (ZONE)	1/2/2014	1/2/2014	Winter Weather	The Manchester Fire Dept. reported an accident involving an ambulance and a salt truck on the Hal Rogers Parkway near Manchester. The accident was the result of slick roads caused by freezing rain.
34	CLAY (ZONE)	1/21/2014	1/21/2014	Winter Weather	Up to four inches of snow was observed near Big Creek over a 15 hour period, but lesser amounts fell to the west.
35	CLAY (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Based on reports from surrounding areas, snowfall amounts of up to six inches occurred over the eastern and southern parts of the county.
36	CLAY (ZONE)	3/2/2014	3/3/2014	Winter Storm	Snow and sleet ranged from one-half inch in the southern part of the county, with up to one-quarter inch of freezing rain, to around five inches in the northwest part of the county.
37	CLAY (ZONE)	2/16/2015	2/16/2015	Winter Storm	A member of the public reported that 2.5 inches of snow had fallen in Oneida as of 930 am on the 16th. By 1122 am, Burning Springs had picked up 4 inches of snow in about five hours. Five inches of snow was reported in Oneida as of noon on this day. By storms end, the entire county had received 5 to 10 inches of snow. The highest observed snow fall amounts were out of Manchester and Oneida where 9 and 10 inches fell respectively. A woman died of hypothermia after becoming lost in the woods in the Wagon Fork Road area just prior to the snowfall beginning.
38	CLAY (ZONE)	2/20/2015	2/21/2015	Winter Storm	Quarter inch ice accumulations occurred throughout the county.
39	CLAY (ZONE)	3/5/2015	3/5/2015	Winter Storm	Around four inches of sleet and snow fell across the county.
40	CLAY (ZONE)	1/22/2016	1/23/2016	Winter Storm	Storm total snowfall accumulations around Clay county varied from 6 to 13 inches. The highest amount was recorded in Hensley, where 13 inches ended up accumulating. Manchester picked up 10 inches of snow by storms end. Up to 2/10 inch of freezing rain also fell prior to the complete changeover to snow.
41	CLAY (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 4 to 6 inches across the county.
42	CLAY (ZONE)	1/16/2018	1/16/2018	Heavy Snow	

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
43	CLAY (ZONE)	12/8/2018	12/9/2018	Heavy Snow	
44	CLAY (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Reports of between 5 and 7 inches of snow fell across the county. The Co-op observer in Oneida reported a 5.8 inch storm total at 10:20 am EST on 12/25.
45	CLAY (ZONE)	2/1/2021	2/2/2021	Winter Weather	A volunteer weather observer reported that 2 inches of snow had fallen in Oneida.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
46	CLAY (ZONE)	2/14/2021	2/16/2021	Ice Storm	One quarter of an inch of ice accumulation due to freezing occurring around much of Clay County.
	CLAY (ZONE)	2/14/2021	2/16/2021	Ice Storm	One quarter of an inch of ice accumulation due to freezing rain occurred in and around Oneida.
47	CLAY (ZONE)	2/17/2021	2/18/2021	Heavy Snow	A little over 4 inches of snow was reported near Manchester.
	CLAY (ZONE)	2/17/2021	2/18/2021	Winter Weather	A storm total snowfall amount of 2.3 inches was reported in Oneida.

PAST WINTER WEATHER EVENTS

After snow fell in Clay County in January 2014, the freezing temps and hilly terrain continued to create problems across the County. After five days of no snow, roads remained slick and dangerous. The cold temperatures prevented the roads from thawing. Clay County Schools missed 15 days of school.

The freezing temperatures created problems again in January 2018 for around 1,000 people. The cold temperatures caused multiple pipes to burst, leaving people without water for a week. Several water storage tanks reached critically low levels due to the water line breaks and people leaving their faucets on to prevent their pipes from freezing. Due to the lack of water, people were given donated bottled water to use until the water lines were restored. Some people went to nearby streams to get buckets of water to supply their home with needed water.

Severe winter weather threatens utilities, critical facilities, and vulnerable populations. Reviewing past severe winter storms can reveal vulnerabilities within the county and city, enabling emergency management to better plan and prepare for future events.

CLAY COUNTY FLOODING

Clay County has three main rivers: Goose Creek, Redbird, and South Fork. The Goose Creek River starts a few miles south of Manchester and runs through downtown Manchester. It runs into Oneida where it meets the Redbird River. The Redbird River runs through the heart of the Redbird Ranger District. These two rivers converge to form the South Fork of the Kentucky River. The South Fork runs through Clay County for 20 plus miles before entering Owsley County. There are also several creeks and streams that run throughout the County. These can cause issues for those who live near them.

Throughout the County, there are several low water bridges in need of repair and/or replacement as well as low-lying roads that are frequently flooded. Clay County is known as the Land of the Swinging Bridges as there are a dozen or more swinging bridges that cross the rivers and creeks. During floods, these swinging bridges have been used to cross the waterways and to rescue people.

Below are tables relaying previous occurrences, locations, and impacts from flooding for Clay County, Kentucky and for its incorporated city. The tables include what the National Weather Service (NWS) labels “Flood” and “Flash Flood” events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Clay County and for its unincorporated and incorporated cities.

The only incorporated city in Clay County is the City of Manchester. In order to capture “Flood” and “Flash Flood” events specific to the incorporated city, the below table include all “Flood” and “Flash Flood” events having searched the entire date range of available data within the NCEI “Storm Events Database,” i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of “probability”), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Clay County and Manchester, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to

illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines "probability" in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the "Flood" and "Flash Flood" events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for Clay County as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience: "PrD" is "Property Damage Estimated Amount"; "CrD" is "Crop Damage Estimated Amount"; "Dth" is "Deaths Reported"; and "Inj" is "Injuries Reported".

Table 2-2: Clay County Flooding Events, 1996-2020

No.	Location	County/ Zone	State	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:											
1	QUEENDALE	CLAY CO.	KY	11/30/96	23:00	EST	Flash Flood		0	0	10.00K	0.00K
2	COUNTYWIDE	CLAY CO.	KY	04/16/98	20:45	EST	Flash Flood		0	0	200.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	04/17/98	2:45	EST	Flood		0	0	1.70K	20.00K
	COUNTYWIDE	CLAY CO.	KY	04/18/98	22:00	EST	Flash Flood		0	0	50.00K	0.00K
3	CENTRAL PORTION	CLAY CO.	KY	01/09/99	7:00	EST	Flash Flood		0	0	0.00K	0.00K
4	EAST PORTION	CLAY CO.	KY	08/12/01	22:30	EST	Flash Flood		0	0	50.00K	0.00K
5	GARRARD	CLAY CO.	KY	01/24/02	20:00	EST	Flash Flood		0	0	0.00K	0.00K
6	CLAY (ZONE)	CLAY (ZONE)	KY	02/16/03	15:39	EST	Flood		0	0	100.00K	0.00K
7	COUNTYWIDE	CLAY CO.	KY	06/15/03	18:30	EST	Flash Flood		0	0	0.00K	0.00K
8	SIDELL	CLAY CO.	KY	08/30/03	17:50	EST	Flash Flood		0	0	0.00K	0.00K
9	COUNTYWIDE	CLAY CO.	KY	09/01/03	0:50	EST	Flash Flood		0	0	0.00K	0.00K
10	DEER LICK	CLAY CO.	KY	09/04/03	4:00	EST	Flash Flood		0	0	20.00K	0.00K
11	CLAY (ZONE)	CLAY (ZONE)	KY	02/05/04	23:54	EST	Flood		0	0	0.00K	0.00K
12	CLAY (ZONE)	CLAY (ZONE)	KY	03/06/04	8:00	EST	Flood		0	0	0.00K	0.00K
13	LAUREL CREEK	CLAY CO.	KY	05/27/04	2:00	EST	Flash Flood		0	0	0.00K	0.00K
14	CLAY (ZONE)	CLAY (ZONE)	KY	05/31/04	9:45	EST	Flood		0	0	0.00K	0.00K
15	CLAY (ZONE)	CLAY (ZONE)	KY	09/17/04	9:00	EST	Flood		0	0	0.00K	0.00K
	CLAY (ZONE)	CLAY (ZONE)	KY	09/17/04	9:00	EST	Flood		0	0	0.00K	0.00K
16	BURNING SPGS	CLAY CO.	KY	11/04/04	7:05	EST	Flash Flood		0	0	0.00K	0.00K
	BURNING SPGS	CLAY CO.	KY	11/04/04	7:32	EST	Flash Flood		0	0	0.00K	0.00K

No.	Location	County/ Zone	State	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
17	BURNING SPGS	CLAY CO.	KY	05/04/09	0:35	EST	Flash Flood		0	0	0.00K	0.00K
18	URBAN	CLAY CO.	KY	06/11/09	14:00	EST	Flash Flood		0	0	0.00K	0.00K
19	COTTONGIM	CLAY CO.	KY	01/24/10	13:00	EST	Flood		0	0	0.00K	0.00K
	HORSE CREEK	CLAY CO.	KY	01/24/10	13:00	EST	Flood		0	0	0.00K	0.00K
20	GARRARD	CLAY CO.	KY	11/30/10	15:15	EST	Flash Flood		0	0	1.00K	1.00K
21	PIGEON-ROOST	CLAY CO.	KY	09/18/12	0:35	EST	Flood		0	0	0.00K	0.00K
22	GOOSEROCK	CLAY CO.	KY	04/17/13	8:35	EST	Flash Flood		0	0	1.00K	0.00K
23	FALL ROCK	CLAY CO.	KY	06/28/14	19:00	EST	Flash Flood		0	0	1.00K	0.00K
	SIDELL	CLAY CO.	KY	06/29/14	14:00	EST	Flash Flood		0	0	1.00K	0.00K
24	PIGEON-ROOST	CLAY CO.	KY	03/04/15	18:00	EST	Flood		0	0	1.00K	0.00K
25	PIGEON-ROOST	CLAY CO.	KY	07/14/15	23:10	EST	Flood		0	0	1.00K	0.00K
26	HECTOR	CLAY CO.	KY	12/25/15	13:30	EST	Flood		0	0	1.00K	0.00K
27	BOTTO	CLAY CO.	KY	07/08/16	19:10	EST	Flash Flood		0	0	20.00K	0.00K
28	HERRON	CLAY CO.	KY	08/04/16	16:21	EST	Flash Flood		0	0	0.50K	0.00K
	SIDELL	CLAY CO.	KY	08/04/16	22:00	EST	Flood		0	0	0.01K	0.00K
29	HORSE CREEK	CLAY CO.	KY	02/20/19	12:45	EST	Flood		0	0	0.00K	0.00K
30	RODONNEL	CLAY CO.	KY	02/23/19	21:50	EST	Flood		0	0	20.00K	0.00K
31	HORSE CREEK	CLAY CO.	KY	06/17/19	2:58	EST	Flood		0	0	0.10K	0.00K
	BURNING SPGS	CLAY CO.	KY	06/17/19	15:30	EST	Flash Flood		0	0	75.00K	0.00K
32	ONEIDA	CLAY CO.	KY	02/06/20	13:30	EST	Flood		0	0	120.00K	0.00K
33	HIMA	CLAY CO.	KY	05/05/20	8:40	EST	Flash Flood		0	0	0.10K	0.00K
	PIGEON-ROOST	CLAY CO.	KY	05/05/20	8:40	EST	Flash Flood		0	0	0.10K	0.00K

	Location	County/ Zone	State	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	PIGEON-ROOST	CLAY CO.	KY	05/05/20	8:40	EST	Flash Flood		0	0	0.20K	0.00K
	Totals:								0	0	674.7K	21.0K

Clay County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate what is assumed to be clusters of discrete events that comprise, in actuality, one event for the purpose of defining a denominator for illustrating frequency. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

That Clay County, unincorporated (and its unincorporated communities) independently experienced 33 flooding events over 25 years yields that Clay County, unincorporated and its unincorporated cities, experienced (and thus can expect to experience in the future) an average frequency of one flooding event every nine months (i.e. 33/25). Specifically, Clay County, unincorporated and its unincorporated communities, experienced an average of 1.32 flooding events each year. Or, using December 31, 2020, as an endpoint, 33/300 months is 0.11 events per month. 1/0.11 = 9.0909 or about one flooding event an average of every nine (9) months.

Table 2-3: City of Manchester Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	MANCHESTER	CLAY CO.	KY	03/18/2002	03:00	EST	Flash Flood		0	0	10.00K	0.00K
2	MANCHESTER	CLAY CO.	KY	05/02/2002	12:45	EST	Flash Flood		0	0	0.00K	0.00K
3	MANCHESTER	CLAY CO.	KY	06/14/2003	12:00	EST	Flash Flood		0	0	5.00K	0.00K
	MANCHESTER	CLAY CO.	KY	06/15/2003	17:50	EST	Flash Flood		0	0	0.00K	0.00K
4	MANCHESTER	CLAY CO.	KY	06/18/2003	18:00	EST	Flash Flood		0	0	0.00K	0.00K
5	MANCHESTER	CLAY CO.	KY	07/10/2003	16:38	EST	Flash Flood		0	0	0.00K	0.00K
6	MANCHESTER	CLAY CO.	KY	08/30/2003	17:00	EST	Flash Flood		0	0	0.00K	0.00K
7	MANCHESTER	CLAY CO.	KY	05/31/2004	01:29	EST	Flash Flood		0	0	0.00K	0.00K
8	MANCHESTER	CLAY CO.	KY	07/10/2004	22:30	EST	Flash Flood		0	1	5.00K	0.00K
9	MANCHESTER	CLAY CO.	KY	05/19/2005	22:38	EST	Flash Flood		0	0	0.00K	0.00K
	Totals:								0	1	20.0K	0.00K

City of Manchester Flooding - Probability as Frequency of Event Occurrence

This assessment assumes that the two (2) discrete events occurring on June 14 and 15, 2003, actually are one (1) event: From 12 noon on June 14 through 5:50 p.m. on June 15, there was flash flooding that ultimately resulted in a broadly estimated $5,000 in property damage.

That the City of Manchester independently experienced nine (9) flooding (all "Flash Flood") events over 25 years yields that the City of Manchester experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every three (3) and a half years (i.e. 9/25).

PAST FLOOD EVENTS

In April 2013, several inches of rain fell across the county in a short period of time causing flash flooding. Horse Creek, which was one of the many creeks to top its bank, flooded KY-80, forcing residents to use alternate routes. This area typically floods one to two times a year. Residents in the Bright Shade community were stranded due to high water.

In February 2015, Lockards Creek Fire Department, Manchester Fire Department, and the Sheriff's Department rescued three people stranded on the roof of a truck. The truck had been crossing the bridge at Chop Bottom when it was swept away due to flooding.

Severe flooding is especially prevalent in the unincorporated community of Oneida in northeast Clay County (see photo below). The small community sits in a low area at the confluence of two rivers which meet to form a third. Below is a photo of Oneida Baptist Church on March 1, 2021; the London Sentinel-Echo noted that "(t)he London-Laurel Rescue Squad and Manchester Clay County Search & Rescue conducted joint operations in Oneida, Kentucky on Monday. Crews used boats to make contact with residents trapped in the homes. All of River Street was underwater Monday."[66]

[66] Retrieved on 2-8-2022 from London-Laurel Rescue Squad helps with flood rescue efforts in Clay County | Local News | sentinel-echo.com.

In southeastern Clay County, Red Bird Mission reported problems with flooding in this recent undated blog post along with a photo showing the flooding:

"Severe winter weather including snow, ice, and flooding have created significant problems providing direct services to clients in need in southeastern Kentucky. Home delivered meals, home care services, congregate Senior Center services, and K-12 school and early childhood development services have all been impacted.

Also, decreased government funding eliminated regional emergency meals for older adults this year. These meals have been essential for home bound seniors when home delivered meal programs cannot safely get to them several days in a row because of hazardous road conditions."[67]

[67] Retrieved on 2-8-2022 from Severe Winter Weather In The Red Bird Area – Red Bird Mission (rbmission.org).

Many of Clay County's roads consist of narrow paved lanes, often barely two lanes in width, running along waterways. This is often due to the fact that the waterways were the first means of transportation in Kentucky when it was first settled by Europeans, and roads were developed along wildlife trails. This results in residents often being cut off from major roadways during flooding such as that pictured.

The only incorporated city in Clay County, also the county seat, Manchester is likewise prone to flooding as it lies on the banks of the South Fork Kentucky River. "The South Fork Kentucky River is approximately 45 miles (72 km) long. It is formed in Clay County, at the town of Oneida in the Daniel Boone National Forest, approximately 10 miles (16 km) northeast of Manchester, by the confluence of Goose Creek and the Red Bird River. Bullskin Creek enters just downstream. The South Fork flows generally north in a highly meandering course through the mountainous Cumberland Plateau region…"[68]

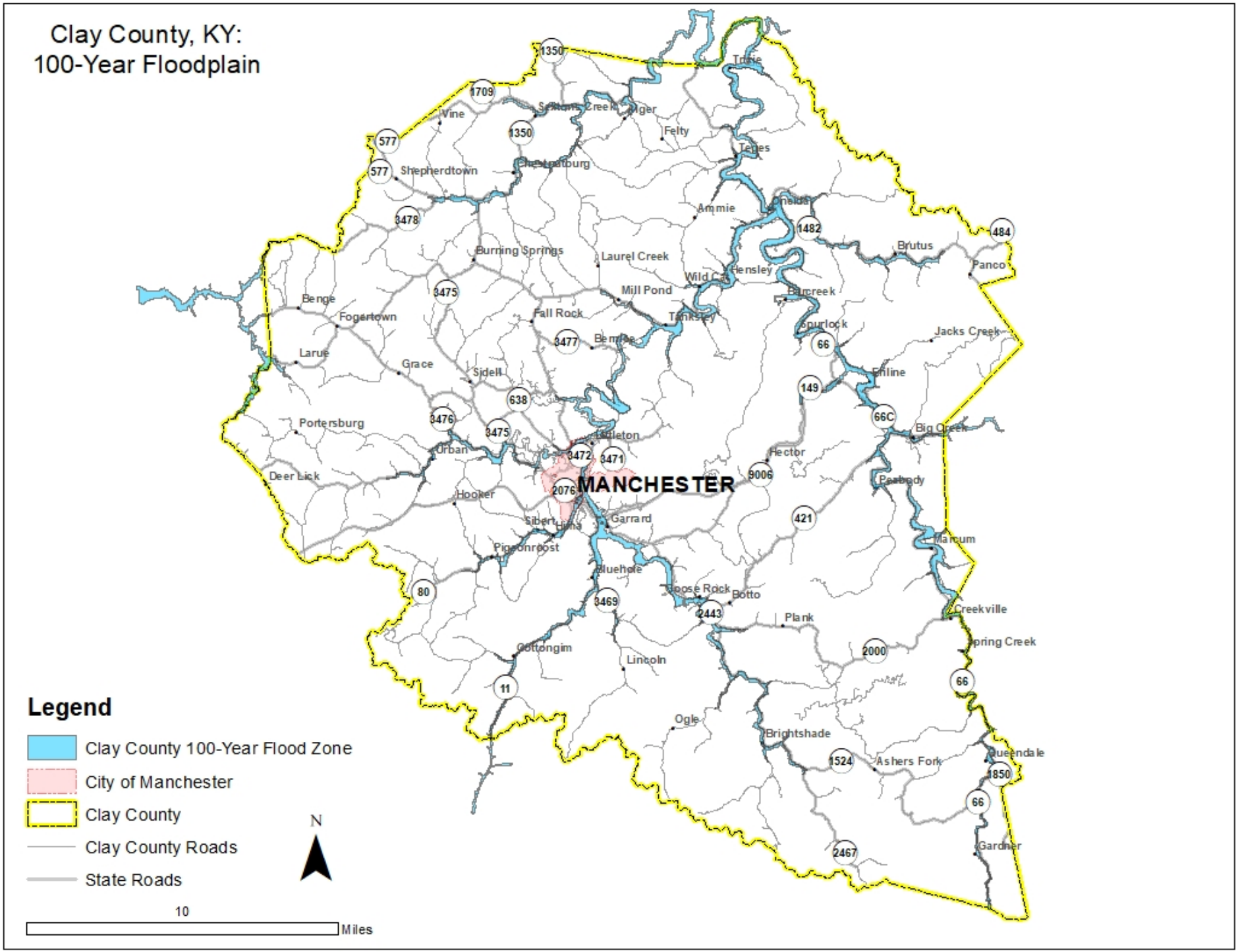
While much of downtown Manchester is on higher ground, some streets are prone to flooding as in the photo below, taken by resident Ken Bolin in 2019.[69]

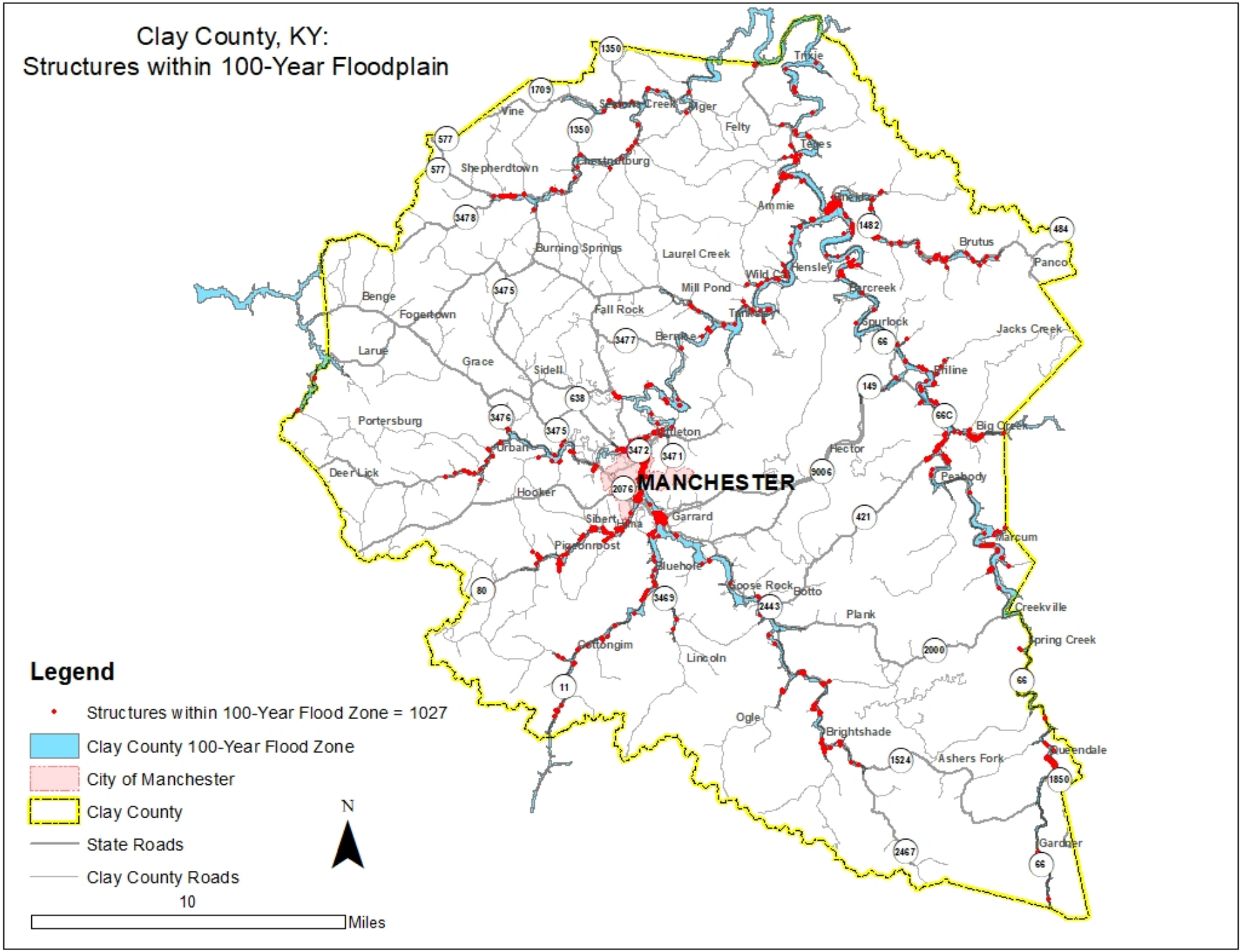
[68] Kentucky River. Wikipedia. Retrieved on 2-8-2022 from Kentucky River - Wikipedia.
[69] "Heavy rains lead to flooding in Clay County". WYMT, Hazard. Retrieved on 2-8-2022 from Photos: Heavy rain leads to flooding in Clay County (wymt.com).

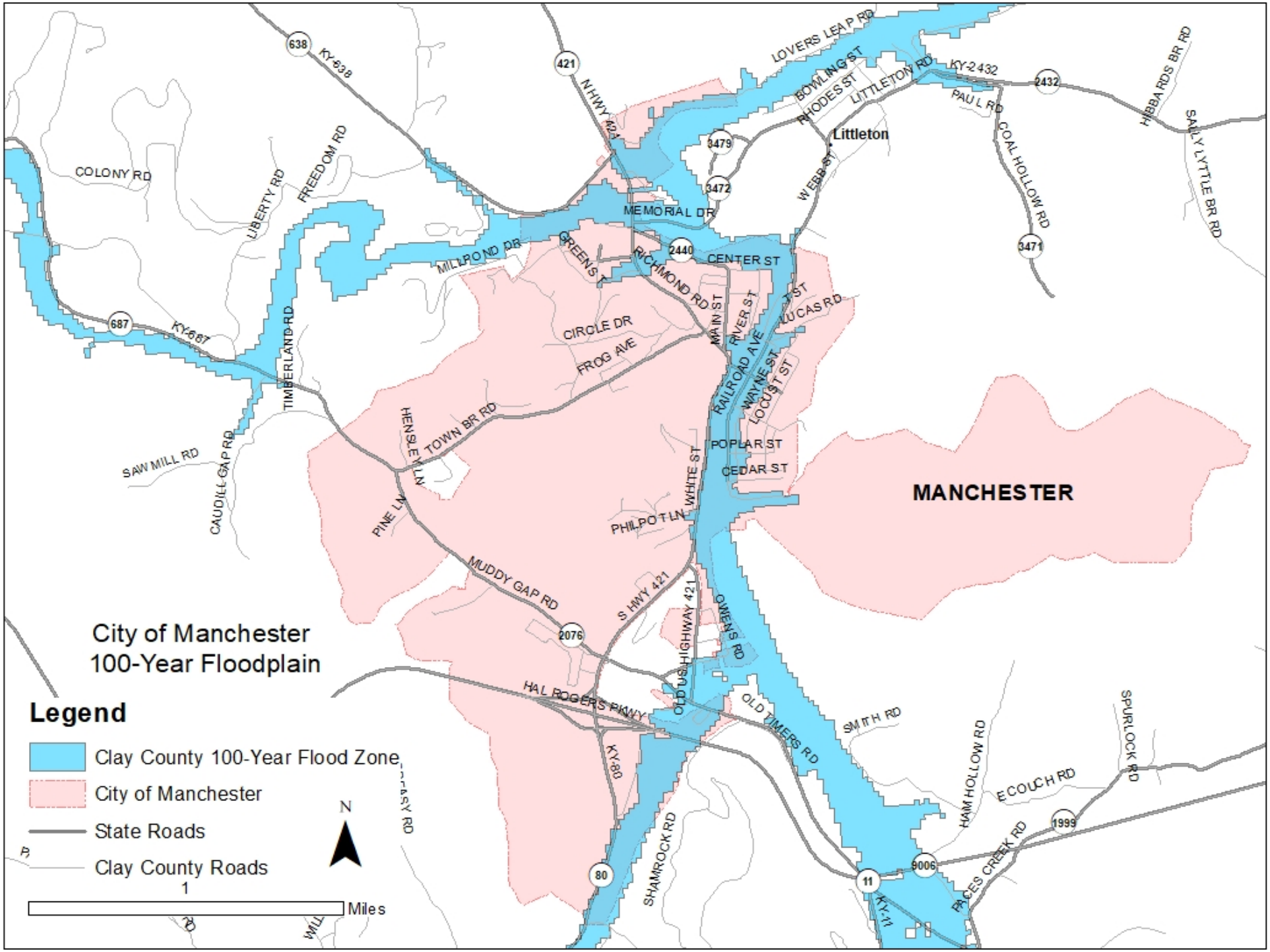
The Clay County High School's baseball field, as well as the field where Little League games are played and area youths come to play pick-up baseball or basketball, is often flooded as it is in a low-lying area beside the South Fork in downtown Manchester. Below is a photo of the aftermath of a recent March 2021 flood, which the school superintendent said could be a "total loss" of the ballfield and buildings. CCHS softball coach Jason Rice said, ""When I came down this morning it was just heartbreaking," said Rice. "To see the devastation at the ballpark was unreal. Fences gone, buildings moved, and that's just what we could see from the parking lot.""[70]

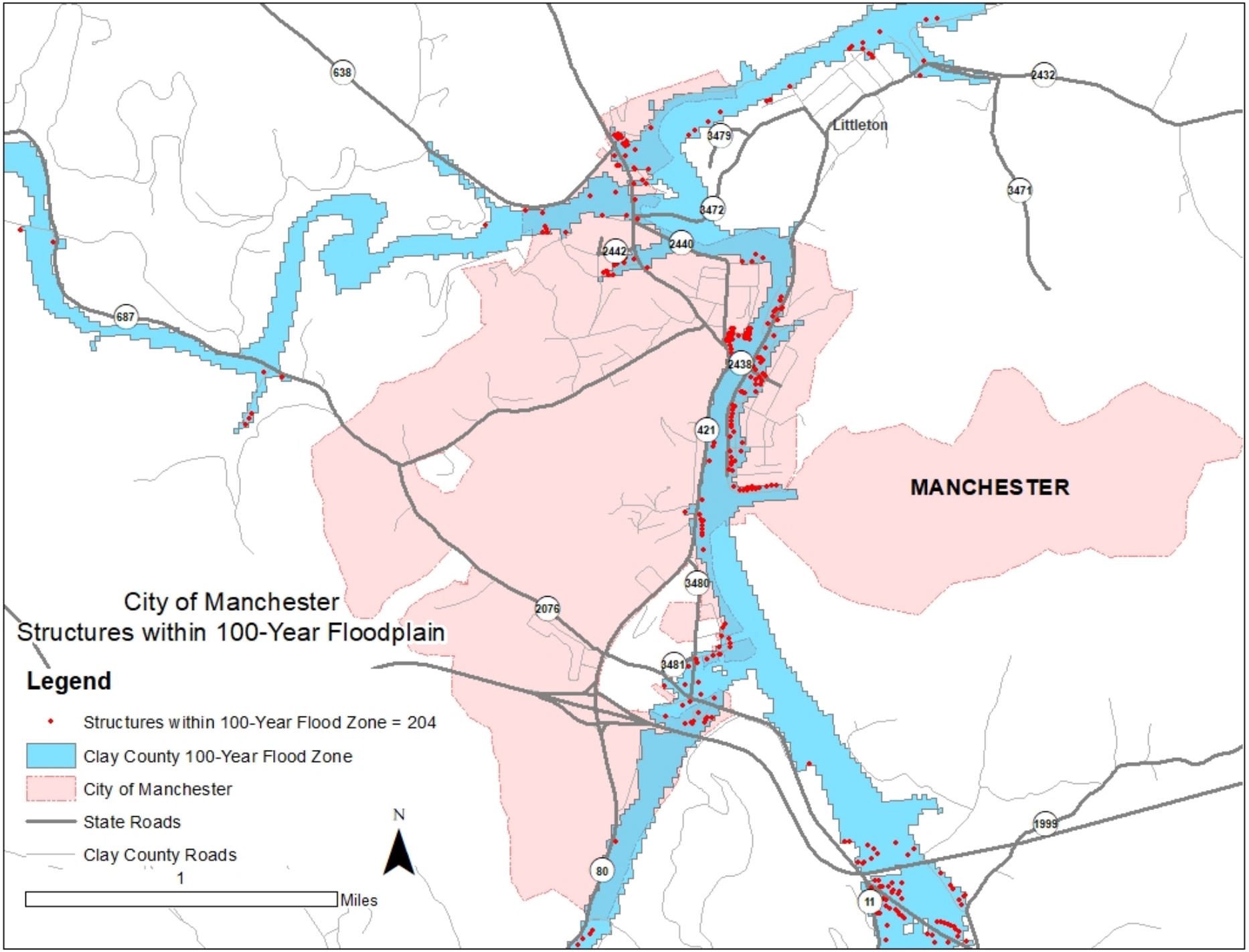
Flooding may cause fatalities or injuries, disrupt or destroy infrastructure (roads, bridges, culverts, water, wastewater, gas, electric), disrupt drinking water supplies, and cause erosion and landslides. Floods can occur anytime during the year and are Kentucky's most costly natural hazard. Reviewing past flood events can identify vulnerabilities within the county and city enabling emergency management to better prepare for future disasters.

[70] "Wrecked Ramsey". Manchester Enterprise, March 2, 2021. Retrieved on 2-8-2022 from WRECKED RAMSEY! | Manchester Enterprise | nolangroupmedia.com.


Clay County, KY:
100-Year Floodplain
MANCHESTER
Legend
Clay County 100-Year Flood Zone
City of Manchester
Clay County
Clay County Roads
State Roads
N
10
Miles


Clay County, KY:
Structures within 100-Year Floodplain
MANCHESTER
Trinkle
Vine
Felty
Tetes
Shepherdtown
Ammie
Brutus
Panco
Hensley
Burning Springs
Laurel Creek
Mill Pond
Fall Rock
Benge
Fogertown
Larue
Grace
Sidell
Spurlock
Jacks Creek
Philine
Portersburg
Big Creek
Hector
Peabody
Deer Lick
Hooker
Garrard
Marcum
Bluehole
Goose Rock
Creekville
Plank
Spring Creek
Cottongim
Lincoln
Ogle
Brightshade
Ashers Fork
Queendale
Gardner
Legend
Structures within 100-Year Flood Zone = 1027
Clay County 100-Year Flood Zone
City of Manchester
Clay County
State Roads
Clay County Roads
N
10
Miles


City of Manchester
100-Year Floodplain
Legend
Clay County 100-Year Flood Zone
City of Manchester
State Roads
Clay County Roads
1
Miles
N
MANCHESTER
Littleton
LOVERS LEAP RD
BOWLING ST
RHODES ST
LITTLETON RD
KY-2432
2432
HIBBARDS BR RD
SALLY LYTTLE BR RD
PAUL RD
COAL HOLLOW RD
3471
3479
3472
WEBB ST
MEMORIAL DR
421
NHWY 421
638
KY-638
COLONY RD
LIBERTY RD
FREEDOM RD
MILLPOND DR
GREENS T
RICHMOND RD
2440
CENTER ST
MAIN ST
RIVER ST
LUCAS RD
687
KY-687
CIRCLE DR
FROG AVE
TIMBERLAND RD
RAILROAD AVE
WAYNE ST
LOCUST ST
HENSLEY LN
TOWN BR RD
POPLAR ST
CEDAR ST
SAW MILL RD
CAUDILL GAP RD
PINE LN
WHITE ST
PHILPOT LN
MUDDY GAP RD
2076
S HWY 421
OLD US HIGHWAY 421
OWENS RD
HAL ROGERS PKWY
OLD TIMERS RD
SMITH RD
KY-80
SHAMROCK RD
HAM HOLLOW RD
E COUCH RD
SPURLOCK RD
1999
9006
PACES CREEK RD
11
KY-11
80


City of Manchester
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 204
Clay County 100-Year Flood Zone
City of Manchester
State Roads
Clay County Roads
1
Miles
N
MANCHESTER
Littleton
638
687
2442
2440
3479
3472
2432
3471
2438
421
3480
2076
3481
80
11
1999

ASSESSING VULNERABILITY: IDENTIFYING ASSETS

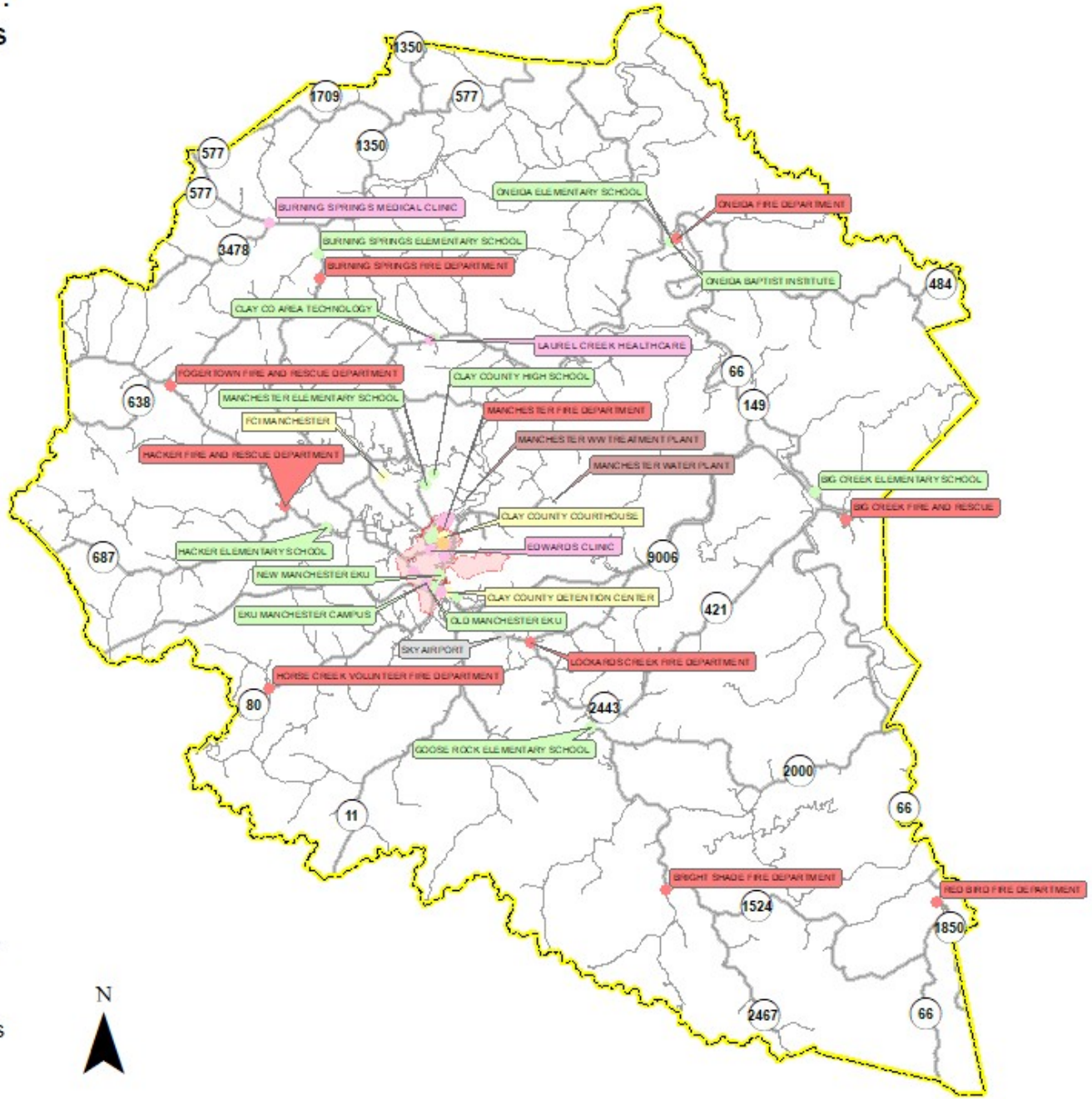
Using best available data CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the county. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 8 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Clay County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Clay County Critical Infrastructure		***Structures Located in Floodplain**
Location	**Address**	**Property Replacement Values**
Clay County		
Executive Building	102 Richmond Rd, Manchester, KY 40962	$12,000,000
Judicial Center	316 Main St. Manchester, KY 40962	$16,500,000
Clay County Road Department	1217 Lyttleton Rd. Manchester, KY 40962	$450,000
Clay County EMS	115 Court Street, Manchester, KY 40962	$ 1,800,000
Clay County Jail	67 Shamrock Rd, Manchester, KY 40962	$14,000,000
Federal Prison	805 Fox Hollow Rd, Manchester, KY 40962	$200,000,000
Post Office	309 Clay County Shopping Center, Manchester, KY 40962	$2,100,000
Memorial Hospital	210 Marie Langdon Dr. Manchester, KY 40962	$132,000,000
Clay County Health Department	330 Shamrock Rd. Manchester, KY 40962	$2,000,000
Clay County Home Health	421 S. Manchester, KY 40962	$45,000
Memorial Home Health	250 Richmond Rd, Manchester, KY 40962	$30,000
Laurel Creek Long Term Care	1033 N. Hwy 11, Manchester, KY 40962	$11,000,000
City of Manchester		
Manchester 911 Center	200 White St. Manchester, KY 40962	$2,500,000
Manchester City Hall	Church Street, Manchester, KY 40962	$750,000
Manchester City Roads	241 Memorial Drive Manchester, KY 40962	$250,000
Manchester Chamber of Commerce	277 White St. Manchester, KY 40962	$33,000
Fire Departments		
Manchester FD	239 Memorial Dr. Manchester, KY 40962	TBD
Burning Springs FD	9081 N. Hwy 412, Manchester, KY 40962	$53,000
Lockards Creek FD	2175 US-421, Manchester, KY 40962	$75,000
Fogertown FD	9988 Hwy 638, Manchester, KY 40962	$100,000

Brightshade FD	141 Mill Creek Rd Manchester, KY 40962	$50,000
Big Creek FD	17646 S. Hwy. 421, Manchester, KY 40962	$50,000
Horse Creek FD	Hwy 80 Manchester, KY 40962	$100,000
Hacker FD	5712 HWY 687 Manchester, KY 40962	$100,000
Redbird FD	31 Queendale Center, Beverly, KY 40913	$55,000
Oneida FD	80 Orchard St. Onedia, KY 40972	$45,000
Schools		
Clay County High School	415 Clay Co. High Rd. Manchester, KY 40962	$12,000,000
Oneida Baptist Institute	11 Mulberry St. Oneida, KY 40972	$20,000,000
Redbird Mission	15420 S. Hwy. 66, Beverly, KY 40913	$10,000,000
Clay County Middle School	239 Richmond Rd. Manchester, KY 40962	$9,000,000
Manchester Elementary	1908 N. Hwy. 412, Manchester, KY 40962	$7,000,000
Hacker Elementary	84 Hooker Rd. Manchester, KY 40962	$7,000,000
Burning Springs Elementary School	9847 N. Hwy. 421, Manchester, KY 40962	$8,000,000
Gooserock Elementary School	364 Hwy. 1524, Manchester, KY 40962	$8,500,000
Big Creek Elementary	523 N. Hwy. 66, Oneida 40972	$7,000,000
Oneida Elementary	435 Newfound Rd. Oneida, KY 40972	$5,000,000
University		
Eastern Kentucky University	50 University Dr. Silvers Building, Manchester, KY 40962	$9,000,000
Clay County Media		
Manchester Enterprise	103 3rd St. Manchester, KY 40962	$150,000,000
WTBK-FM 105.7	107 Dickerson St. Manchester, KY 40962	$40,000

Clay County, KY: Critical Facilities



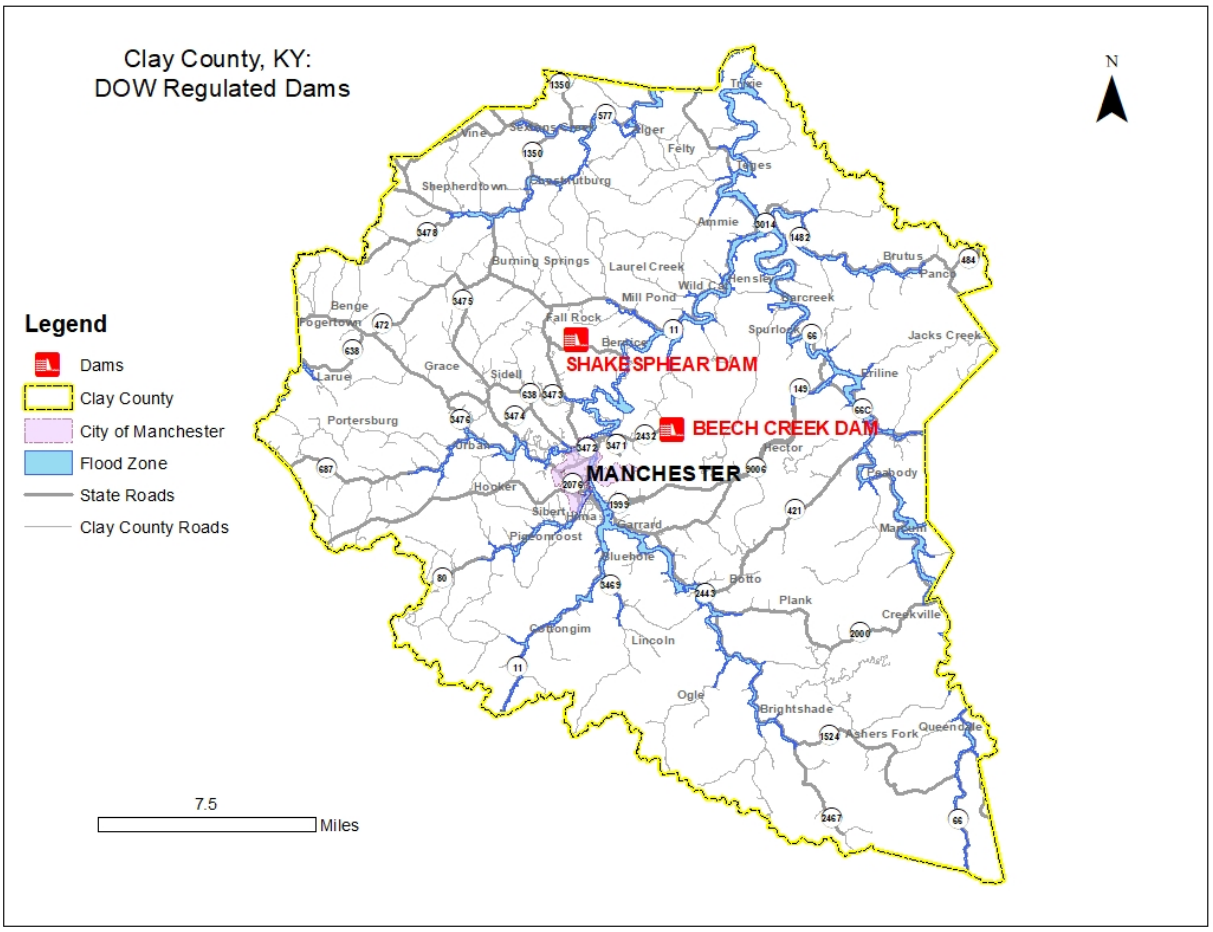
Legend

- Transportation
- Police
- Healthcare
- Government
- Fire & Rescue
- Education
- City of Manchester
- Clay County
- Clay County Roads
- State Roads

N

10

Miles



ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Clay County	1027	$54,500.00	$55,971,500.00
City of Manchester	204		$11,118,000.00

CLAY COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Clay County, Unincorporated possesses one (1) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The one (1) property in Clay County, Unincorporated is disaggregated as follows:

Clay County, Uninc., RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Clay County	Single-Family Occupancy	1	1	0	1	1
Clay County	2-4 Family Occupancy	0	0	0	0	0
Clay County	Other Non-Residential	0	0	0	0	0
TOTAL		***1***	***1***	***0***	***1***	***1***

The City of Manchester possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation.

Floodplain Coordinator(s)				
Community Name	**Name**	**Job Title**	**Address**	**Phone Number**
Clay Co.	David Watson	Emergency Management Director	102 Richmond RD/ Suite 201 Manchester, KY 40962	606-599-5489

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov. Below is an overview of the county's participation with the National Flood Insurance Program.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210057#	Clay County	Clay	12/27/74	01/01/87	09/28/07	01/01/87	No
210058#	Manchester	Clay	02/01/74	07/02/87	09/28/07(M)	07/02/87	No

NFIP FINANCIAL CLAIMS

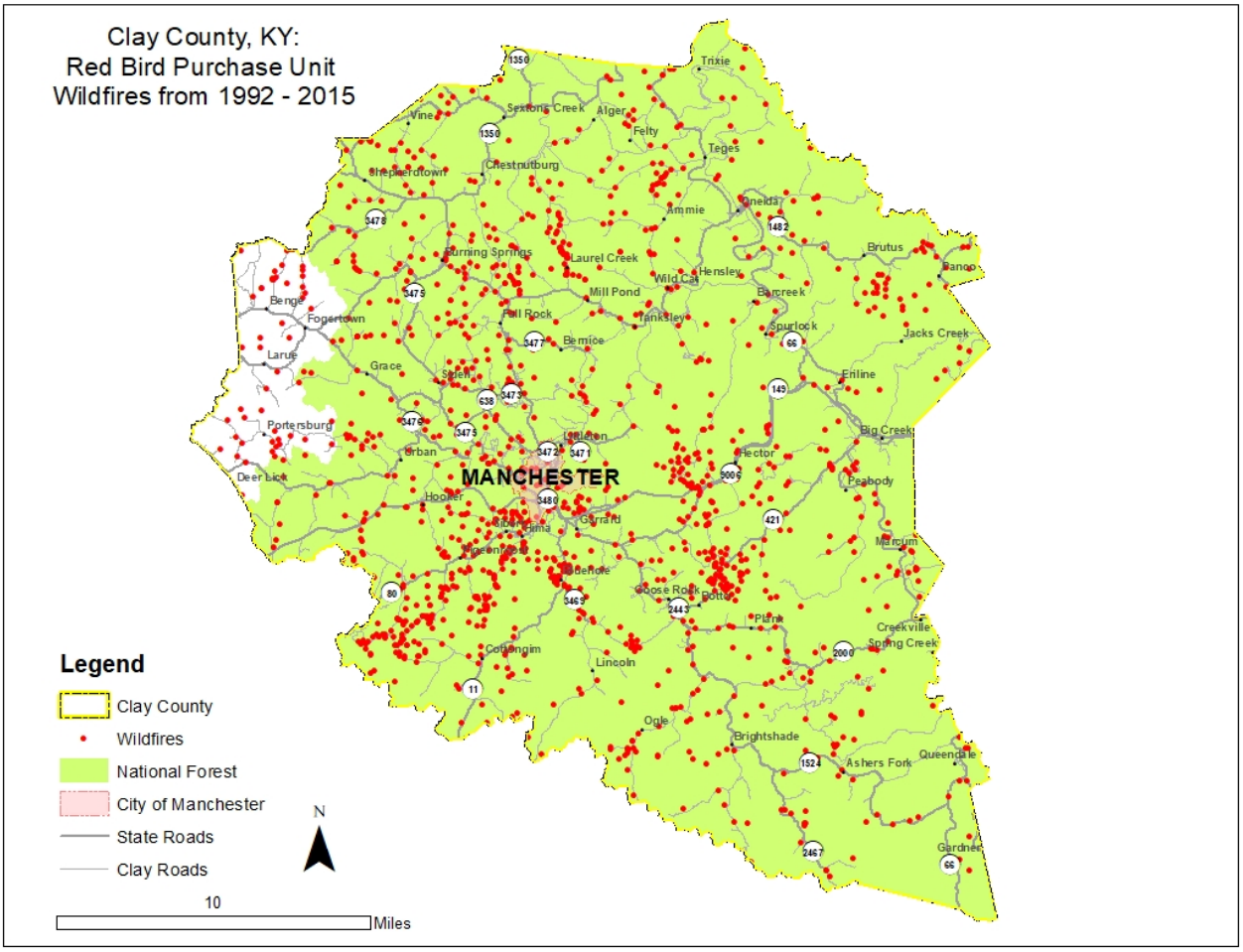
Since 1978 a total of 66 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $243,417 in claims. To put it in perspective that is an average of $5,409.27 per claim or $6,085.43 per year spent on repairing flood damages. There are only 66 flood policies in effect as of March 2018 and 1,027 identified structures located within the 100-year-floodplain.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Clay County	40,080	3	50	53	212	4,704	4,916	1	31	31	8,963	196,718	205,681
Manchester	11,454		13	13		1,469	1,469	5	8	13	12,132	25,604	37,736
Total	51,534		63	66	212	6,173	6,385	6	39	45	21,095	222,322	243,417
Nfipservices.floodsmart.gov													

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

WILDFIRE

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged



droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[71]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Clay County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	2	0.2	2.326%
Class B	0.25 to 9 Acres	55	212.0	63.953%
Class C	10 to 99 Acres	29	930.0	33.721%
Class D	100 to 299 Acres	0	0.0	0.000%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

County	**Year**	**# of Fires**	**# Acres Burned**	**# Acres Vulnerable**
Clay	2013	57	1325.0	270,810
	2014	60	1843.6	
	2015	60	1341.5	
	2016	92	3360.7	
	2017	44	1006.0	
	2018	17	647.0	

[71] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

	2019	54	714.0	
	2020	32	428.2	

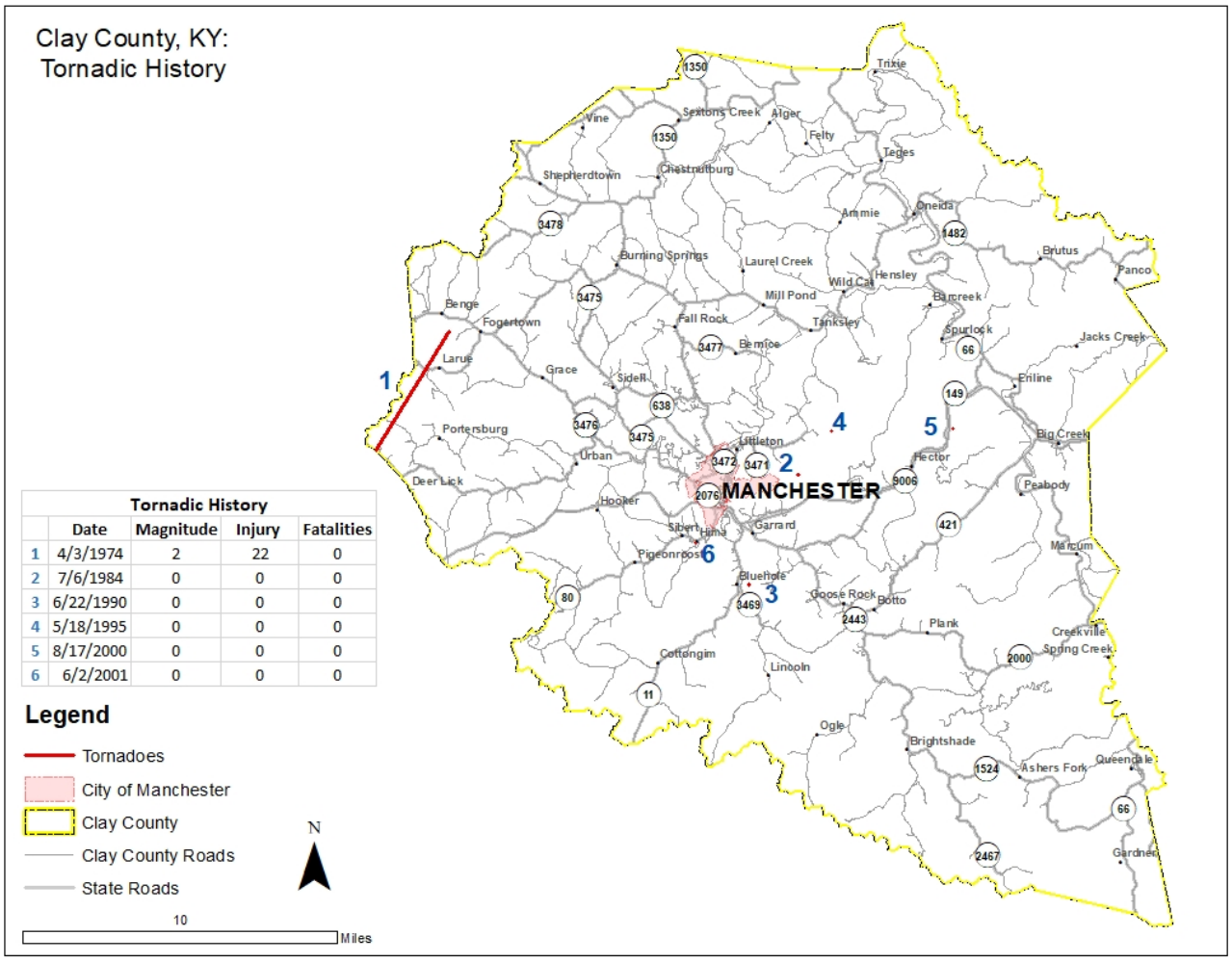
Table 1-4 Clay County Summary of Impacts From Wildfires, 2019-2020	
# of Fires	86
Injuries	0
Fatalities	0
Suppression Costs	$ 83,971
# Houses Saved	37
Value of Houses Saved	$ 2,459,000
# Houses Lost	0
Value of Houses Lost	$ -
# Structures Saved	7
Value of Structures Saved	$ 75,000
# Structures Lost	0
Value of Structures Lost	$ -

In 2019-2020 (the last years for which data is available), Clay County suffered 86 wildfires of all class types. Two years equal 730 days. Thus, there were 86/730 fires per day, or 0.1178 fires per day, or 1 wildfire of all class types every 8.49 days (1/0.1178). Within particular wildfire classes, there were two (2) Class A wildfires between 2019-2020. This translates to 2/730 fires where less than 0.25 acres were burned, or 0.0027 Class A fires per day, or 1 Class A wildfire about every 370.37 days (1/0.0027). There were 55 Class B wildfires between 2019-2020. This translates to 55/730 fires where between 0.25 to 9 acres were burned, or 0.0753 Class B fires per day, or one (1) Class B wildfire about every 13.28 days (1/0.0753). There were 29 Class C wildfires between 2019-2020. This translates to 29/730 fires where between 10 to 99 acres were burned, or 0.0397 Class C fires per day, or one (1) Class C wildfire about every 25.19 days (1/0.0397). There were no Class D to Class G wildfires – fires where 100 to 5,000 or more acres were burned – in 2019-2020 in Clay County.

CLAY COUNTY SEVERE THUNDERSTORMS

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours.[72] There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures. Currently, Clay County has no storm shelters.

Thunderstorms can produce tornados, floods, lightning and damaging winds. They may occur individually, in clusters or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios.



[72] The National Severe Storms Laboratory. Severe Weather 101 – Thunderstorms. Retrieved on 6/18/2020 from https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/.

Severe Thunderstorms have at least one of the following:

- Wind gusts of at least 58 mph or higher, i.e. 50 knots;
- Tornado;
- Hail that is one inch or larger, i.e. at minimum the size of a quarter.

This analysis will focus on the wind profiles for each county; later sections will assess hail and tornados.[73]

Thunderstorms can be categorized by their physical characteristics, i.e., the presence or absence of rotation, the number or location of updrafts and downdrafts present. There is a continuous spectrum of storms in the sky and a storm may move from one category along this spectrum to another. The five (5) types are:

- **Ordinary or Single-Cell Storm:** Single cell storms are short-lived and usually not severe.
    - Short life, generally 30-45 minutes
    - Downdraft that forms within 15-20 minutes after cell initiation
    - Updraft that weakens in 25-30 minutes; outflow stabilizes
    - Gusty winds, usually not severe
- **Pulse Storm:** A Pulse Storm is a single-cell thunderstorm that is usually not strong; when it is of substantial intensity, it produces severe weather for short periods of time. Such a storm weakens and then generates another short burst or pulse.
    - Short life, generally 30-45 minutes
    - Usually not severe, but given the right environmental conditions, these storms can create:
        - Downburst winds, usually less than 70 mph
        - A weak tornado
    - Damage is isolated.
- **Multicellular Cluster:** This type is the most common storm, consisting of a group of ordinary cells at various stages of the thunderstorm life cycle.
    - Most common type of thunderstorm
    - May last for several hours
    - Consists of a group of cells moving as a single unit
    - Contains cells in different stage of the thunderstorm life cycle
    - Occasionally may contain supercells
    - Given the right conditions, the cells can become severe within the multicellular cluster producing:
        - Downburst winds;
        - Weak tornadoes; and
        - Heavy rainfall in a short time.

[73] The TYPES section is adapted from the National Weather Service. (2011). "Weather Spotter's Field Guide." Department of Commerce. As presented in the Kentucky Hazard Mitigation Plan published by the University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP). (2018)

- **Multicellular Line:** This category is a long line of storms with a continuous, well developed gust front along the leading edge.
    - Frequently called squall line
    - A long line of storms with individual storm outflows merging to produce a continuous, well-developed gust front marking the leading edge of rain-cooled air
    - Line of storms often oriented north-south or northeast-southwest and usually move toward the northeast, east, or southeast
    - May be embedded along the line
    - Given the right environmental conditions, multicell line storms can produce:
        - Strong downburst winds;
        - Heavy rainfall; and
        - Occasional tornadoes
- **Supercell:** A supercell is a highly organized thunderstorm with an extremely strong updraft. They exhibit persistent storm-scale rotation of the updraft-downdraft couplet or mesocyclone.
    - Classifying supercellular storms is subjective. Still, the following is generally acknowledged about supercells:
        - Highly organized storm with rotation inside
        - Updrafts can attain speeds more than 100 mph
        - Can produce strong, violent tornadoes
        - Rear-flank downdraft can produce damaging outflow winds in excess of 100 mph.
    - Supercells can produce the following elements:
        - Potentially torrential rainfall immediately adjacent to the storm updraft
        - Lighter rainfall at greater distances from the updraft
        - Rear-Flank Downdrafts (RFDs) producing strong, sometimes damaging outflows
        - Tornadoes

Damaging Winds: National Weather Service issues warnings when the winds from a thunderstorm are expected to be 58 mph (50 knots) or higher.

Downburst: This term refers to an area of strong, often damaging winds produced by air rapidly descending in a thunderstorm. Downbursts are sometimes described as a microburst when it covers an area of less than 2.5 square miles and lasts three to seven minutes. Downbursts can be referred to as microburst when they cover larger areas or last for more than seven (7) minutes. On rare occasions, downbursts can have wind speeds in excess of 150 mph.

Bow Echo: A bow-shaped line of convective cells – best seen on radar – is often associated with swaths of damaging straight-line winds and small tornadoes.

Derecho: A derecho is a widespread and usually fast-moving convectively-induced episode of damaging winds. Derechos can result from bow echoes, supercells, multicell clusters or lines, or a blend of any of these. They can produce damaging straight-line winds over areas hundreds of

miles long and more than 100 miles across. Due to the large area extent, an episode is usually not classified as a derecho until it is complete.

Note: When reviewing the types and impacts of thunderstorms and winds, it is important to realize that while tornadoes are typically more destructive when they occur, straightline winds can also be highly destructive and occur much more frequently. In the final analysis, straightline winds cause more damage in both injuries/deaths and property damage in the United States than do tornadoes.

Table 2-4: Clay County Severe Thunderstorm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	447.30K	5.10K
1	SEXTONS CREEK	CLAY CO.	KY	5/21/2001	16:15	EST	Thunder-storm Wind	60 kts. E	0	0	0.00K	0.00K
2	CLAY (ZONE)	CLAY (ZONE)	KY	11/24/2003	6:15	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
3	COUNTY WIDE	CLAY CO.	KY	5/26/2004	15:00	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
4	MANCHESTER	CLAY CO.	KY	5/31/2004	1:05	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	MANCHESTER	CLAY CO.	KY	5/31/2004	1:11	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BURNING SPGS	CLAY CO.	KY	5/31/2004	1:15	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
5	MANCHESTER	CLAY CO.	KY	6/12/2004	14:50	EST	Thunder-storm Wind	60 kts. EG	0	0	20.00K	0.00K
6	GARRARD	CLAY CO.	KY	7/13/2004	22:45	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

7	MANCHESTER	CLAY CO.	KY	4/22/2005	20:50	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
8	MANCHESTER	CLAY CO.	KY	5/19/2005	14:45	EST	Thunder-storm Wind	63 kts. EG	0	0	0.00K	0.00K
9	PIGEON ROOST	CLAY CO.	KY	8/5/2005	14:21	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
10	MANCHESTER	CLAY CO.	KY	4/7/2006	15:59	EST	Thunder-storm Wind	55 kts. EG	0	0	4.00K	0.00K
11	MANCHESTER	CLAY CO.	KY	4/19/2006	4:21	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
12	MANCHESTER	CLAY CO.	KY	4/19/2006	4:21	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
13	MANCHESTER	CLAY CO.	KY	5/26/2006	23:43	EST	Thunder-storm Wind	65 kts. EG	0	0	3.00K	0.00K
	MANCHESTER	CLAY CO.	KY	5/26/2006	23:43	EST	Thunder-storm Wind	60 kts. EG	0	0	5.00K	0.00K
14	BURNING SPGS	CLAY CO.	KY	5/31/2006	16:38	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K

15	SIDELL	CLAY CO.	KY	6/11/2006	20:04	EST	Thunder-storm Wind	55 kts. EG	0	0	2.00K	0.00K
	MANCHESTER	CLAY CO.	KY	6/11/2006	20:09	EST	Thunder-storm Wind	55 kts. EG	0	0	2.00K	0.00K
	BENGE	CLAY CO.	KY	6/11/2006	20:28	EST	Thunder-storm Wind	55 kts. EG	0	0	3.00K	0.00K
16	ONEIDA	CLAY CO.	KY	6/22/2006	23:28	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
	MANCHESTER	CLAY CO.	KY	6/22/2006	23:28	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
17	MANCHESTER	CLAY CO.	KY	7/4/2006	15:52	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
	MANCHESTER	CLAY CO.	KY	7/4/2006	16:13	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
18	FOGER TOWN	CLAY CO.	KY	8/6/2006	15:01	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
19	MANCHESTER	CLAY CO.	KY	8/10/2006	18:14	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K

20	MANCHESTER	CLAY CO.	KY	4/3/2007	20:43	EST-5	Thunder-storm Wind	55 kts. EG	0	0	20.00K	0.00K
	GARRARD	CLAY CO.	KY	4/3/2007	20:43	EST-5	Thunder-storm Wind	55 kts. EG	0	0	7.00K	0.00K
	GARRARD	CLAY CO.	KY	4/3/2007	20:43	EST-5	Thunder-storm Wind	55 kts. EG	0	0	18.00K	0.00K
21	MANCHESTER	CLAY CO.	KY	5/4/2007	15:13	EST-5	Thunder-storm Wind	53 kts. EG	0	0	1.60K	0.00K
	MANCHESTER	CLAY CO.	KY	5/4/2007	15:13	EST-5	Thunder-storm Wind	53 kts. EG	0	0	0.70K	0.00K
22	BIG CREEK	CLAY CO.	KY	6/5/2007	17:46	EST-5	Thunder-storm Wind	53 kts. EG	0	0	10.00K	0.00K
23	BIG CREEK	CLAY CO.	KY	6/24/2007	16:13	EST-5	Thunder-storm Wind	53 kts. EG	0	0	2.00K	0.00K
	BRIGHT SHADE	CLAY CO.	KY	6/24/2007	16:13	EST-5	Thunder-storm Wind	55 kts. EG	0	0	8.00K	0.00K
	MANCHESTER	CLAY CO.	KY	6/24/2007	16:21	EST-5	Thunder-storm Wind	53 kts. EG	0	0	3.00K	0.00K
	SPUR-LOCK	CLAY CO.	KY	6/24/2007	16:21	EST-5	Thunder-storm Wind	53 kts. EG	0	0	5.00K	0.00K

24	ONEIDA	CLAY CO.	KY	7/17/2007	14:45	EST-5	Thunder-storm Wind	55 kts. EG	0	0	5.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
25	MANCHESTER	CLAY CO.	KY	7/23/2007	18:02	EST-5	Thunder-storm Wind	55 kts. EG	0	0	4.00K	0.00K
26	MANCHESTER	CLAY CO.	KY	1/29/2008	22:50	EST-5	Thunder-storm Wind	53 kts. EG	0	0	2.00K	0.00K
27	GARDNER	CLAY CO.	KY	3/4/2008	15:41	EST-5	Thunder-storm Wind	53 kts. EG	0	0	1.00K	0.00K
28	MANCHESTER	CLAY CO.	KY	3/19/2008	15:51	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	MANCHESTER	CLAY CO.	KY	3/19/2008	15:51	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
29	FOGER-TOWN	CLAY CO.	KY	4/11/2008	14:05	EST-5	Thunder-storm Wind	55 kts. EG	0	0	35.00K	0.00K
	MANCHESTER	CLAY CO.	KY	4/11/2008	14:15	EST-5	Thunder-storm Wind	58 kts. EG	0	0	100.00K	0.00K
30	GARRARD	CLAY CO.	KY	5/11/2008	8:50	EST-5	Thunder-storm Wind	55 kts. EG	0	0	35.00K	0.00K

31	MANCHESTER	CLAY CO.	KY	6/10/2008	1:26	EST-5	Thunder-storm Wind	54 kts. EG	0	0	3.00K	0.00K
32	ONEIDA	CLAY CO.	KY	6/28/2008	18:15	EST-5	Thunder-storm Wind	54 kts. EG	0	0	7.00K	0.00K
33	MANCHESTER	CLAY CO.	KY	7/20/2008	16:54	EST-5	Thunder-storm Wind	51 kts. EG	0	0	1.00K	0.00K
34	LAUREL CREEK	CLAY CO.	KY	7/28/2008	13:47	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	MANCHESTER	CLAY CO.	KY	7/28/2008	14:00	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
35	PEABODY	CLAY CO.	KY	2/11/2009	16:13	EST-5	Thunder-storm Wind	54 kts. EG	0	0	3.00K	0.00K
36	MANCHESTER	CLAY CO.	KY	5/28/2009	17:59	EST-5	Thunder-storm Wind	51 kts. EG	0	0	1.00K	0.00K
37	ONEIDA	CLAY CO.	KY	6/11/2009	13:51	EST-5	Thunder-storm Wind	53 kts. EG	0	0	5.00K	0.00K
38	MANCHESTER	CLAY CO.	KY	6/16/2009	17:02	EST-5	Thunder-storm Wind	51 kts. EG	0	0	4.00K	0.00K

39	ONEIDA	CLAY CO.	KY	6/18/2009	12:13	EST-5	Thunder-storm Wind	52 kts. EG	0	0	5.00K	0.00K
	ONEIDA	CLAY CO.	KY	6/18/2009	21:21	EST-5	Thunder-storm Wind	52 kts. EG	0	0	5.00K	0.00K
40	SEXTONS CREEK	CLAY CO.	KY	8/4/2009	15:25	EST-5	Thunder-storm Wind	55 kts. EG	0	0	8.00K	0.00K
	BRIGHT-SHADE	CLAY CO.	KY	8/4/2009	16:15	EST-5	Thunder-storm Wind	55 kts. EG	0	0	7.00K	0.00K
41	CLAY (ZONE)	CLAY (ZONE)	KY	12/9/2009	11:30	EST-5	High Wind	52 kts. EG	0	0	0.00K	0.00K
42	LAUREL CREEK	CLAY CO.	KY	6/14/2010	14:40	EST-5	Thunder-storm Wind	52 kts. EG	0	0	5.00K	0.00K
43	BURNING SPGS	CLAY CO.	KY	8/5/2010	13:55	EST-5	Thunder-storm Wind	55 kts. EG	0	0	5.00K	0.00K
	ONEIDA	CLAY CO.	KY	8/5/2010	14:00	EST-5	Thunder-storm Wind	55 kts. EG	0	0	25.00K	5.00K
44	ONEIDA	CLAY CO.	KY	9/11/2010	16:28	EST-5	Thunder-storm Wind	50 kts. EG	0	0	3.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

45	SEXTONS CREEK	CLAY CO.	KY	10/26/2010	14:50	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
46	MANCHESTER	CLAY CO.	KY	4/4/2011	16:20	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
47	ONEIDA	CLAY CO.	KY	5/22/2011	15:08	EST-5	Thunder-storm Wind	52 kts. EG	0	0	3.00K	0.00K
48	PIGEON-ROOST	CLAY CO.	KY	5/23/2011	5:40	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	PIGEON-ROOST	CLAY CO.	KY	5/23/2011	5:40	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	PIGEON-ROOST	CLAY CO.	KY	5/23/2011	5:40	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	PIGEON-ROOST	CLAY CO.	KY	5/24/2011	7:48	EST-5	Thunder-storm Wind	52 kts. EG	0	0	5.00K	0.00K
49	CHEST-NUT-BURG	CLAY CO.	KY	5/26/2011	2:56	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	LITTLE-TON	CLAY CO.	KY	5/26/2011	3:15	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K
	GOOSE-ROCK	CLAY CO.	KY	5/26/2011	3:21	EST-5	Thunder-storm Wind	52 kts. EG	0	0	1.00K	0.00K

50	LAUREL CREEK	CLAY CO.	KY	6/9/2011	12:05	EST-5	Thunder-storm Wind	60 kts. EG	0	0	30.00K	0.00K
	ONEIDA	CLAY CO.	KY	6/9/2011	12:25	EST-5	Thunder-storm Wind	50 kts. EG	0	0	1.00K	0.00K
51	BURNING SPGS	CLAY CO.	KY	6/21/2011	18:41	EST-5	Thunder-storm Wind	50 kts. EG	0	0	1.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
52	PIGEON-ROOST	CLAY CO.	KY	6/23/2011	17:18	EST-5	Thunder-storm Wind	55 kts. EG	0	0	10.00K	0.00K
	LINCOLN	CLAY CO.	KY	6/23/2011	17:44	EST-5	Thunder-storm Wind	52 kts. EG	0	0	3.00K	0.00K
53	BERNICE	CLAY CO.	KY	8/8/2011	14:03	EST-5	Thunder-storm Wind	50 kts. EG	0	0	1.00K	0.00K
54	URBAN	CLAY CO.	KY	7/5/2012	14:36	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	GOOSE-ROCK	CLAY CO.	KY	7/5/2012	14:48	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
55	HORSE CREEK	CLAY CO.	KY	1/30/2013	7:24	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

56	DEER LICK	CLAY CO.	KY	5/21/2013	16:30	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BURNING SPGS	CLAY CO.	KY	5/21/2013	16:30	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
57	MANCHESTER	CLAY CO.	KY	6/13/2013	11:58	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
58	PIGEON-ROOST	CLAY CO.	KY	7/4/2013	19:41	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	SEXTONS CREEK	CLAY CO.	KY	7/4/2013	19:51	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
59	SEXTONS CREEK	CLAY CO.	KY	7/13/2013	11:15	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
60	PEABODY	CLAY CO.	KY	11/1/2013	1:50	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
61	SEXTONS CREEK	CLAY CO.	KY	2/21/2014	0:30	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	HORSE CREEK	CLAY CO.	KY	2/21/2014	0:35	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

62	SEXTONS CREEK	CLAY CO.	KY	5/21/2014	21:05	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
63	BLUE-HOLE	CLAY CO.	KY	6/10/2014	17:24	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	HORSE CREEK	CLAY CO.	KY	6/10/2014	17:24	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
64	GOOSE-ROCK	CLAY CO.	KY	6/20/2014	13:06	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	SPUR-LOCK	CLAY CO.	KY	6/20/2014	13:10	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
65	HORSE CREEK	CLAY CO.	KY	7/14/2014	13:25	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
66	HIMA	CLAY CO.	KY	7/27/2014	13:55	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	FALL ROCK	CLAY CO.	KY	7/27/2014	14:35	EST-5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
	HECTOR	CLAY CO.	KY	7/27/2014	14:40	EST-5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
	BIG CREEK	CLAY CO.	KY	7/27/2014	14:54	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

	MARCUM	CLAY CO.	KY	7/27/2014	14:55	EST-5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	SHEP-HERD-TOWN	CLAY CO.	KY	7/27/2014	15:15	EST-5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
67	HORSE CREEK	CLAY CO.	KY	6/8/2015	12:00	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
68	GOOSE-ROCK	CLAY CO.	KY	6/21/2015	14:50	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
69	MANCHES TER	CLAY CO.	KY	5/7/2016	18:30	EST-5	Thunder-storm Wind	51 kts. EG	0	0	0.00K	0.00K
70	SHEP-HERD-TOWN	CLAY CO.	KY	7/4/2016	16:17	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
71	AMMIE	CLAY CO.	KY	7/8/2016	14:45	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
72	QUEEN-DALE	CLAY CO.	KY	8/28/2016	14:15	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BLUE-HOLE	CLAY CO.	KY	8/28/2016	14:40	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

73	LITTLE-TON	CLAY CO.	KY	12/18/2016	2:50	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
74	ONEIDA	CLAY CO.	KY	3/1/2017	9:25	EST-5	Thunder-storm Wind	53 kts. MG	0	0	0.00K	0.00K
75	QUEEN-DALE	CLAY CO.	KY	7/6/2017	17:32	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
76	BURNING SPGS	CLAY CO.	KY	5/31/2018	13:41	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
77	JONSEE	CLAY CO.	KY	4/25/2020	17:03	EST-5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.10K

Clay County Thunderstorms/Wind - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 5/21/2001. The denominator is set at 20 years because 2000 was the earliest year with this type of data. While Clay County's data started in 2001, the denominator will remain 20 to maintain comparability between counties.

That Clay County experienced 77 severe thunderstorm/wind events over 20 years yields that Clay County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every three months (i.e., 77/240). Specifically, Clay County experienced an average of 4 severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.32 events per month. $1/.32 = 3.1 \approx 1$ severe winter storm event an average of every three months.

Table 2-5: Clay County Hailstorm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	0.00K	0.00K
1	ONEIDA	CLAY CO.	KY	4/15/1998	13:15	EST	Hail	1.00 in.	0	0	0.00K	0.00K
2	PEABODY	CLAY CO.	KY	4/28/2002	13:45	EST	Hail	1.00 in.	0	0	0.00K	0.00K
3	MANCHES-TER	CLAY CO.	KY	6/2/2002	17:27	EST	Hail	1.00 in.	0	0	0.00K	0.00K
4	MANCHES-TER	CLAY CO.	KY	7/12/2003	15:00	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	FOGER-TOWN	CLAY CO.	KY	7/13/2003	15:07	EST	Hail	1.25 in.	0	0	0.00K	0.00K
5	MANCHES-TER	CLAY CO.	KY	10/21/2005	15:27	EST	Hail	1.25 in.	0	0	0.00K	0.00K
6	QUEEN-DALE	CLAY CO.	KY	1/2/2006	19:10	EST	Hail	1.25 in.	0	0	0.00K	0.00K
7	MANCHES-TER	CLAY CO.	KY	4/7/2006	15:44	EST	Hail	1.00 in.	0	0	0.00K	0.00K
8	CREEK-VILLE	CLAY CO.	KY	5/4/2007	15:33	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
9	BARCREEK	CLAY CO.	KY	5/15/2010	17:50	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
10	PIGEON-ROOST	CLAY CO.	KY	4/9/2011	13:50	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K

11	MANCHES-TER	CLAY CO.	KY	5/22/2011	15:03	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
12	ONEIDA	CLAY CO.	KY	4/26/2012	16:15	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
13	BURNING SPGS	CLAY CO.	KY	7/27/2014	13:20	EST-5	Hail	2.75 in.	0	0	0.00K	0.00K
	BIG CREEK	CLAY CO.	KY	7/27/2014	15:00	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
14	BURNING SPGS	CLAY CO.	KY	5/2/2016	13:08	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
15	TEGES	CLAY CO.	KY	3/27/2017	19:10	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
16	ASHERS FORK	CLAY CO.	KY	6/5/2019	17:47	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	0.00K	0.00K

Clay County Hailstorms - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The pink versus the green highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 4/15/1998. As the last date recorded for a hailstorm in Clay County is 6/5//2019, the denominator is set at 20 years to maintain comparability across counties.

That Clay County experienced 16 events with hail 1" or larger over 20 years yields that Clay County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every year and two months (i.e., 16/240). Specifically, Clay County experienced an average of 0.8 severe hailstorm events every year. Or, using December 31, 2020 as an endpoint, this is 0.07 events per month. 1/.07 = 14.28 ≈ 1 severe hailstorm event on average every year and two months.

Table 2-6: Clay County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	0.00K	0.00K
1	BIG CREEK	CLAY CO.	KY	8/17/2000	17:40	EST	Tornado	F0	0	0	0.00K	0.00K
2	MANCHES-TER	CLAY CO.	KY	6/2/2001	17:40	EST	Tornado	F0	0	0	0.00K	0.00K
	Totals:								0	0	0.00K	0.00K

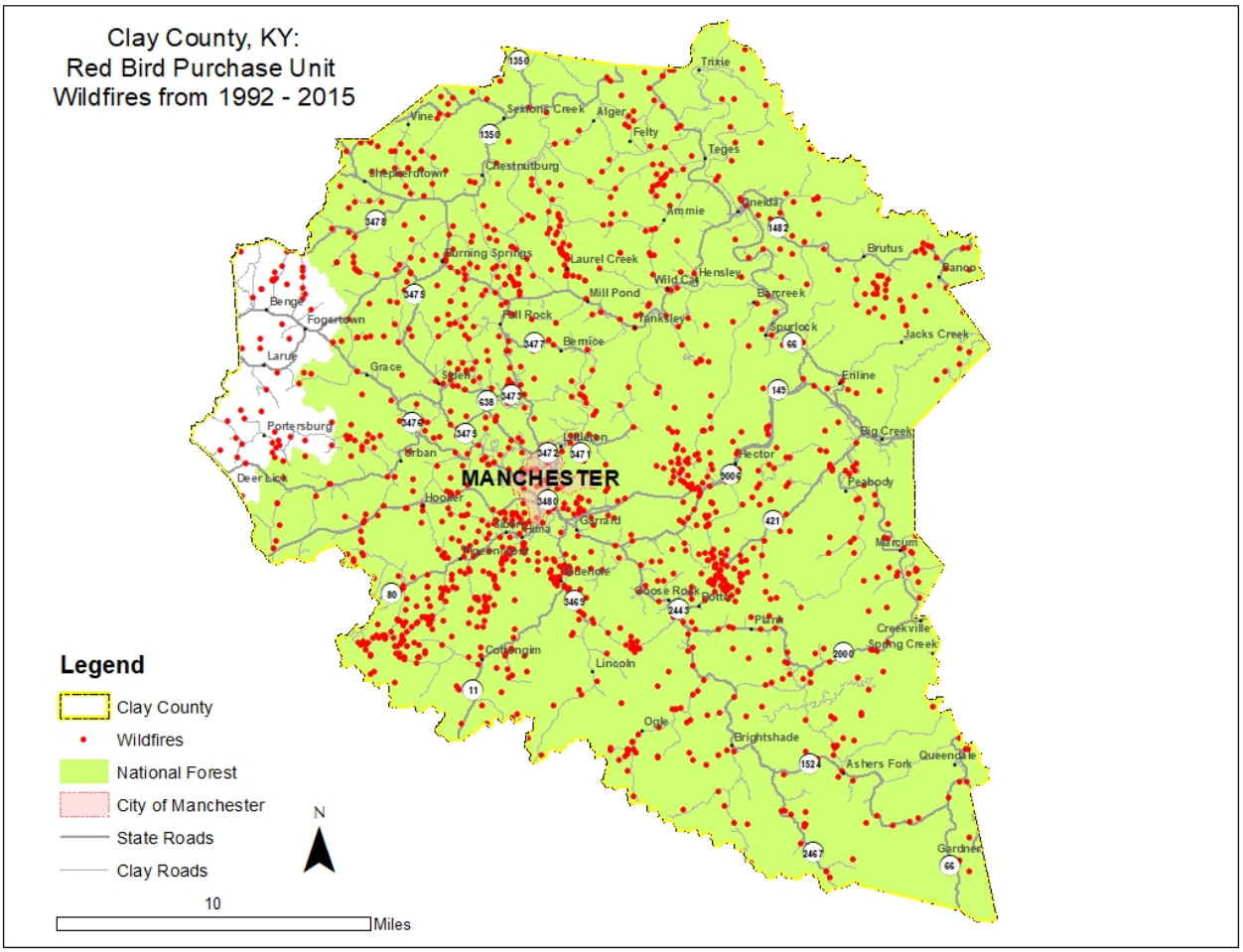
Clay County Tornados - Probability as Frequency of Event Occurrence

While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 8/17/2000 and the last date 6/2/2001. However, the denominator is set at 20 years to maintain comparability across counties. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen.

That Clay County experienced 2 events with tornados over 20 years yields that Clay County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 10 years (i.e., 2/240). Using December 31, 2020 as an endpoint, this is 0.008 events per month. $1/.008 = 125 \approx 1$ tornado event an average of every 10 years.

CLAY COUNTY WILDFIRES

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every



five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[74]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Clay County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	2	0.2	2.326%
Class B	0.25 to 9 Acres	55	212.0	63.953%
Class C	10 to 99 Acres	29	930.0	33.721%
Class D	100 to 299 Acres	0	0.0	0.000%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

[74] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Clay	2013	57	1325.0	270,810
	2014	60	1843.6	
	2015	60	1341.5	
	2016	92	3360.7	
	2017	44	1006.0	
	2018	17	647.0	
	2019	54	714.0	
	2020	32	428.2	

In 2019-2020 (the last years for which data is available), Clay County suffered 86 wildfires of all class types. Two years equal 730 days. Thus, there were 86/730 fires per day, or 0.1178 fires per day, or 1 wildfire of all class types every 8.49 days (1/0.1178). Within particular wildfire classes, there were two (2) Class A wildfires between 2019-2020. This translates to 2/730 fires where less than 0.25 acres were burned, or 0.0027 Class A fires per day, or 1 Class A wildfire about every 370.37 days (1/0.0027). There were 55 Class B wildfires between 2019-2020. This translates to 55/730 fires where between 0.25 to 9 acres were burned, or 0.0753 Class B fires per day, or one (1) Class B wildfire about every 13.28 days (1/0.0753). There were 29 Class C wildfires between 2019-2020. This translates to 29/730 fires where between 10 to 99 acres were burned, or 0.0397 Class C fires per day, or one (1) Class C wildfire about every 25.19 days (1/0.0397). There were no Class D to Class G wildfires – fires where 100 to 5,000 or more acres were burned – in 2019-2020 in Clay County.

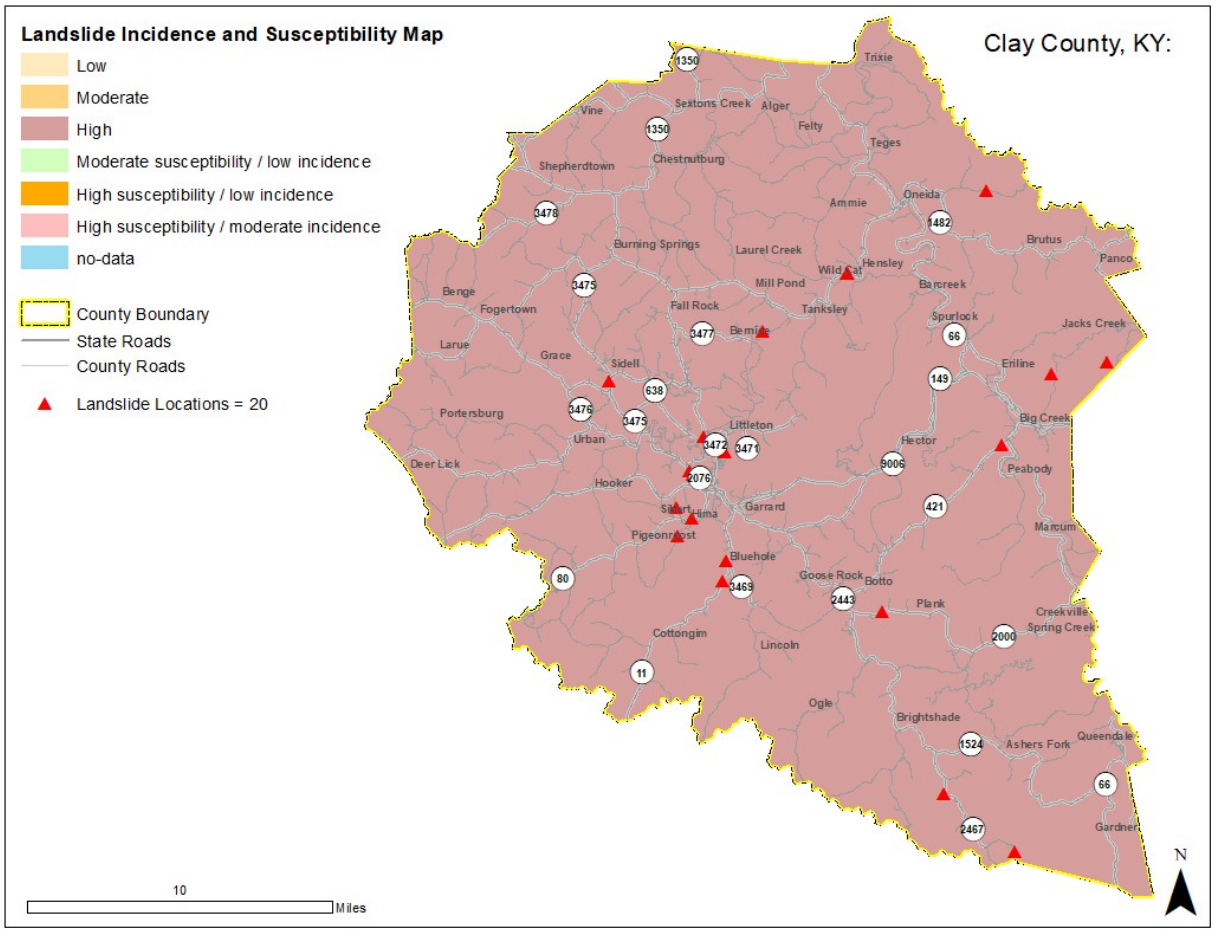
All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current. The DOF does not collect data about wildfires in incorporated areas; therefore, there is no information available regarding wildfires in Manchester.

Table 1-4 Clay County Summary of Impacts From Wildfires, 2019-2020	
# of Fires	86
Injuries	0
Fatalities	0
Suppression Costs	$ 83,971
# Houses Saved	37
Value of Houses Saved	$ 2,459,000
# Houses Lost	0
Value of Houses Lost	$ -
# Structures Saved	7
Value of Structures Saved	$ 75,000
# Structures Lost	0
Value of Structures Lost	$ -

LANDSLIDES

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field. Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils.

The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.



All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Clay	Big Creek	US 421		1/25/2012	Land-slide	Sandstone; Siltstone; Shale; Limestone; Coal							Yes	
2	Clay	Scalf	KY 2467	Above and Below Road; Stream at Bottom	2014		Shale; Sandstone; Siltstone; Coal; Underclay		100 feet						
3	Clay	Mistle-toe	Little Bullskin Creek Rd		2016	Land-slide	Siltstone; Shale; Sandstone; Coal								$ 48,000
4	Clay	Ogle	KY 2000		2016	Land-slide	Sandstone; Shale; Siltstone; Coal; Limestone								
5	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone; Coal							Damaged Home	
6	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone								
7	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone								
8	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone								

9	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone								
10	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone								
11	Clay	Barcreek	KY 11		2019		Sandstone; Siltstone; Shale; Limestone								
12	Clay	Barcreek	KY 66		2019		Sandstone; Siltstone; Shale; Limestone								
13	Clay	Beverly	KY 11		2019		Shale; Sandstone; Siltstone								
14	Clay	Beverly	KY 66		2019		Shale; Sandstone; Siltstone; Coal								
15	Clay	Beverly	KY 1524		2019		Sandstone; Siltstone; Shale								
16	Clay	Beverly	KY 1524		2019		Shale; Sandstone; Siltstone								
17	Clay	Creek-ville	KY 66		2019		Siltstone; Sandstone; Shale								
18	Clay	Creek-ville	KY 2000		2019		Siltstone; Sandstone; Shale								
19	Clay	Maulden	KY 577		2019		Siltstone; Sandstone; Shale								
20	Clay	Mistle-toe	KY 1482		2019		Siltstone; Shale; Sandstone								

21	Clay	Ogle	KY 149		2019		Sandstone; Shale; Siltstone; Coal								
22	Clay	Ogle	KY 149		2019		Sandstone; Shale; Siltstone; Coal								
23	Clay	Ogle	KY 1524		2019		Sandstone; Shale; Siltstone								
24	Clay	Ogle	KY 1524		2019		Sandstone; Shale; Siltstone								
25	Clay	Oneida	KY 66		2019		Siltstone; Sandstone; Coal								
26	Clay	Oneida	KY 66		2019		Siltstone; Sandstone; Coal								
27	Clay	Oneida	KY 577		2019		Siltstone; Sandstone; Coal								
28	Clay	Oneida	KY 577		2019		Siltstone; Sandstone; Coal								
29	Clay	Oneida	KY 577		2019		Siltstone; Sandstone; Coal								
30	Clay	Porters-burg	KY 687		2019		Shale; Sandy Shale; Siltstone								
31	Clay	Creek-ville	KY 2000		2020		Siltstone; Sandstone; Shale; Coal							Break in Pavement	
32	Clay	Ogle	US 421		2021		Sandstone; Shale; Siltstone; Coal; Limestone							Slide Repair	

33	Clay	Barcreek	KY 11												
34	Clay	Barcreek	KY 11												
35	Clay	Barcreek	(37.21056, -83.7325)												
36	Clay	Beverly	(36.96167, -83.5908)												
37	Clay	Big Creek	(37.1875, -83.5625)												
38	Clay	Big Creek	(37.1925, -83.5297)												
39	Clay	Hima	Hooker Hill Rd			Land-slide	Shale; Sandstone; Siltstone; Coal							Yes	
40	Clay	Hima	KY 11												
41	Clay	Hima	(37.12278, -83.7769)												
42	Clay	Hima	(37.11472, -83.7858)												
43	Clay	Ogle	KY 1524	Above and Below Road			Sandstone; Siltstone; Shale; Coal; Limestone							Material on Road; Break in Pavement	

Clay County Landslides - Probability as Frequency of Event Occurrence

Clay County, unincorporated (and its unincorporated cities) independently experienced 43 landslide events over 30 years. Thus, Clay County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every eight months (i.e., 43/30). Specifically, Clay County, unincorporated and its unincorporated cities experienced an average of 1.5 landslide events

each year. Or, using December 31, 2021, as an endpoint, 43/360 months is 0.1194 events per month. 1/0.1194 = 8.3752 ≈ 1 landslide event an average of every eight (8) months.

Count	County	City	Location	Failure Loca-tion	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Clay	Manchester	KY 2440		2020		Sandstone; Shale							Break in Pavement	
2	Clay	Manchester	(37.18833, -83.8244)												
3	Clay	Manchester	(37.16139, -83.7689)												
4	Clay	Manchester	(37.12778, -83.7858)												
5	Clay	Manchester	(37.15361, -83.7567)												
6	Clay	Manchester	(37.145, -83.7781)												
7	Clay	Manchester	(37.14361, -83.7758)												

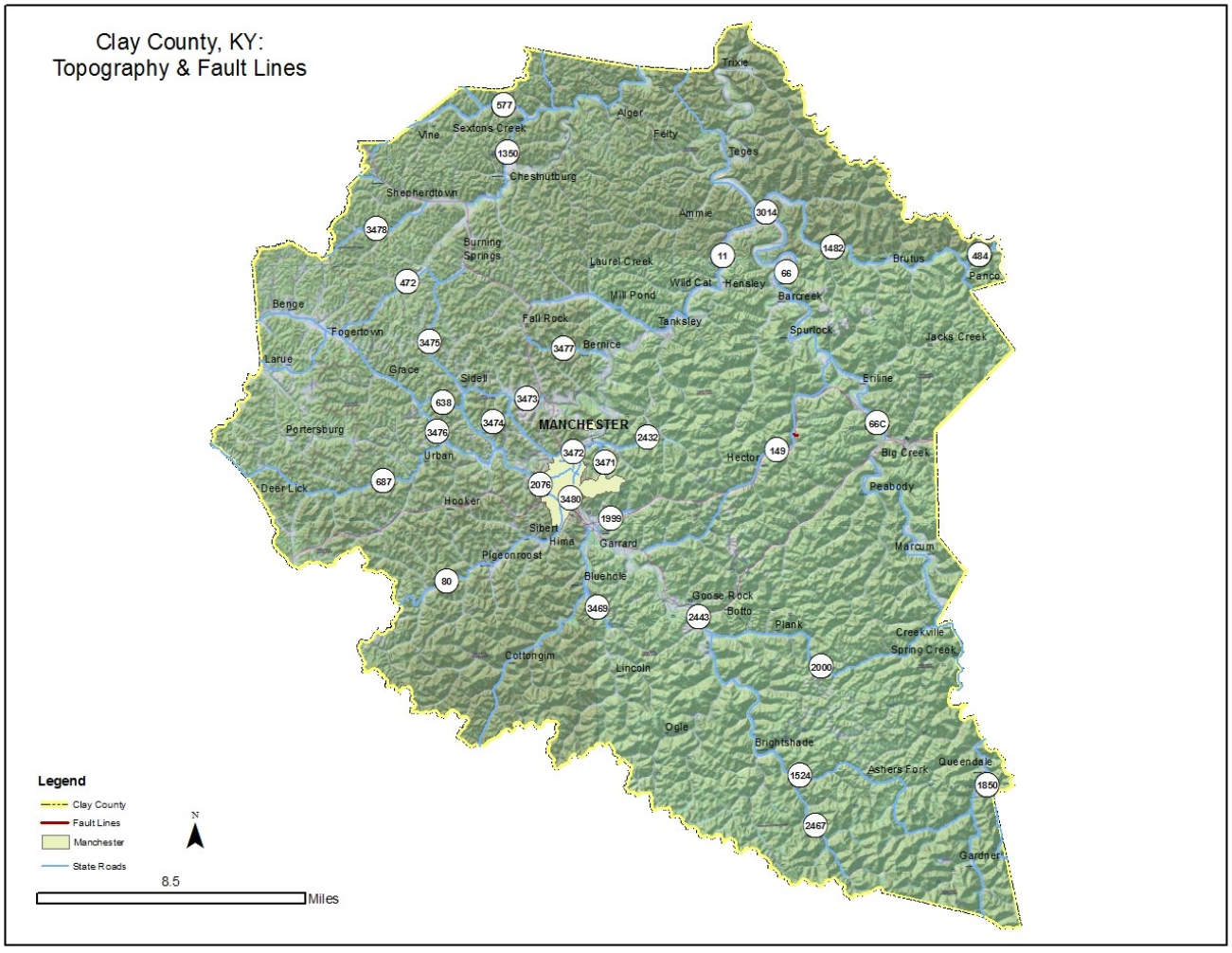
Manchester Landslides - Probability as Frequency of Event Occurrence

Incorporated Manchester independently experienced 7 landslide events within its city limits over 30 years. Therefore, Manchester experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 4.3 years (i.e., 7/30). Or, using December 31, 2021, as an endpoint, 7/360 months is 0.0194 events per month. 1/0.0194 = 51.55 ≈ 1 landslide event an average of every 52 months, or one every 4.3 years.

EARTHQUAKES

Earthquakes can happen any time of the year and without warning. The risk in Kentucky is higher in identified seismic zones such as the New Madrid Fault Zone in the western part of the state. Following is a list of USGS-recorded earthquakes in Clay County from the 1900s to January 31, 2018, with a map of fault lines in the county.

Clay County Historical Earthquakes 1/1/1900 – 1/31/2018				
Location	**Magnitude**	**Depth**	**Date**	**Time**
13 km SE of Oneida	2.0	14.3 km	8/26/2012	09:03:59 (UTC)
16 km E of Manchester	1.9	9.5 km	07/03/2012	08:11:11 (UTC)
12 km SSW of Manchester	2.0	1.9 km	10/16/2010	13:21:06 (UTC)
Source: USGS Earthquake Hazard Program				



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This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Clay County was about 46 persons in 2010 (the latest data available in Census Quickfacts[5]). This small population size and commensurate low density of structures suggest that the impact of an earthquake would be at the lower end of the range estimated for a given earthquake magnitude. The US Geological Survey states[6]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake occurred in 1960 off the coast of Chile and had a magnitude of 9.5.
Michigan Technological University's Earthquake Magnitude Scale[7] puts a number to the potential for damage:

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

Clay County has only had three earthquakes recorded in the USGS Earthquake Hazard Program database. All three earthquakes fell in the 2.5 or less magnitude on the Earthquake Magnitude Scale, which identifies the extent as "usually not felt, but can be recorded by seismograph". Since few earthquakes have occurred in Clay County, the occurrence of an earthquake of 5.5 or above in magnitude, where damage to structures typically begins, would be very rare.[8] There have been no recorded events at 5.5 or above on the Earthquake Magnitude Scale and thus there are no recorded past damages and impacts from earthquakes for Clay County and its incorporated city.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Clay County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Clay County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Clay County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Clay County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Clay County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Clay County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

CLAY COUNTY HAZARD MITIGATION GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

- Review budgets for mitigation projects, update as needed, and allot funds for such projects.
- Prevent future flood losses by stronger enforcement of NFIP ordinances.
- Designate someone other than Judge Executive/Mayor for the floodplain coordinator position.
- Regulate tree maintenance by ensuring proper trimming especially before winter storm season.

Objective(s):

1. Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally sensitive areas.

Goal #2 *Protect Clay County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

- Implement projects to correct and prevent landslides.
- Implement projects for warning citizens during severe weather events such as the installation of sirens and use of a ring down system.
- Implement projects to mitigate flooding including creating/widening channels so waters have a more direct outlet into streams from cities and communities.
- Seek funding for other flooding projects include acquisition/relocation of designated repetitive loss properties and other flood prone properties.

Objective(s):

1.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Clay County's most vulnerable populations and structures.

1.2 Decrease the number of FEMA-identified "repetitive loss properties."

1.3 Improve and monitor water utility infrastructure throughout Clay County and increase the number of water storage tanks.

Goal #3 *Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

- Provide education materials on landslides when citizens apply for building permits.
- Provide community education on new warning systems and routinely afterwards.
- Provide information on the need for flood insurance along with supporting statistics and benefits of NFIP participation.

Objective(s):

3.1 Increase the level of knowledge and awareness for Clay County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

Goals Correlation to Hazards			
Hazards	**Goal #1**	**Goal #2**	**Goal#3**
Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Emergency Power Supply- purchase 2 Cummins 80KW generators with trailer			✓		Currently in progress. Clay County is awaiting funding from a grant provided by Walmart.
Emergency Early Warning Siren – populates areas, events, Oneida Baptist Institute				✓	Has not been purchased. Continue to seek funding.
Safe Room Ramsey Ball Park				✓	Has not been built. Continue to seek funding.
Safe Room Rawlings & Stintson Park				✓	Has not been built. Continue to seek funding.
Safe Room Oneida Baptist Institute				✓	Has not been built. Continue to seek funding.
Ponders Branch drainage tile & gibbon's basket	✓				KYTC State Emergency funded project.
Marin McKinney Cemetery RD .03 miles of gabion baskets along creek line	✓				
Install new emergency early warning siren for the City of Manchester.			✓		One siren has been replaced. Continue to seek funding for more early warning sirens.

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and

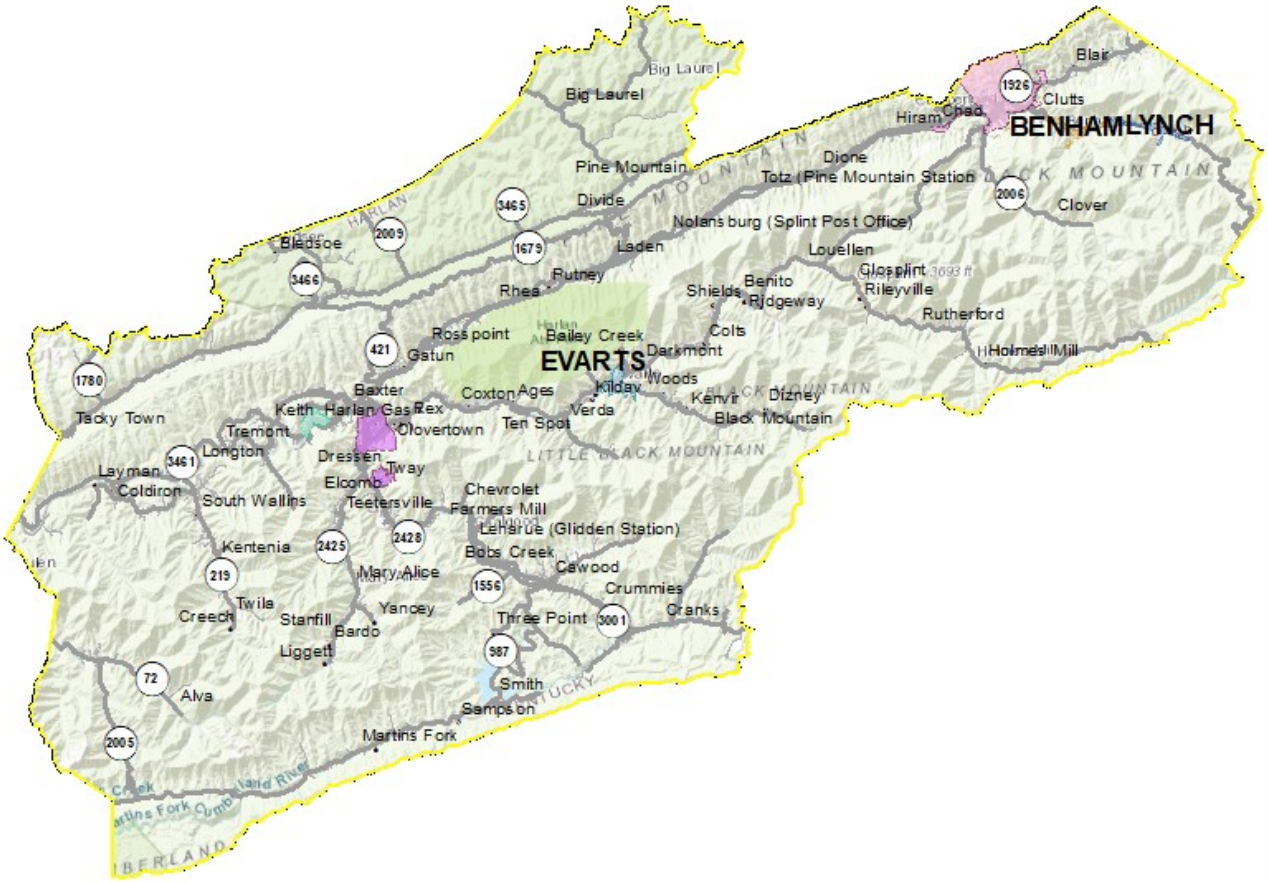
programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

CLAY COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Redbird Mission School only has one way to enter and exit it. There have been landslides issues in the past which has blocked entrance into the school causing the it to be cancelled. Complete engineering study to create mitigation strategies.	Landslides	County		X			Long Term	1	1	5	Grants	5
Purchase generator for Redbird Mission.	All Hazards	Redbird Mission		X			Long Term	2	3	5	Grants	5
The community of Island Creek has flooding issues. Six homes have flooded four times within the past two years. Acquire and or relocate the properties.	Flood	County	X				Long Term	1	1	5	Grants	3
Parking lot at Redbird Mission floods. Complete engineering study to better understand flooding issues.	Flood	Redbird Mission	X				Long Term	1	1	5	Grant/Capital	5
At Gilbert's Creek there is a low water bridge that floods. Elevate bridge.	Flood	County	X				Long Term	1	5	5	County & Grants	1
Near the Sugar Creek bridge the road floods. Complete engineering study to better understand flooding issues.	Flood	County	X				Short Term	1	5	5	County & Grants	1
Several water lines throughout the county cross creeks. Water line breaks are nearly	Winter Weather & Floods	City	X				Short Term	1	5	5	City & Grants	1

undetectable when occurring in streams and creeks. Elevate and or move water lines from crossing through creeks.												
The water utilities throughout the county are dated and old. Replace existing water lines.	Winter Weather	City	X				Short Term	1	5	5	City/Grant	1
Clay County residents experienced a water shortage due to low temperatures and water line breaks. Build bigger water towers and or a secondary water tower to store and supply more water to Clay County residents.	Winter Weather & Drought	City	X				Short Term	1	5	5	City/Grant	1
Several low water bridges throughout the county are dilapidated. Repair and or replace bridges.	Flood	County	X				Long Term	1	5	5	County	1
At Goose Rock the road continues to erode due to flooding. Complete an engineering study to resolve issue.	Flood	County		X			Long Term	1	1	5	County	5
Several roads within the County such as Chop Bottom Road, Buzzard Road, School House Road, and Red Bird Loop are low lying and have flooding issues. Complete an engineering study to resolve issues.	Flood	County		X			Long Term	1	1	5	County	5
At Memorial Drive near the Hospital the road freezes due to cold weather and water runoff. Complete an engineering study to resolve road issues.	Winter Weather	City		X			Long Term	1	1	5	City	5
Implement a ring down system for better communications during emergency situations.	All Hazards	County & City			X		Short Term	1	4	5	Grant	1
Increase the amount of emergency sirens within the	All Hazards	County & City			X		Short Term	1	4	5	Grant	1

County. Currently there is only one in the City of Manchester.												
Build substations for State and City Garages throughout the County to better serve the residents during disasters.	All Hazards	County & City		X			Long Term	1	1	5	County/City	5
Clean the trash and debris from the creeks and streams in Clay County.	Flood	County	X				Short Term	5	3	3	Grants	3
Purchase a portable generator for warming stations.	Winter Weather	County		X			Short Term	1	3	5	Grants	5
Purchase generators for critical facilities within the County.	All Hazards	County		X			Short Term	1	3	5	Grants	5
Acquire homes that are severe repetitive loss properties in the County.	Flood	County	X				Long Term	1	1	1	Grants	1
Complete engineering study for landslide mitigation projects on KY-11 and KY-66.	Landslide	State	X				Long Term	1	1	1	Grants	1
Laurel Branch bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Wiles Branch bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Martins Branch bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Wiles bridge 1 needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Danger Branch bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Long Branch bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Sacker Road Bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Ball's Branch bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Salmon's Bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1
Cap Baker Bridge needs repaired or replaced.	All Hazards	County	X				Short Term	1	1	5	Grants	1

Harlan County, KY:
Hazard Mitigation Overview



VII. HARLAN COUNTY OVERVIEW

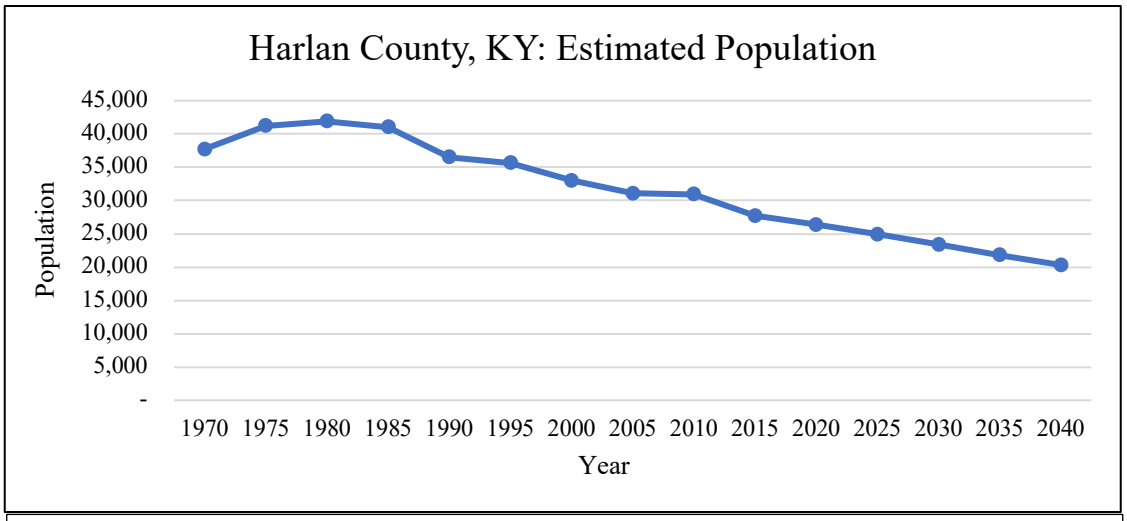
Harlan County is located in southeastern Kentucky and is one of the oldest of Kentucky's 120 counties. It has a rich and colorful history associated with the coal industry as many of the cities within Harlan County were established by coal companies. Coal was once a booming and lucrative industry for the county but has declined drastically since its heyday. The county is attempting to switch its focus from the coal industry to adventure tourism. Harlan County is home to the Black Mountain ATV Off Road Adventure, which includes 7,000 acres to explore and Portal 31, Kentucky's first exhibition coal mine.

Harlan County, KY: Quick Facts	
Total Population, July 1, 2019	26,010
Population per Square Miles, 2010	62.9
Land Area in Square Miles, 2010	465.83
Housing Units, July 1, 2016	13,469
Persons in Poverty, percent	37.1%
Median Value of Owner-Occupied Housing Units, 2011-2015	$52,700
Median Household Income, 2012-2016	$25,350
Total Employment, 2015	4,684
Total Employer Establishments, 2015	420
Source: U.S. Census Bureau	

HARLAN COUNTY POPULATION

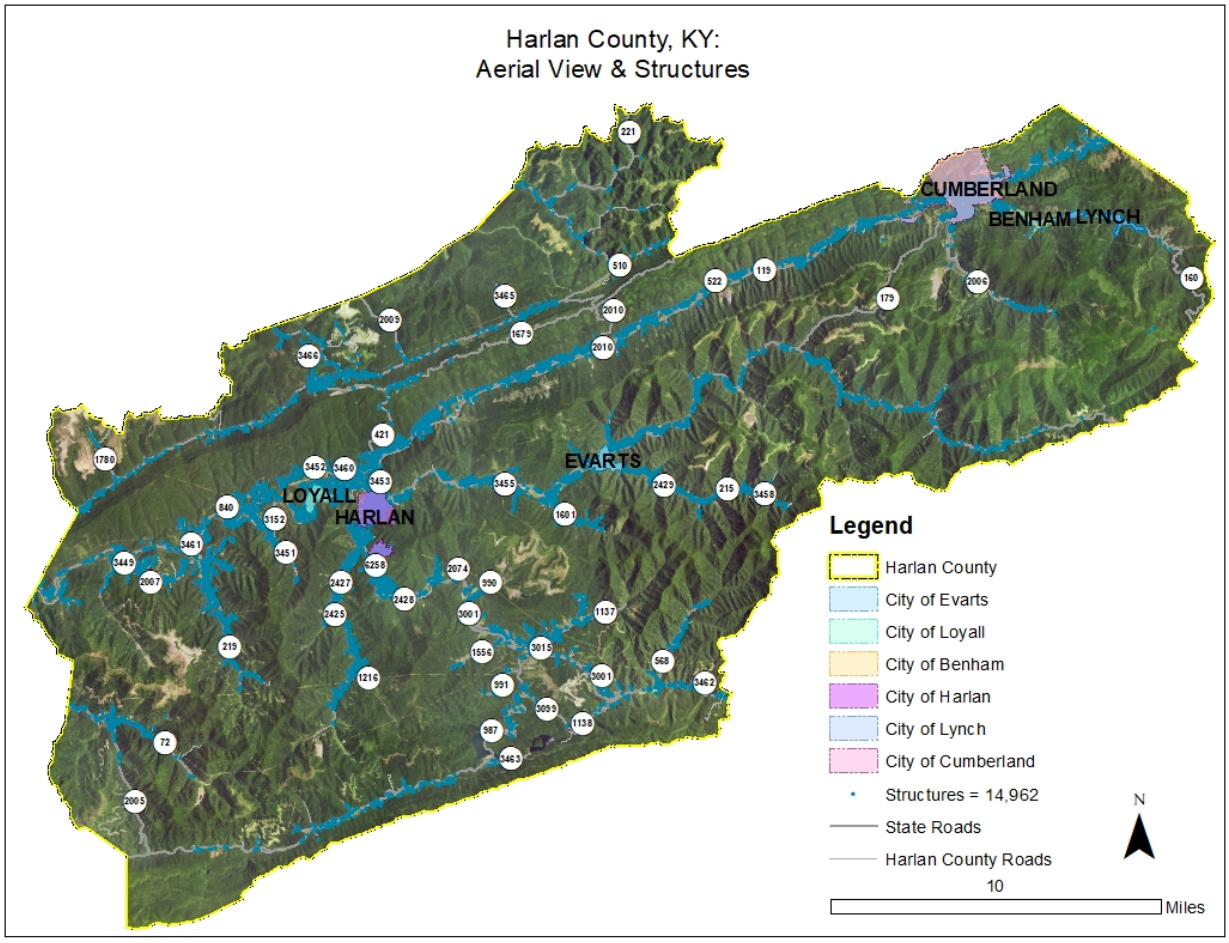
The total population for Harlan was 26,699 in 2019. Harlan County has six cities; Benham, Cumberland, Evarts, Harlan, which is the County seat, Loyall, and Lynch. The highest population recorded was in 1940 with 75,275, during the height of the coal industry. Between 2010 and 2020, Harlan County lost more than 10% of its population; it is projected to continue the downward trend.

Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Harlan County	28,715	27.613	26,699	7% fewer	
City of Benham	492	469	411	16% fewer	
City of Cumberland	2,186	2,096	1,724	21% fewer	
City of Evarts	872	846	686	21% fewer	
City of Harlan	1,705	1,634	1,447	15% fewer	
City of Loyall	676	650	585	13.5% fewer	
City of Lynch	734	706	553	25% fewer	
Source: U.S. Census Bureau					



Source: U.S. Census Bureau & KY State Data Center

According to the United States Census, there were 13,606 housing units located in Harlan County in 2019. The following map illustrates where the residential & commercial structures are located based on CVADD ArcGIS database.



COMMUNITY CAPABILITIES

Harlan County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Harlan County Fiscal Court is comprised of a Judge Executive and 5 Magistrates. The City of Benham, Cumberland, Evarts, Harlan, Loyall, and Lynch are all Home Rule class cities lead by a Mayor-Council government. Both the Fiscal Court and City Councils have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation.

Harlan County Plans & Programs									
	Planning Commission	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Harlan County			✓	✓	✓	✓	✓		✓
City of Benham			✓	✓	✓	✓	✓		✓
City of Cumberland			✓	✓	✓	✓	✓		✓
City of Evarts			✓	✓	✓	✓	✓		✓
City of Harlan			✓	✓	✓	✓	✓		✓
City of Loyall			✓	✓	✓	✓	✓		✓
City of Lynch			✓	✓	✓	✓	✓		✓

Harlan County, including all fire departments, finished their Community Wildlife Protection Plan and are working on their Firewise recognition status.

EMERGENCY MANAGEMENT

To prepare for future natural hazards Harlan County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Harlan County THIRA.

THIRA Hazard Ranking	
1	Flooding
2	Thunderstorm
3	Water Outage

The Harlan County Emergency Management also participates with the Local Emergency Planning Committee (LEPC) that meets quarterly and promotes emergency planning and preparedness. The LEPC

includes members from various professions and is open to the public. For more information about Harlan County's THIRA and LEPC meetings contact the Emergency Management Director.

HARLAN COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. The following chart summarizes the natural hazards that have had a negative impact on the people and places of Harlan County. These hazards were discussed and reviewed during the community meetings.

Rank	Natural Hazards
1	Flooding
2	Severe Thunderstorms
3	Severe Winter Weather
4	Landslides
5	Wildfire

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

FLOOD

The communities in Harlan County are located within the narrow valley bottoms near rivers and streams. Near the communities of Baxter, Martins Fork, and Poor Fork, the Poor and Clover forks converge into the Cumberland River. To protect the communities and cities in Harlan County a massive flood control project was started in the late 1980s. It took six years of construction that resulted in nine flood gates, levees, a three-pump water removal system and a way to reroute the Cumberland River out of the City of Harlan.

Below are tables relaying previous occurrences, locations, and impacts from flooding for Harlan County, Kentucky and for its incorporated cities. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Harlan County and for its unincorporated and incorporated cities.

The incorporated cities in Harlan County are Harlan, Cumberland, Lynch, and Evarts. In order to capture "Flood" and "Flash Flood" events specific to the incorporated city, the below table include all "Flood" and "Flash Flood" events having searched the entire date range of available data within the NCEI "Storm Events Database," i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of "probability"), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Harlan County and the incorporated cities, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard

mitigation plan further defines “probability” in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the “Flood” and “Flash Flood” events that were reported and subsequently recorded in the NCEI “Storm Events Database” are recorded for Harlan County as a “Zone.” These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience: “PrD” is “Property Damage Estimated Amount”; “CrD” is “Crop Damage Estimated Amount”; “Dth” is “Deaths Reported”; and “Inj” is “Injuries Reported”.

NOTE: The City of Benham did not have any flood events reported in the database.

TABLE 3-1: Harlan County "Flood" and "Flash Flood" Events, 1996-2020

NO.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0		
1	WALLINS CREEK	HARLAN CO.	KY	5/8/1996	9:30	EST	Flash Flood		0	0	5.00K	0.00K
2	CRANKS	HARLAN CO.	KY	11/30/1996	16:00	EST	Flash Flood		0	0	5.00K	0.00K
3	COUNTYWIDE	HARLAN CO.	KY	4/16/1998	20:45	EST	Flash Flood		0	0	5.00K	0.00K
	COUNTYWIDE	HARLAN CO.	KY	4/18/1998	22:00	EST	Flash Flood		0	0	20.00K	0.00K
3	HIGHSPLINT	HARLAN CO.	KY	4/3/2000	19:20	EST	Flash Flood		0	0	0.00K	0.00K
4	BLACK BOTTOM	HARLAN CO.	KY	6/14/2001	17:45	EST	Flash Flood		0	0	0.00K	0.00K
5	TOTZ	HARLAN CO.	KY	8/4/2001	2:06	EST	Flash Flood		0	0	10.00K	0.00K
6	COXTON	HARLAN CO.	KY	1/23/2002	21:30	EST	Flash Flood		0	0	0.00K	0.00K
	ELCOMB	HARLAN CO.	KY	1/24/2002	7:50	EST	Flash Flood		0	0	0.00K	0.00K
7	CLOSPLINT	HARLAN CO.	KY	3/17/2002	21:55	EST	Flash Flood		0	0	50.00K	0.00K
8	CLOSPLINT	HARLAN CO.	KY	3/6/2004	5:30	EST	Flash Flood		0	0	0.00K	0.00K
9	CLOSPLINT	HARLAN CO.	KY	5/31/2004	3:25	EST	Flash Flood		0	0	0.00K	0.00K
10	BAXTER	HARLAN CO.	KY	4/3/2007	20:45	EST-5	Flash Flood		0	0	0.00K	0.00K
11	WALLINS CREEK	HARLAN CO.	KY	6/18/2009	11:00	EST-5	Flash Flood		0	0	0.00K	0.00K

12	MOLUS	HARLAN CO.	KY	8/15/2009	17:15	EST-5	Flash Flood		0	0	0.00K	0.00K
13	CRANKS	HARLAN CO.	KY	12/9/2009	2:00	EST-5	Flood		0	0	0.00K	0.00K
14	POPEVILLE	HARLAN CO.	KY	5/3/2010	4:25	EST-5	Flood		0	0	0.00K	0.00K
15	LAYMAN	HARLAN CO.	KY	4/16/2011	5:10	EST-5	Flash Flood		0	0	0.00K	0.00K
	HARCROW	HARLAN CO.	KY	4/16/2011	5:10	EST-5	Flash Flood		0	0	0.00K	0.00K
No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
16	SAND HILL	HARLAN CO.	KY	1/30/2013	17:00	EST-5	Flood		0	0	0.00K	0.00K
	BOBS CREEK	HARLAN CO.	KY	1/30/2013	18:00	EST-5	Flood		0	0	0.00K	0.00K
	CRANKS	HARLAN CO.	KY	1/30/2013	20:00	EST-5	Flood		0	0	0.00K	0.00K
17	RIO VISTA	HARLAN CO.	KY	4/17/2013	8:50	EST-5	Flood		0	0	0.00K	0.00K
	CRANKS	HARLAN CO.	KY	4/17/2013	9:00	EST-5	Flash Flood		0	0	200.00K	0.00K
18	BLEDSOE	HARLAN CO.	KY	6/21/2016	21:30	EST-5	Flash Flood		0	0	500.00K	5.00K
19	CRANKS	HARLAN CO.	KY	4/22/2017	10:50	EST-5	Flash Flood		0	0	0.00K	0.00K
	CRANKS	HARLAN CO.	KY	4/23/2017	16:40	EST-5	Flood		0	0	0.00K	0.00K
	LAYMAN	HARLAN CO.	KY	4/23/2017	18:22	EST-5	Flood		0	0	0.00K	0.00K
20	TEETERSVILLE	HARLAN CO.	KY	5/27/2017	21:45	EST-5	Flash Flood		0	0	1.00K	0.00K
	MARY ALICE	HARLAN CO.	KY	5/28/2017	5:25	EST-5	Flood		0	0	1.00K	0.00K

21	CRANKS	HARLAN CO.	KY	2/10/2018	17:00	EST-5	Flood		0	0	500.00K	0.00K
22	COXTON	HARLAN CO.	KY	6/26/2018	12:54	EST-5	Flash Flood		0	0	25.00K	0.00K
23	VERDA	HARLAN CO.	KY	9/27/2018	16:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	KENTENIA	HARLAN CO.	KY	9/27/2018	16:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	BAXTER	HARLAN CO.	KY	9/27/2018	16:13	EST-5	Flood		0	0	5.00K	0.00K
24	SAND HILL	HARLAN CO.	KY	2/6/2020	9:31	EST-5	Flood		0	0	5.000M	0.00K
	Totals:								0	0	$1.332M	5.00K

Harlan County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

That Harlan County, unincorporated (and its unincorporated communities) independently experienced 28 flooding events over 25 years yields that Harlan County, unincorporated and its unincorporated cities, experienced (and thus can expect to experience in the future) an average frequency of one flooding event every eleven months (i.e. 28/25). Specifically, Harlan County, unincorporated and its unincorporated communities, experienced an average of 1.12 flooding events each year. Or, using December 31, 2020, as an endpoint, 28/300 months is 0.0933 events per month. 1/0.0933 = 10.7181 or about one flooding event an average of every eleven (11) months.

TABLE 3-2: City of Harlan Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/3/1997	7:00	EST	Flood		0	0	5.00K	0.00K
2	HARLAN (ZONE)	HARLAN (ZONE)	KY	4/17/1998	6:45	EST	Flood		0	0	0.00K	0.00K
3	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/18/2002	0:20	EST	Flood		0	0	0.00K	0.00K
4	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/16/2003	3:30	EST	Flood		0	0	365.55K	0.00K
5	HARLAN (ZONE)	HARLAN (ZONE)	KY	5/31/2004	9:45	EST	Flood		0	0	0.00K	0.00K
6	HARLAN	HARLAN CO.	KY	4/17/2013	8:50	EST-5	Flash Flood		0	0	1.000M	0.00K
7	HARLAN	HARLAN CO.	KY	10/23/2017	11:45	EST-5	Flood		0	0	0.00K	0.00K
	Totals:								0	0	$1.37055M	5.00K

City of Harlan Flooding - Probability as Frequency of Event Occurrence

The City of Harlan independently experienced seven (7) flooding events over 25 years. Thus the City of Harlan has experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every three (3) and a half years (i.e. 7/25).

TABLE 3-3: City of Cumberland Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	CUMBERLAND	HARLAN CO.	KY	2/10/2018	21:50	EST-5	Flood		0	0	0.00K	0.00K
2	CUMBERLAND	HARLAN CO.	KY	5/31/2004	3:32	EST	Flash Flood		0	0	0.00K	0.00K
3	CUMBERLAND	HARLAN CO.	KY	7/26/2020	20:05	EST-5	Flash Flood		0	0	10.00K	0.00K
	Totals:								0	0	$10K	0.00K

City of Cumberland Flooding - Probability as Frequency of Event Occurrence

The City of Cumberland independently experienced three (3) flooding events over 25 years, meaning that the City of Cumberland experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every eight (8) and a third years (i.e. 3/25).

TABLE 3-4: City of Lynch Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	LYNCH	HARLAN CO.	KY	5/6/2001	18:06	EST	Flood		0	0	0.00K	0.00K
2	LYNCH	HARLAN CO.	KY	2/11/2018	0:10	EST-5	Flood		0	0	0.00K	0.00K
	Totals:								0	0	$0.00K	$0.00K

City of Lynch Flooding - Probability as Frequency of Event Occurrence

The City of Lynch independently experienced two (2) flooding events over 25 years, meaning that the City of Lynch experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every twelve (12) and a half years (i.e. 2/25).

TABLE 3-5: City of Evarts Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	EVARTS	HARLAN CO.	KY	7/5/2000	18:40	EST	Flash Flood		0	0	0.00K	0.00K
2	EVARTS	HARLAN CO.	KY	3/4/2015	10:00	EST-5	Flood		0	0	1.00K	0.00K
	Totals:								0	0	$1K	0.00K

City of Evarts Flooding - Probability as Frequency of Event Occurrence

The City of Evarts independently experienced two (2) flooding events over 25 years, meaning that the City of Evarts experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every twelve (12) and a half years (i.e. 2/25).

PAST FLOOD EVENTS
(Harlan County) PAST FLOOD EVENTS

Harlan County residents still face the possibility of flooding even with the extensive flood control project completed in the county, including a flood wall in Pineville. In March 2002, four to five inches of rain fell during a 24-hour period with some isolated spots reporting six inches of precipitation. Nearly 250 homes along the Cumberland River were damaged. A mudslide sent one family's home over a 50ft embankment. In the flooded areas, emergency crews and rescue personnel helped with evacuations, many of which were conducted by boat.

The picture above shows flooding at the Dayhoit community.

In February 2018, Harlan County received around 5 inches of rain, pushing the Cumberland River to a crest of 22.6. Multiple emergency rescues were required throughout the event. More than a half dozen rescues were performed where people had driven their cars into flooded roadways. Multiple people had to be evacuated from areas on KY 413 in Baxter, Tremont, Dayhoit, and Blair.

The Red Cross set up a shelter at Harlan Baptist Church, Christ's Hands, the Courthouse, and a fire station at Benham. Flooding may cause fatalities or injuries, disrupt or destroy infrastructure (roads, bridges, culverts, water, wastewater, gas, electric), disrupt drinking water supplies, and cause erosion and landslides. Floods can occur anytime during the year and are Kentucky's most costly natural hazard. Reviewing past flood events can identify vulnerabilities within the county and cities enabling emergency management to better prepare for future disasters.

On February 6, 2020, a flood in the Baxter community of Harlan County swept a mobile home used for storage off its foundation (above). The NCEI Storm Events Database said of that date, "A local newspaper and citizens reported a couple of mobile homes being swept into the Cumberland River outside of Harlan as the river overspilled its banks. Approximately 70 homes were reported to have been impacted by flood waters across the county. Various streets, especially northeast of Harlan, were closed due to flood waters, including Kentucky Highway 413 from U.S. Highway 421 to Kentucky Highway 522. Portions of U.S. Highway 119 were also closed around Loyall and Baxter near the Cumberland River as major flood stage was reached. This forced the closure of flood gates in Harlan." Harlan County Judge Executive Dan Mosley said " '(the) National Weather Service data showed the river crest at Baxter as being the highest it has been at 25 feet since the 1977 flood.' He added crews at the Harlan pump station pumped more than 87 million gallons of water during the flood."[75] It also made several county roads impassable (see photo below).[76]

[75] "Floodwaters swept trailer off foundation in Harlan County". February 6, 2020. WYMT-TV. Retrieved on 2-8-2022 from Watch: Floodwaters swept trailer off foundation in Harlan County (wymt.com).

[76]"County hit by flooding". February 7, 2020. Harlan Enterprise. Retrieved on 2-8-2022 from County hit by flooding - Harlan Enterprise | Harlan Enterprise.

On the morning of October 23, 2017, "widespread showers moved across eastern Kentucky…ahead of a cold front. Isolated heavy rain showers caused localized flooding and gusty winds in Harlan. Local media reported localized urban flooding in Harlan as 2 to 2.5 inches of rain fell.[77]

Cumberland and Lynch, towns which are in close proximity to each other along KY 160 and Looney Creek, both flooded during an event beginning Feb. 9, 2018, with flooding going into Feb. 11, 2018. "The hardest hit area was Harlan County, where flooding occurred across much of the county as up to 5.5 inches of rain fell. A state of emergency was declared as the Cumberland River at Baxter reached major flood stage, prompting the closure of all of the city of Harlan's floodgates…Kentucky Highway 160 was closed through Lynch due to flooding. A written state of emergency was declared for Harlan County during the height of the flooding." [78]

Below are the details of flooding extents for Harlan County and its incorporated municipalities.

[77] "Storm Events Database Event Details – Harlan, KY, 2017-10-23". NCEI. Retrieved on 4-6-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).
[78] "Storm Events Database Event Details – Lynch, KY, 2018-2-11". NCEI. Retrieved on 4-6-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Harlan County, Unincorporated Flooding and Flash-Flooding Events with Narratives for Extent and Impacts, 1996-2021

Count	County	Location	Date	Type	Event Narrative
1	HARLAN CO.	WALLINS CREEK	5/8/1996	Flash Flood	
2	HARLAN CO.	CRANKS	11/30/1996	Flash Flood	
3	HARLAN CO.	COUNTYWIDE	4/16/1998	Flash Flood	
	HARLAN CO.	COUNTYWIDE	4/18/1998	Flash Flood	
4	HARLAN CO.	HIGHSPLINT	4/3/2000	Flash Flood	Heavy rains produced flash flooding in several areas around the county. Portions of KY-38 were washed out near Highsplint. Rockslides closed portions of KY-2005 near Pathfork and HWY-421 near Pine Mountain. Several other roads were also closed due to wash-outs or rock slides.
5	HARLAN CO.	PUTNEY	7/14/2000	Flood	Mudslide reported near Putney.
6	HARLAN CO.	BLACK BOTTOM	6/14/2001	Flash Flood	Heavy rains caused 4 inches of water and debris to flow over Kentucky Route 179.
7	HARLAN CO.	TOTZ	8/4/2001	Flash Flood	Three homes were flooded as Kentucky Highway 522 was covered with water.
8	HARLAN CO.	COXTON	1/23/2002	Flash Flood	Kentucky highway 38 was closed when reported to be flooded at the site of a bridge.
	HARLAN CO.	ELCOMB	1/24/2002	Flash Flood	Catrons Creek was out of its banks. Water was reported in four homes along Kentucky highway 72. Water also covered Kentucky highway 72 itself.
9	HARLAN CO.	CLOSPLINT	3/17/2002	Flash Flood	Heavy rains that fell on March 17 and March 18 caused several evacuations as well as numerous road closures across much of Harlan County. 12 hour rainfall amounts exceeded three inches.
10	HARLAN CO.	CLOSPLINT	3/6/2004	Flash Flood	
11	HARLAN CO.	CLOSPLINT	5/31/2004	Flash Flood	
12	HARLAN CO.	BAXTER	4/3/2007	Flash Flood	Three inches of flowing water on Highway 421 at Baxter.
13	HARLAN CO.	WALLINS CREEK	6/18/2009	Flash Flood	Five feet of water was reported on Back Street near the post office at Wallins Creek.
14	HARLAN CO.	MOLUS	8/15/2009	Flash Flood	Water was reported flowing over a bridge near Highway 221 and Highway 1785. A large mudslide occurred just north of the flooding blocking Highway 221.
15	HARLAN CO.	CRANKS	12/9/2009	Flood	Highway 421 was closed for a couple of hours due to flooding.
16	HARLAN CO.	POPEVILLE	5/3/2010	Flood	The Kentucky State Police reported that flood water from a creek was over both lanes of US Hwy 421 near the Cawood area.

Count	County	Location	Date	Type	Event Narrative

Count	County	Location	Date	Type	Event Narrative
17	HARLAN CO.	HARCROW	4/16/2011	Flash Flood	There was a foot of water flowing over both lanes of Hwy 38 in Evarts.
	HARLAN CO.	LAYMAN	4/16/2011	Flash Flood	There was 6 inches of water flowing over highway 119 in Wallins Creek.
18	HARLAN CO.	BOBS CREEK	1/30/2013	Flood	Highway 1556 was closed due to high water.
	HARLAN CO.	CRANKS	1/30/2013	Flood	Highway 421 near Cranks was closed for a time due to flooding.
	HARLAN CO.	SAND HILL	1/30/2013	Flood	Water was reported across Hwy 160 southwest of Cumberland.
19	HARLAN CO.	CRANKS	4/17/2013	Flash Flood	Highway 421 was flooded near Cranks.
	HARLAN CO.	RIO VISTA	4/17/2013	Flood	Highway 119 in Baxter had one lane blocked due to flood water.
20	HARLAN CO.	BLEDSOE	6/21/2016	Flash Flood	Law enforcement reported several instances of significant flash flooding between Bledsoe and Baxter. Radar estimates and rain gauges indicated 3 to 6 inches of rain fell across Harlan County, with one cooperative observer 3 miles north of Harlan measuring 6.02 inches of rain. Considerable property damage was incurred, including that to between 75 to 100 homes as well as several fences and yards. Some homes in Bledsoe ended up with 3 to 4 feet of water inside of them. Roads and small bridges along U.S. Highway 421 were washed away as creeks spilled over their banks. Roads were further hampered by a rock/mud slide at U.S. Highway 119 and Sukey Ridge Rd outside of Baxter. The Kentucky State Emergency Operations Center received requests for assistance and resources from county officials as written declarations were also composed. American Red Cross teams were mobilized to Harlan County, providing food and water to residents.
21	HARLAN CO.	CRANKS	4/22/2017	Flash Flood	Emergency Management officials reported water swiftly flowing over roadways from Cranks to Smith as around two inches of rain fell.
	HARLAN CO.	CRANKS	4/23/2017	Flood	Emergency management reported water from Cranks Creek spilling over onto U.S. Highway 421 in Cranks, along with water from Martins Fork flowing over Kentucky Highway 987 in Smith.
	HARLAN CO.	LAYMAN	4/23/2017	Flood	Law enforcement observed shallow water flowing over Kentucky Highway 221 near the intersection with Kentucky Highway 1780 near Tacky Town.
22	HARLAN CO.	TEETERSVILLE	5/27/2017	Flash Flood	A foot of water was observed flow across Hwy 72 near the junction of Hwy 2425.
	HARLAN CO.	MARY ALICE	5/28/2017	Flood	West Hwy 72 just past mile marker 6 was completely under water, near the intersection of KY Hwy 1216.
23	HARLAN CO.	CRANKS	2/10/2018	Flood	Numerous roads in Cranks, Evarts, and Harlan and elsewhere around the county were closed or impassable due to flooding. A written state of emergency was declared for Harlan County during the height of the flooding.
24	HARLAN CO.	COXTON	6/26/2018	Flash Flood	A local media outlet reported flash flooding from near Coxton to Ages, as well as in Jones Creek where flowing water approached homes and carried away vehicles and culverts.

Count	County	Location	Date	Type	Event Narrative
25	HARLAN CO.	BAXTER	9/27/2018	Flood	Local broadcast media and dispatch relayed reports of nearly 3 feet of standing water in a poor drainage area on Duffield Street in Harlan. Farther southwest of Harlan, runoff caused Little Creek in Crawford Branch to develop a swift enough current to wash out a culvert on a driveway on Kentucky Highway 2425.
	HARLAN CO.	KENTENIA	9/27/2018	Flash Flood	The Kentucky Department of Highways reported half a foot of flowing water across portions of Camp Creek Road in Camp Branch southwest of Harlan.
	HARLAN CO.	VERDA	9/27/2018	Flash Flood	The Department of Highways reported water flowing over Caywood Branch Road east of Harlan.
26	HARLAN CO.	SAND HILL	2/6/2020	Flood	A local newspaper and citizens reported a couple of mobile homes being swept into the Cumberland River outside of Harlan as the river overspilled its banks. Approximately 70 homes were reported to have been impacted by flood waters across the county. Various streets, especially northeast of Harlan, were closed due to flood waters, including Kentucky Highway 413 from U.S. Highway 421 to Kentucky Highway 522. Portions of U.S. Highway 119 were also closed around Loyall and Baxter near the Cumberland River as major flood stage was reached. This forced the closure of flood gates in Harlan.
27	HARLAN CO.	BAXTER	3/28/2021	Flash Flood	Officials were in the process of closing one lane of Hwy 119 due to high water over the road.
	HARLAN CO.	CRANKS	3/28/2021	Flood	Pictures on social media showed water surrounding a house in the Cranks community.
	HARLAN CO.	ELCOMB	3/28/2021	Flash Flood	Yards were reported flooded and water was surrounding some homes in the Elcomb community of Harlan County.
	HARLAN CO.	TEETERSVILLE	3/28/2021	Flood	Hwy 72 near Caball Estates in the Catrons Creek community is impassable according to pictures posted to social media.

City of Benham Flooding and Flash-Flooding Events, 1996-2021 and Event Narratives for Extent

(Source: NCEI Storm Events Database)

County	Location	Date	Type	Deaths (Direct)	Injuries (Direct)	Property Damage	Crop Damage	Injuries (Direct)	Deaths (Direct)	Event Narrative
Harlan	Benham	N/A[79]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Using the best available data source that is universally applicable to all jurisdictions comprising the Cumberland Valley Area Development District, i.e., the National Center for Environmental Information's Storm Events database that mirrors the data collected by the National Weather Service, the City of Benham has not had a flooding or flash-flooding event recorded throughout the entire range of available data (1996-2021). Thus, the City of Benham does have a value to measure extent of how bad flooding and flash-flooding can get, cannot calculate a probability of future occurrences, and does not have impacts (damages) to share.

[79] N/A here means "Not Available" rather than "Not Applicable."

City of Cumberland Flooding and Flash-Flooding Events with Narratives for Extent and Impacts, 1996-2021

Count	County	Location	Date	Type	Event Narrative
1	HARLAN CO.	CUMBERLAND	5/31/2004	Flash Flood	
2	HARLAN CO.	CUMBERLAND	2/10/2018	Flood	Many roads in and around Cumberland were covered with water, including Main Street near Highway 119. (Main Street near U.S. Highway 119 has an elevation 1,493 feet. See: https://elevation.maplogs.com/poi/e_main_st_cumberland_ky_usa.72496.html.) A written state of emergency was declared for Harlan County during the height of the flooding.
3	HARLAN CO.	CUMBERLAND	7/26/2020	Flash Flood	Two to three inches of rain fell in the Cumberland community of Harlan County. City police reported high water across a handful of streets in the community, including multiple road closures. College road along the south side of town was among those listed. The police department also reported that one of their police cruisers was stuck in the flood waters and would not start.

Using the best available data source that is universally applicable to all jurisdictions comprising the Cumberland Valley Area Development District, i.e., the National Center for Environmental Information's Storm Events database that mirrors the data collected by the National Weather Service, the City of Cumberland has had three (3) discrete flooding or flash-flooding events recorded throughout the entire range of available data (1996-2021).

Neither of the three (3) discrete events had data recorded that would provide an obvious measure or illustration of how bad flooding can get (i.e., extent). Thus, to approximate "extent," it is illustrative that Kentucky's WKYT reported that Harlan County declared a state-of-emergency for the February 10-11, 2018 flooding event. In its reporting, it quoted the judge/executive of Harlan County that informed it that many bodies of water had surpassed flood stage. See: https://www.wkyt.com/content/news/State-of-emergency-issued-in-Harlan-County-after-flooding-473705663.html. To make a more obvious connection, a major body of water that affects the City of Cumberland is the Cumberland River. The Cumberland River near Harlan, Kentucky, according to the USGS National Water Information System, has a gage height of 3.68 feet (See: https://waterdata.usgs.gov/ky/nwis/current/?type=flow&group_key=basin_cd&search_site_no_station_nm=Harlan&site_no_name_select=station_nm). Thus, that on February 10, 2018, the City of Cumberland experienced road overtopping by floodwaters and knowing that the judge/executive for Harlan County acknowledged that bodies of water had surpassed flood stage, it can be assumed that for the February 10, 2018 event, the City of Cumberland experienced over 3.68 feet of water.

City of Evarts Flooding and Flash-Flooding Events with Narratives for Extent and Impacts, 1996-2021

Count	County	Location	Date	Type	Event Narrative
1	HARLAN CO.	EVARTS	7/5/2000	Flash Flood	Flash flooding caused water to flow over KY Highway 215 to the depth of 2 feet. The road was closed until the water subsided.
2	HARLAN CO.	EVARTS	3/4/2015	Flood	The Clover Fork left its banks and sent about a foot of water flowing across Kelly Street. The street had to be temporarily closed.
3	HARLAN CO.	EVARTS	3/28/2021	Flash Flood	Officials were in the process of closing Kelly Street in the community of Evarts due to high water from Turners Branch making the road impassable.

City of Harlan Flooding and Flash-Flooding Events with Narratives for Extent and Impacts, 1996-2021

Count	County	Location	Date	Type	Event Narrative
1	HARLAN (ZONE)		3/3/1997	Flood	
2	HARLAN (ZONE)		4/17/1998	Flood	
3	HARLAN (ZONE)		3/18/2002	Flood	
4	HARLAN (ZONE)		2/16/2003	Flood	At 0900 EST, February 16, the Cumberland River crested at 20.0 feet at Baxter, which is 4.0 feet above flood stage.
5	HARLAN (ZONE)		5/31/2004	Flood	
6	HARLAN CO.	HARLAN	4/17/2013	Flash Flood	A foot of water flowed over May Street. A couple of mudslides and a flooded business were reported in the Middle of Harlan as well. Substantial damage was done to roads across the county, mainly from urban and small stream flooding and from ditches washing out.
7	HARLAN CO.	HARLAN	10/23/2017	Flood	Local media reported localized urban flooding in Harlan as 2 to 2.5 inches of rain fell.

City of Loyall Flooding and Flash-Flooding Events, 1996-2021 and Event Narratives for Extent

(Source: NCEI Storm Events Database)

County	Location	Date	Type	Deaths (Direct)	Injuries (Direct)	Property Damage	Crop Damage	Injuries (Indirect)	Deaths (Indirect)	Event Narrative
Harlan	Loyall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Using the best available data source that is universally applicable to all jurisdictions comprising the Cumberland Valley Area Development District, i.e., the National Center for Environmental Information's Storm Events database that mirrors the data collected by the National Weather Service, the City of Loyall has not had a flooding or flash-flooding event recorded throughout the entire range of available data (1996-2021). Thus, the City of Loyall does have a value to measure extent of how bad flooding and flash-flooding can get, cannot calculate a probability of future occurrences, and does not have impacts (damages) to share.

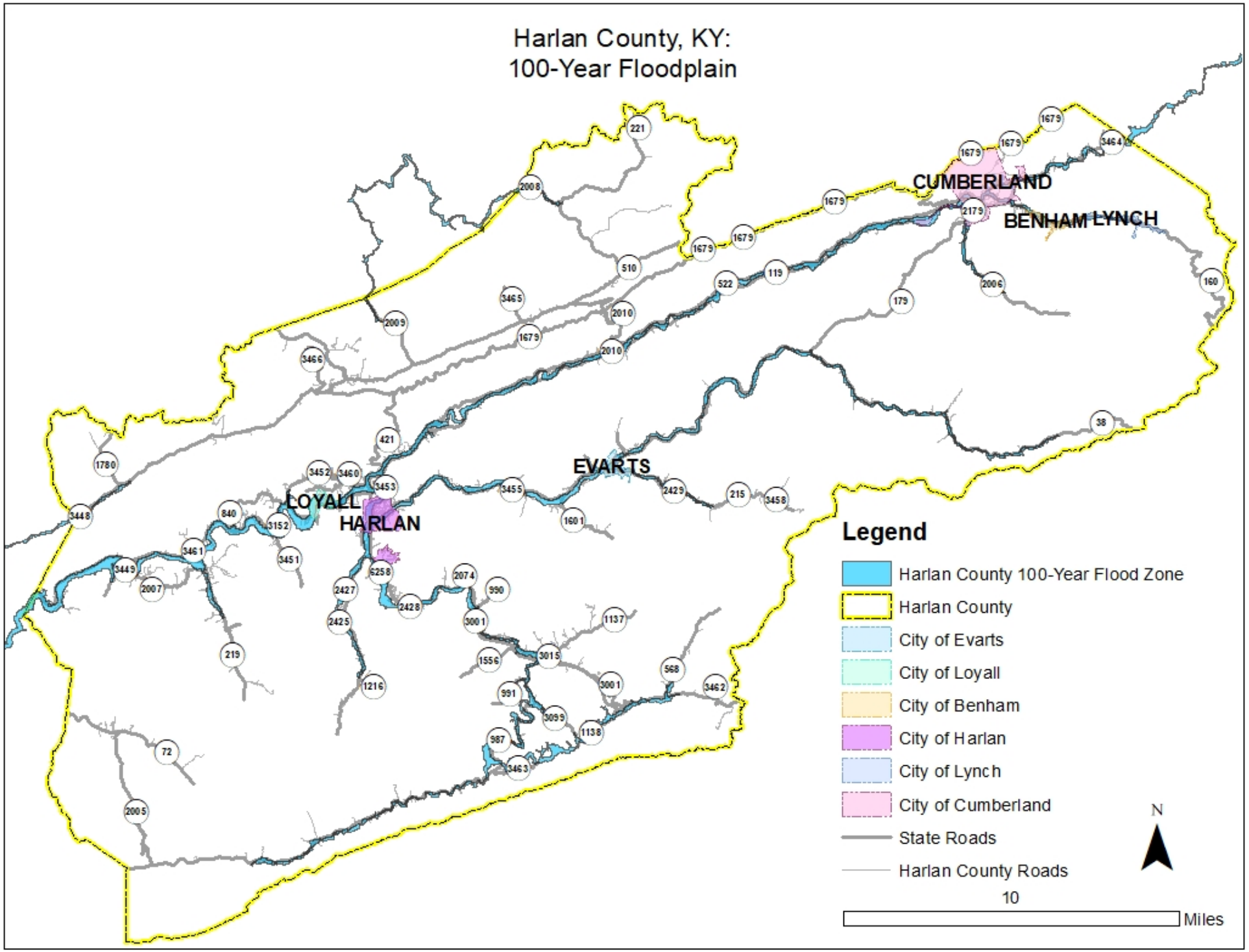
City of Lynch Flooding and Flash-Flooding Events with Narratives for Extent and Impacts, 1996-2021

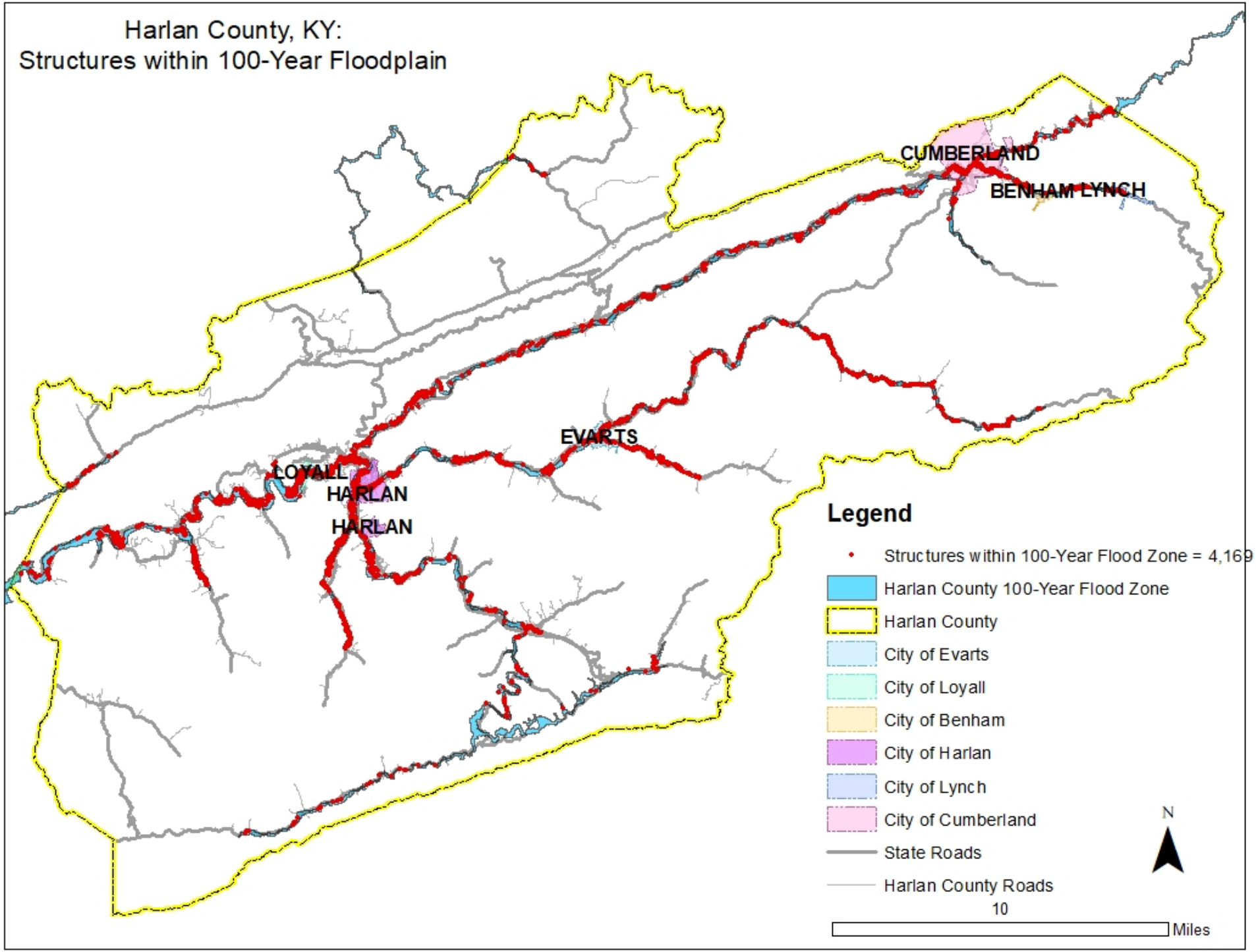
Count	County	Location	Date	Type	Event Narrative
1	HARLAN CO.	LYNCH	5/6/2001	Flood	Rockslides were reported on Kentucky Highway 160 near Black Mountain.
2	HARLAN CO.	LYNCH	2/11/2018	Flood	Kentucky Highway 160 was closed throughout Lynch due to flooding. (KY-160 in Lynch is at an elevation of 1,772 feet. See: https://elevation.maplogs.com/poi/e_main_st_cumberland_ky_usa.72496.html and search for "KY-160, Lynch, KY".) A written state of emergency was declared for Harlan County during the height of the flooding.

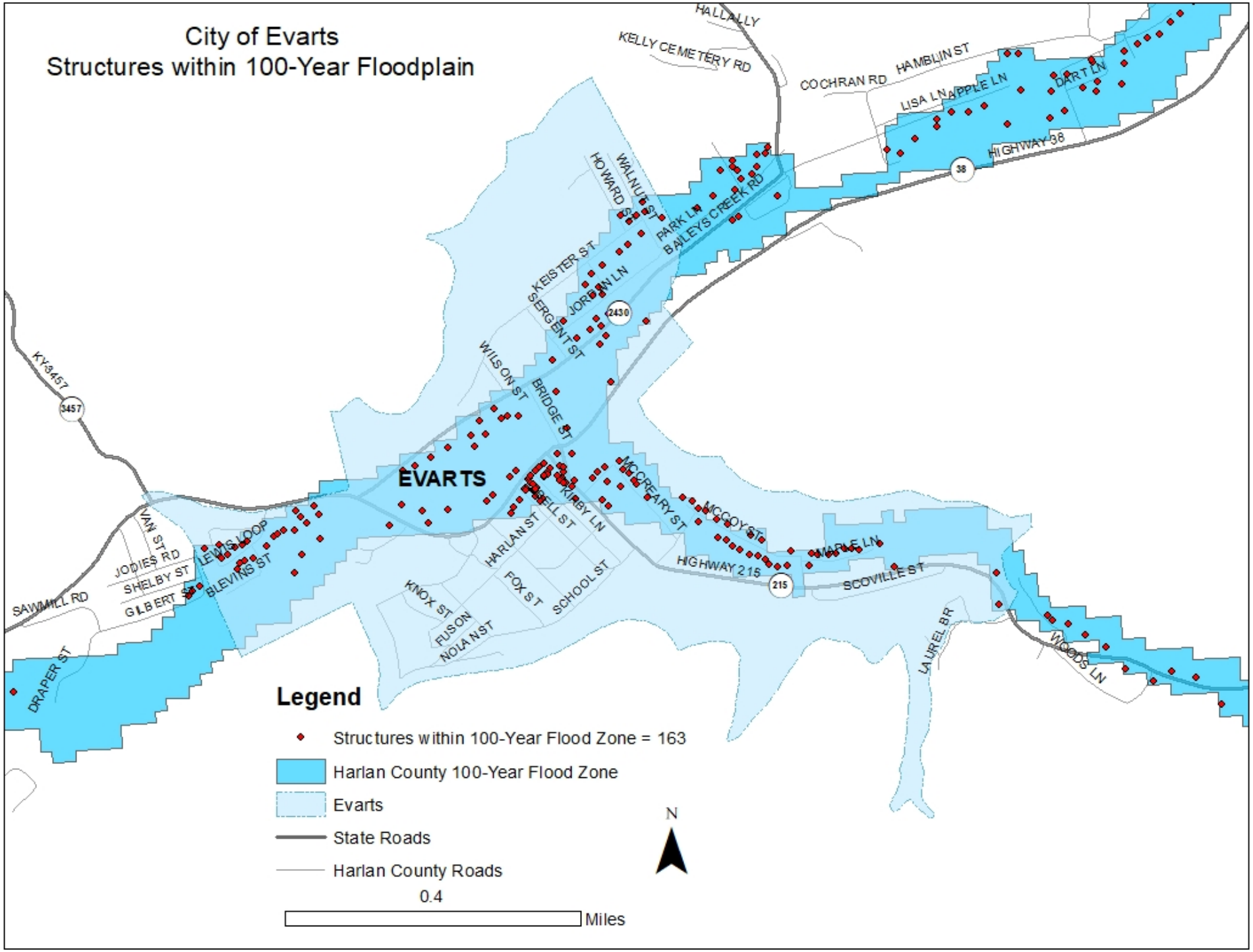
Using the best available data source that is universally applicable to all jurisdictions comprising the Cumberland Valley Area Development District, i.e., the National Center for Environmental Information's Storm Events database that mirrors the data collected by the National Weather Service, the City of Lynch has had two discrete flooding or flash-flooding events recorded throughout the entire range of available data (1996-2021).

Neither of the two (2) discrete events had data recorded that would provide an obvious measure or illustration of how bad flooding can get (i.e., extent). Thus, to approximate "extent," it is illustrative that Kentucky's WKYT reported that Harlan County declared a state-of-emergency for the February 10-11, 2018 flooding event. In its reporting, it quoted the judge/executive of Harlan County that informed it that many bodies of water had surpassed flood stage. See: https://www.wkyt.com/content/news/State-of-emergency-issued-in-Harlan-County-after-flooding-473705663.html. To make a more obvious connection, a major body of water that affects the City of Lynch is the Cumberland River. The Cumberland River near Harlan, Kentucky, according to the USGS National Water Information System, has a gage height of 3.68 feet (See: https://waterdata.usgs.gov/ky/nwis/current/?type=flow&group_key=basin_cd&search_site_no_station_nm=Harlan&site_no_name_select=station_nm). Thus, that on February 11, 2018, the City of Lynch experienced road overtopping by floodwaters and knowing that the judge/executive for Harlan County acknowledged that bodies of water had surpassed flood stage, it can be assumed that for the February 11, 2018 event, the City of Lynch experienced over 3.68 feet of water.

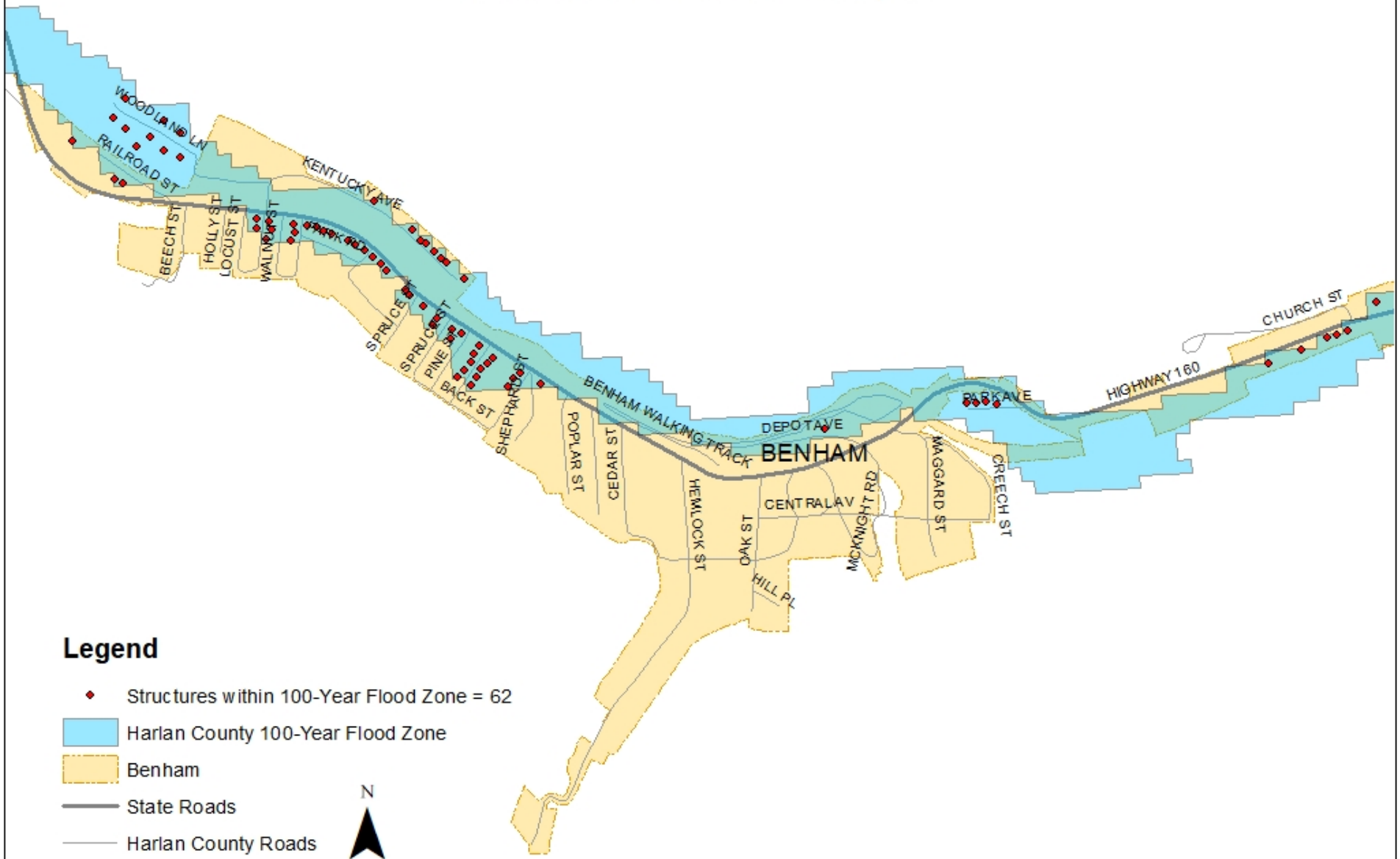
The following maps display the 100-year-flood as it would occur without the flood mitigation measures used within the county and cities. The floodwall, diverted waterways, and pumps are not calculated in the floodplain analysis.

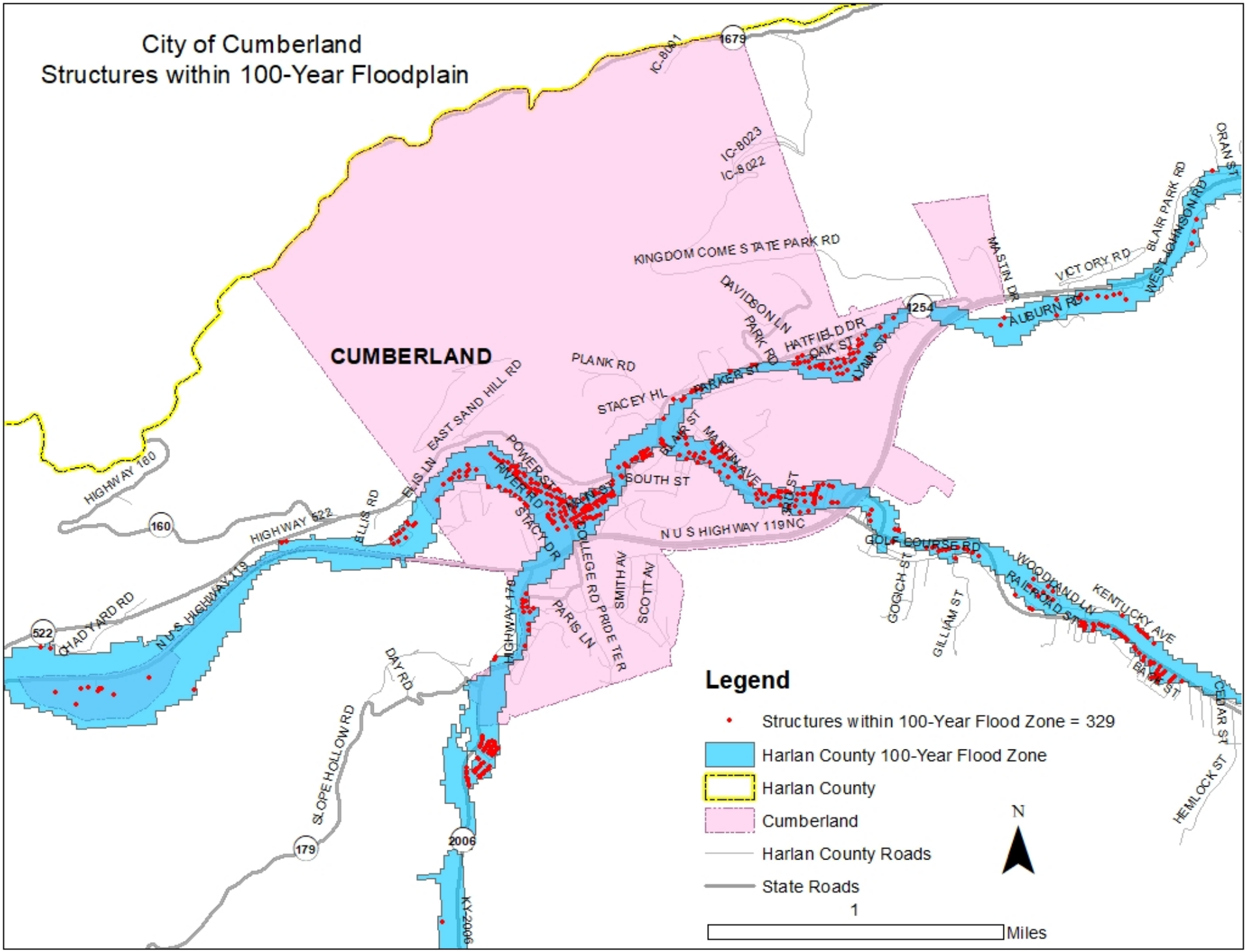

Harlan County, KY:
100-Year Floodplain
CUMBERLAND
BENHAM
LYNCH
EVARTS
LOYALL
HARLAN
Legend
Harlan County 100-Year Flood Zone
Harlan County
City of Evarts
City of Loyall
City of Benham
City of Harlan
City of Lynch
City of Cumberland
State Roads
Harlan County Roads
N
10
Miles

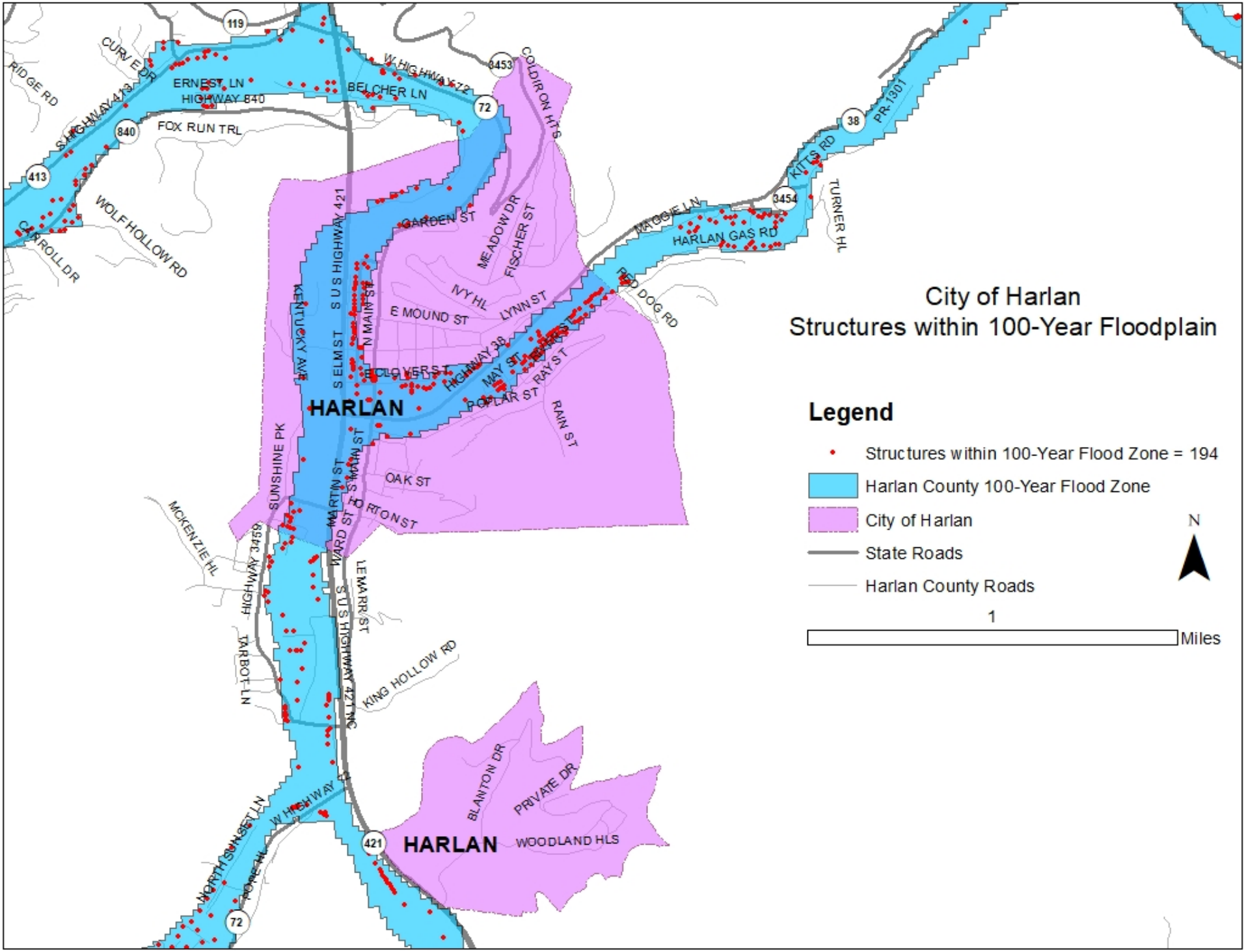

Harlan County, KY:
Structures within 100-Year Floodplain
CUMBERLAND
BENHAM
LYNCH
EVARTS
LOYALL
HARLAN
HARLAN
Legend
Structures within 100-Year Flood Zone = 4,169
Harlan County 100-Year Flood Zone
Harlan County
City of Evarts
City of Loyall
City of Benham
City of Harlan
City of Lynch
City of Cumberland
State Roads
Harlan County Roads
N
10
Miles


City of Evarts
Structures within 100-Year Floodplain
HALLALLY
KELLY CEMETERY RD
COCHRAN RD
HAMBLIN ST
LISA LN
APPLE LN
DART LN
HIGHWAY 38
38
HOWARD ST
WALNUT ST
PARK LN
BAILEYS CREEK RD
KEISTER ST
SERGENT ST
JORDAN LN
2430
WILSON ST
BRIDGE ST
KY-3457
3457
EVARTS
KIRBY LN
MCCREARY ST
MCCOY ST
MAPLE LN
HIGHWAY 215
215
SCOVILLE ST
VAN ST
JODIES RD
SHELBY ST
GILBERT ST
LEWIS LOOP
BLEVINS ST
SAWMILL RD
HARLAN ST
KNOX ST
FUSON
NOLA ST
FOX ST
SCHOOL ST
DRAPER ST
LAUREL BR
WOODS LN
Legend
Structures within 100-Year Flood Zone = 163
Harlan County 100-Year Flood Zone
Evarts
State Roads
Harlan County Roads
N
0.4
Miles

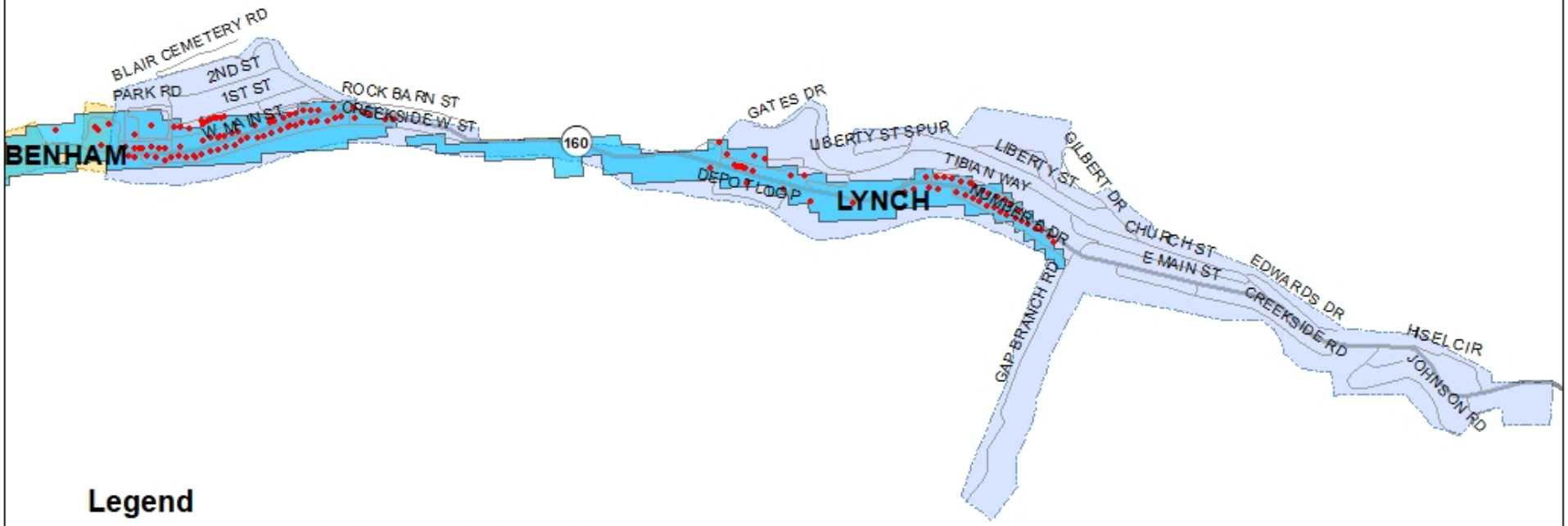
City of Benham
Structures within 100-Year Floodplain




City of Cumberland
Structures within 100-Year Floodplain
CUMBERLAND
KINGDOM COME STATE PARK RD
DAVIDSON LN
PARK RD
PLANK RD
EAST SAND HILL RD
STACEY HL
HATFIELD DR
OAK ST
LYNN ST
PARKER ST
MASTIN DR
VICTORY RD
AUBURN RD
BLAIR PARK RD
WEST JOHNSON RD
ORAN ST
1254
1679
IC-8021
IC-8023
IC-8022
HIGHWAY 160
160
ELLIS LN
ELLIS RD
HIGHWAY 522
522
POWER ST
RIVER RD
STACY DR
BLAIR ST
MAIN ST
MARTIN AVE
SOUTH ST
N U S HIGHWAY 119NC
COLLEGE RD
PRIDE TER
PARIS LN
SMITH AV
SCOTT AV
HIGHWAY 179
GOLF COURSE RD
GOGICH ST
GILLIAM ST
RAILROAD ST
WOODLAND LN
KENTUCKY AVE
BANK ST
CEDAR ST
HEMLOCK ST
CHADYARD RD
N U S HIGHWAY 119
DAY RD
SLOPE HOLLOW RD
179
2006
KY-2006
Legend
Structures within 100-Year Flood Zone = 329
Harlan County 100-Year Flood Zone
Harlan County
Cumberland
Harlan County Roads
State Roads
N
1
Miles


City of Harlan
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 194
Harlan County 100-Year Flood Zone
City of Harlan
State Roads
Harlan County Roads
N
1
Miles
HARLAN
HARLAN
119
840
413
72
3453
38
3454
421
3459
CURVE DR
RIDGE RD
ERNEST LN
HIGHWAY 840
FOX RUN TRL
BELCHER LN
W HIGHWAY 72
COLDIRON HTS
PR 1301
KITTS RD
TURNER HL
MAGGIE LN
HARLAN GAS RD
CARROLL DR
WOLF HOLLOW RD
GARDEN ST
MEADOW DR
FISCHER ST
IVY HL
E MOUND ST
LYNN ST
RED DOG RD
KENTUCKY AVE
S US HIGHWAY 421
N MAIN ST
S ELM ST
E CLOVER ST
HIGHWAY 38
MAY ST
POPLAR ST
RAY ST
RAIN ST
SUNSHINE PK
MARTIN ST
WARD ST
S MAIN ST
OAK ST
HORTON ST
MCKENZIE HL
HIGHWAY 3459
TARBOT LN
LEMARR ST
S US HIGHWAY 421 NS
KING HOLLOW RD
BLANTON DR
PRIVATE DR
WOODLAND HLS
W HIGHWAY 72
NORTH SUNSET LN
POPE HL

City of Lynch
Structures within 100-Year Floodplain



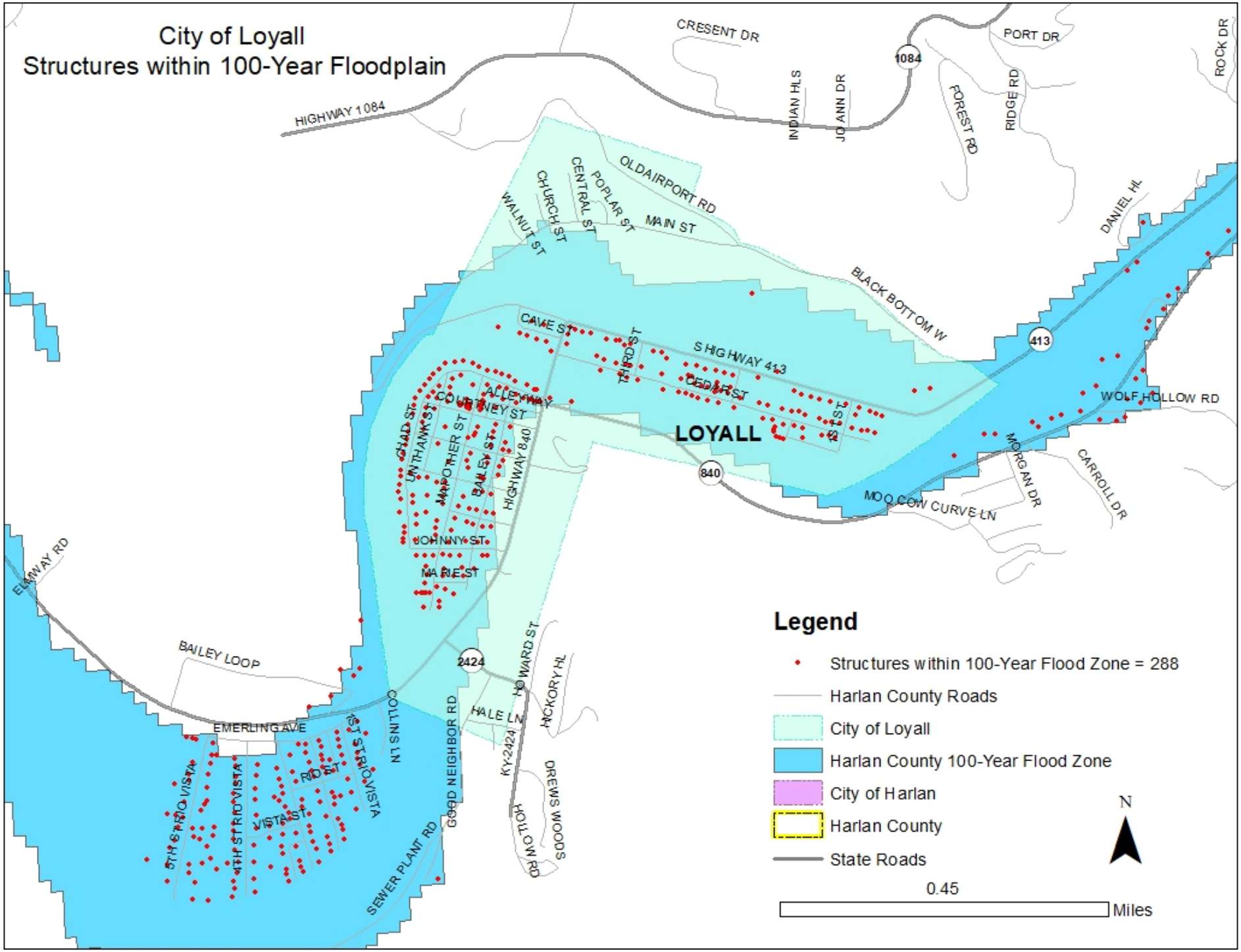
Legend

- Structures within 100-Year Flood Zone = 127
- Harlan County 100-Year Flood Zone
- City of Lynch
- City of Benham
- State Roads
- Harlan County Roads

N

0.5

Miles


City of Loyall
Structures within 100-Year Floodplain
CRESENT DR
PORT DR
ROCK DR
1084
HIGHWAY 1084
INDIAN HLS
JO ANN DR
FOREST RD
RIDGE RD
OLD AIRPORT RD
CHURCH ST
CENTRAL ST
POPLAR ST
MAIN ST
WALNUT ST
DANIEL HL
BLACK BOTTOM W
CAVE ST
SHIGHWAY 413
413
WOLF HOLLOW RD
LOYALL
840
HIGHWAY 840
MOO COW CURVE LN
MORGAN DR
CARROLL DR
ELMWAY RD
BAILEY LOOP
2424
EMERLING AVE
COLLINS LN
GOOD NEIGHBOR RD
HOWARD ST
HICKORY HL
HALE LN
KY-2424
DREWS WOODS
HOLLOW RD
SEWER PLANT RD
Legend
Structures within 100-Year Flood Zone = 288
Harlan County Roads
City of Loyall
Harlan County 100-Year Flood Zone
City of Harlan
Harlan County
State Roads
N
0.45
Miles

ASSESSING VULNERABILITY: IDENTIFYING ASSETS

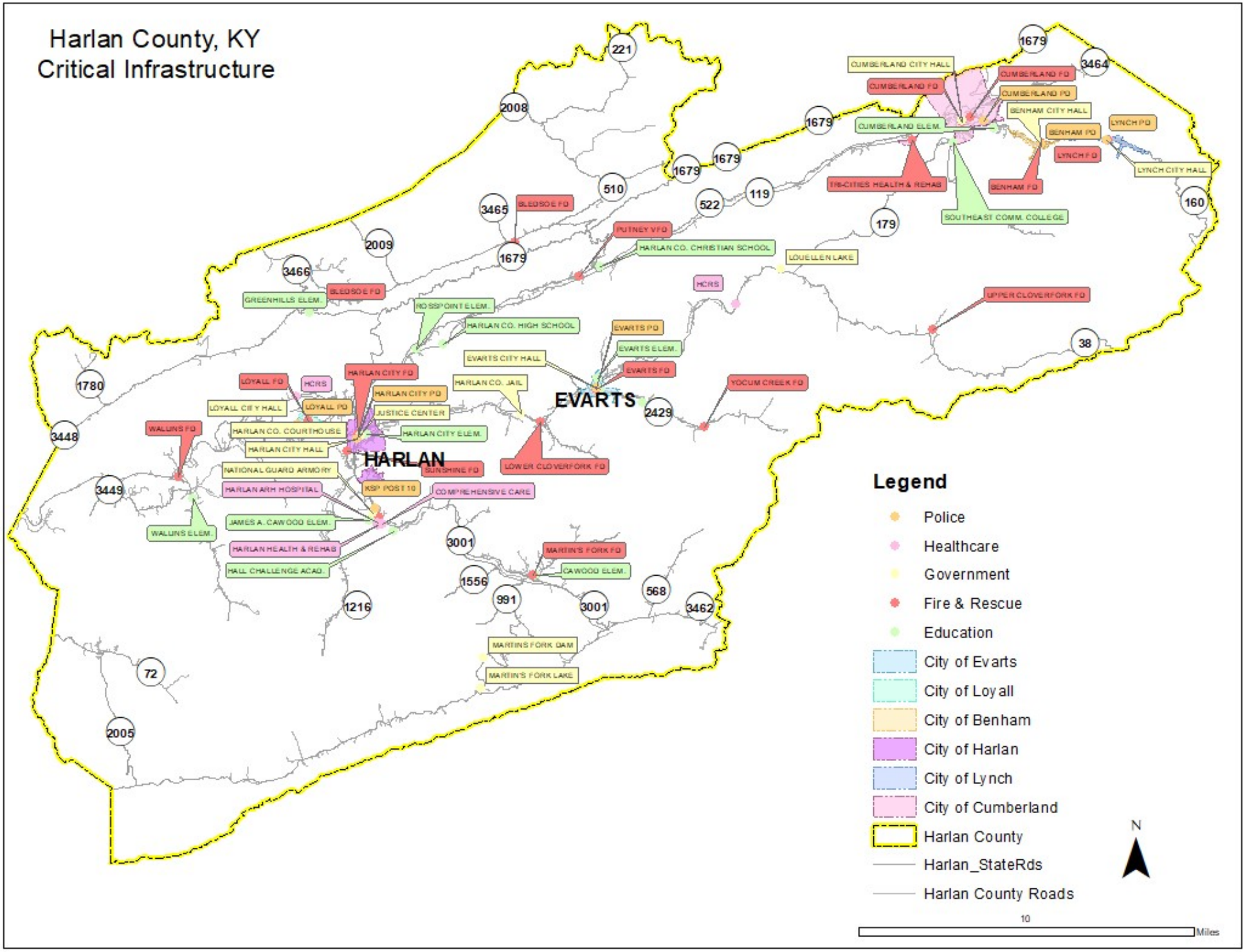
Using the best available data, CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the county. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

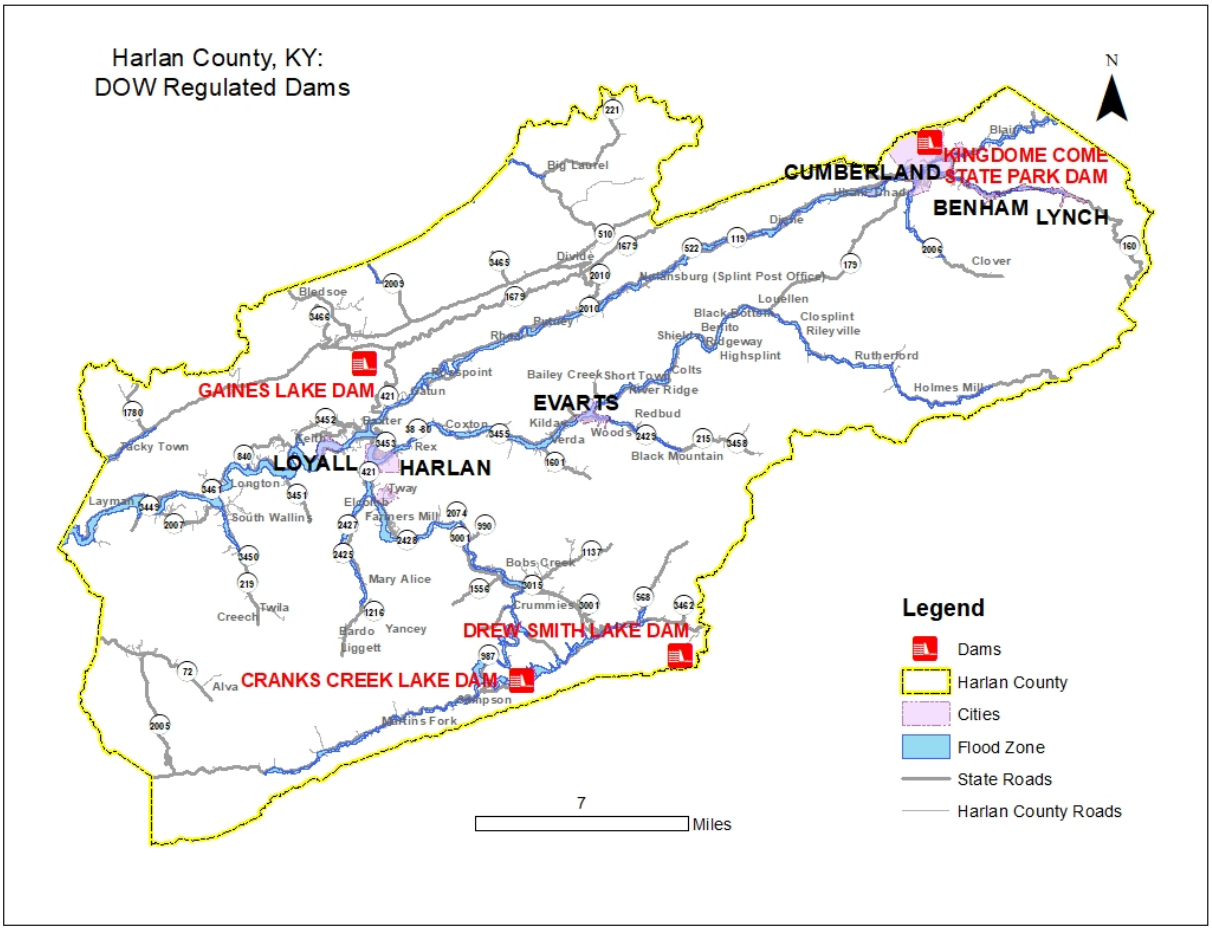
Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 33 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Harlan County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Harlan County Critical Infrastructure		***Structures located in Floodplain**
Location	**Address**	**Property Replacement Value**
Harlan County		
ARH Daniel Boone Clinic	37 Ball Park Rd, Harlan, KY 40831	TBD
Cumberland River Comprehensive	134 Comprehensive Dr. Harlan, KY 40831	
Harlan Health & Rehab	200 Medical Center Drive Harlan, KY 40831	$ 25,000,000
Tran-Star EMS	Industrial Park Road	TBD
City of Benham		
Benham City Hall	230 Main St. Benham, KY 40807	$300,000
Benham Police Department	230 Main St. Benham, KY 40807	$300,000
City of Cumberland		
Cumberland City Hall	402 W Main St. Cumberland, KY 40823	$100,000
Cumberland Police Department	414 W Main St. Cumberland, KY 40823	$400,000
Tri-Cities Nursing & Rehabilitation Center	19101 US 110 Cumberland, KY 40823	$10,000,000
Tri-Cities Volunteer Rescue Squad	1301 East Main Street Cumberland, KY 40823	TBD
City of Evarts		
Clover Fork Clinic	101 Chand Street Evarts, KY 40828	$820,000
Cumberland Hope Center	6050 KY-38 Evarts, KY 40823	
Evarts City Hall	101 Harlan St. Evarts, KY 40828	$300,000
Evarts Police Department	101 Harlan St. Evarts, KY 40828	$300,000
Harlan County Detention Center	6000 KY-38 Evarts, KY 40828	$8,000,000
City of Harlan		
Air Evac Life Team	155 Ball Park Rd Harlan, KY 40831	TBD
Boys & Girls Club	311 East Central Street Harlan, KY 40831	TBD
Harlan ARH Hospital	81 Ball Park Road Harlan, KY 40831	$99,000,000
Harlan City Hall	218 S. Main St. Harlan, KY 40831	$700,000
Harlan County Health Department	402 East Clover Street Harlan, KY 40831	$369,600
Harlan National Guard Armory	3436 Old US Hwy 421 Harlan, KY 40831	$ 50,000,000

Harlan Police Department	218 S. Main St. Harlan, KY 40831	$700,000
Kentucky State Police	3319 US 421 Harlan, KY 40831	$3,000,000
Mountain Comprehensive Health Corp.	132 Village Center Rd, Harlan, KY 40831	TBD
City of Loyall		
CSX Rail Yard		TBD
Loyall City Hall	306 Carter St. Loyall, KY 40854	$300,000
Loyall Police Department	306 Carter St. Loyall, KY 40854	$300,000
City of Lynch		
Lynch City Hall	6 East Main St. Lynch, KY 40855	$100,000
Lynch Police Department	6 W Main St. Cumberland, KY 40855	$400,000
Community of Baxter		
Harlan County Emergency Rescue Squad	2008 US 119 Bledsoe, KY 40806	$659,363
Harlan County Road Department	392 State Hwy. 840 Baxter, KY 40806	$310,000
Tucker-Guthrie Memorial Airport	1494 Hwy 1084 Baxter, KY 40806	$1,675,732
Schools		
Harlan County BOE	251 Ball Park Rd, Harlan, KY 40831	TBD
Harlan County Bus Garage	285 Ball Park Rd, Harlan, KY 40831	TBD
Appalachia Challenge Academy	465 Grays Drive Grays Knob, KY 40829	$1,779,700
Black Mountain Elementary	1555 State Hwy 215 Evarts, KY 40828	$ 10,000,000
Cawood Elementary	51 Noal St. Cawood, KY 40815	$9,200,000
Cumberland Elementary	322 Golf Course RD Cumberland, KY 40823	$ 13,500,000
Evarts Elementary	132 Keister St. Evarts, KY 40828	$13,500,000
Green Hills Elementary	123 West Hwy 221 Bledsoe, KY 40810	$7,000,000
Harlan County Christian School	6340 Hwy 522 Totz, KY 40870	$ 2,000,000
Harlan City Elementary	420 E. Central St. Harlan, KY 40831	$15,000,000
Harlan City High School	420 E. Central St. Harlan, KY 40831	$12,000,000
Harlan County High School	4000 US 119 Baxter, KY 40806	$49,000,000
James A. Cawood Elementary	729 Ball Park RD Harlan, KY 40831	$23,000,000
KCEOC Headstart	84 Morgan Dr, Grays Knob, KY 40829	TBD
KCEOC Headstart	54 Verda School RD, Evarts, KY 40828	TBD
Rosspoint Elementary	132 State HWY 522 Baxter, KY 40806	$ 7,500,000
Sunshine Preschool	304 Surgener Street Harlan, KY 40831	$990,500
Wallins Elementary	993 State Hwy 219 Wallins Creek, KY 40873	$13,000,000
Universities		
Southeast Community College	700 College RD Cumberland, KY 40823	$95,000,000
Southeast Community & Technical College	164 Ball Park Rd Harlan, KY 40831	$80,000,000
Volunteer Fire Departments		

Benham FD	402 W Main St. Benham, KY 40807	$100,000
Bledsoe FD	6418 N. Hwy 421 Bledsoe, KY 40810	$500,000
Bledsoe FD	156 Stacy Loop Rd. Bledsoe, KY 40810	$500,000
Cumberland FD Station #1	414 Cumberland Ave Cumberland, KY 40823	$400,000
Cumberland FD Station #*2*	1315 Main St. Cumberland, KY 40823	$200,000
Cumberland FD Station #3	1509 East Main St. Cumberland KY 40823	$400,000
Evarts FD	101 Harlan Street Evarts, KY 40828	$300,000
Harlan City FD Station #1	114 North Main St. Harlan, KY 40831	$1,000,000
Harlan City FD South Station #2	528 Skidmore Dr. Harlan, Ky 40831	$200,000
Loyall FD	306 County Pike Loyall, KY 40854	$300,000
Lynch FD	6 East Main St. Lynch, KY 40855	$100,000
Putney FD	65 Shriners RD Putney, KY 40865	$200,000
Sunshine FD #1	31 Marsh St. Harlan, KY 40831	$200,000
Sunshine FD #2	10560 US Hwy 421 Cawood, KY 40815	TBD
Upper Cloverfork FD	160 Breedens Creek RD Closeplint, KY	$200,000
Wallins FD	286 Connector RD Wallins, KY 40873	$200,000
Yocum Creek FD Station #2	74 Verda School Rd Evarts, KY 40828	$125,000
Yocum Creek FD	206 Rail Lane Evarts, KY 40828	$500,000
Harlan Media		
Harlan Daily	1512 S US 421 Harlan, KY 40831	TBD
WCPM	101 Keller St Cumberland, KY 40823	TBD
WFSR AM/ WTUK	125 S Main Street Harlan, KY 40831	TBD
WHLN	100 Eversole St Harlan, KY 40831	TBD
Waste Water/Water Treatment		
Cawood Water District	54 Plant Road, Cawood, KY 40815	TBD
City of Benham	283 Hemlock Street, Benham, KY 40855	$73,600
City of Lynch	1 East Main Street, Lynch, KY 40855	TBD
Cumberland Municipal Water Works	205 Kingdom Come Drive, Cumberland, KY 40823	$3,600,000
Evarts Municipal Water Plant	168 East Main Street, Evarts, KY 40828	$60,800
Harlan Municipal Water Works	922 Coldiron Heights, Harlan, KY 40831	TBD
Lakes		
Cranks Creek Lake, Louellan Lake, & Martins Fork Lake		
Dams	**HAZARD CLASS**	
Cranks Creek Lake Dam, Drew Smith Lake, Gaines Lake, Kingdom Come State Park Dam, Martins Fork Dam		


Harlan County, KY
Critical Infrastructure
HARLAN
EVARTS
CUMBERLAND CITY HALL
CUMBERLAND FD
CUMBERLAND FD
CUMBERLAND FD
BENHAM CITY HALL
CUMBERLAND ELEM.
BENHAM FD
LYNCH FD
LYNCH FD
LYNCH CITY HALL
TRI-CITIES HEALTH & REHAB
BENHAM FD
SOUTHEAST COMM. COLLEGE
BLEDSOE FD
PUTNEY VFD
HARLAN CO. CHRISTIAN SCHOOL
LOUELLEN LAKE
HCRS
UPPER CLOVERFORK FD
GREENHILLS ELEM.
BLEDSOE FD
ROSSPOINT ELEM.
HARLAN CO. HIGH SCHOOL
EVARTS FD
EVARTS ELEM.
EVARTS CITY HALL
EVARTS FD
HARLAN CO. JAIL
YOCUM CREEK FD
LOYALL FD
HCRS
HARLAN CITY FD
HARLAN CITY PD
LOYALL CITY HALL
LOYALL FD
JUSTICE CENTER
WALINS FD
HARLAN CO. COURTHOUSE
HARLAN CITY ELEM.
HARLAN CITY HALL
NATIONAL GUARD ARMORY
SUNSHINE FD
LOWER CLOVERFORK FD
HARLAN ARH HOSPITAL
KSP POST 10
COMPREHENSIVE CARE
WALINS ELEM.
JAMES A. CAWOOD ELEM.
HARLAN HEALTH & REHAB
HALL CHALLENGE ACAD.
MARTIN'S FORK FD
CAWOOD ELEM.
MARTINS FORK DAM
MARTIN'S FORK LAKE
221
2008
1679
3464
1679
1679
1679
510
522
119
3465
1679
179
160
2009
3466
38
1780
3448
3449
3001
1556
991
3001
568
3462
1216
72
2005
2429
Legend
Police
Healthcare
Government
Fire & Rescue
Education
City of Evarts
City of Loyall
City of Benham
City of Harlan
City of Lynch
City of Cumberland
Harlan County
Harlan_StateRds
Harlan County Roads
N
10
Miles



ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Harlan County	4169	$52,700.00	$219,706,300.00
City of Benham	62		$3,267,400.00
City of Cumberland	329		$17,338,300.00
City of Evarts	163		$8,590,100.00
City of Harlan	194		$10,223,800.00
City of Loyall	288		$15,177,600.00
City of Lynch	127		$6,692,900.00

HARLAN COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Harlan County, Unincorporated possesses three (3) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The three (3) properties in Harlan County, Unincorporated are disaggregated as follows:

Harlan County, Uninc., RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Harlan County	Single-Family Occupancy	0	0	0	0	0
Harlan County	2-4 Family Occupancy	0	0	0	0	0
Harlan County	Other Non-Residential	1	1	0	1	1
TOTAL		***1***	***1***	***0***	***1***	***1***

The City of Benham possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The City of Cumberland possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The City of Evarts possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The City of Harlan possesses one (1) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The one (1) property in City of Harlan is disaggregated as follows:

City of Harlan RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Harlan, City of	Single-Family Occupancy	1	1	0	1	1
Harlan, City of	2-4 Family Occupancy	0	0	0	0	0
Harlan, City of	Other Non-Residential	0	0	0	0	0
TOTAL		***1***	***1***	***0***	***1***	***1***

The City of Loyall possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The City of Lynch possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community.[80] These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation. The following are the floodplain coordinator(s) for Harlan County.

Floodplain Coordinator				
Communities Name	Name	Job Title	Address	Phone Number
Cities of Benham, Cumberland, Evarts, City of Harlan, Loyall, Lynch, and Harlan County.	Tony Felosi	Solid Waste Enforcement	P.O. Box 956 Harlan, KY 40831	606-573-2600

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures.[81] It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov. The following chart/information is an overview of the County's participation with the National Flood Insurance Program.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210099B	Benham	Harlan	05/17/74	09/05/79	03/16/15	09/05/79	No
210100B	Cumberland	Harlan	03/16/73	03/15/77	03/16/15	03/15/77	No
210101B	Evarts	Harlan	05/17/74	11/19/80	03/16/15	11/19/80	No
210102B	Harlan, City of	Harlan	03/16/73	01/17/79	03/16/15	01/17/79	No
210098B	Harlan County	Harlan	11/29/74	08/15/78	03/16/15	08/15/78	No
215189B	Loyall	Harlan		04/06/73	03/16/15	04/06/73	No
210104B	Lynch	Harlan	05/10/74	07/02/79	03/16/15	07/02/79	No

NFIP FINANCIAL CLAIMS

Since 1978 a total of 478 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $2,345,699 in claims. To put it in perspective that is an average of $4,907.32 per claim or $58642.475 per year spent on repairing flood damages. There

[80] FEMA. *Floodplain Management*. Retrieved on 6/19/2020 from https://www.fema.gov/floodplain-management.
[81] FEMA. *The National Flood Insurance Program*. Retrieved on 6/19/2020 from https://www.fema.gov/national-flood-insurance-program.

are only 379 flood insurance policies in effect as of March 2018 and 1,469 identified structures located within the 100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Benham	1894		4	4		624	624	2	1	3	1,185	6,703	788
Cumberland	24428	2	34	36	116	3,291	3,407	15	16	31	50,454	98,662	149,116
Evarts	24200	1	26	27	25	2,918	2,943	12	14	26	50,337	120,323	170,660
Harlan Co.	184183	38	257	295	4,762	30,845	30,607	126	168	294	359,125	1,205,538	1,564,663
Harlan	11017	3	8	11	272	3,080	3,352	44	14	58	166,672	116,674	283,346
Loyall	1227		2	2		141	141	35	13	48	81,105	11,491	92,596
Lynch	1204		4	4		622	622	1	1	2	1,289		1,289
Wallins Creek								9	7	16	12,360	63,781	76,141
Total	248153	44	335	379	5,175	41,521		244	234	478	722,527	1,623,172	2,345,699
Nfipservices.floodsmart.gov													

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

SEVERE THUNDERSTORMS

Thunderstorms are most likely in the spring and summer months during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures.

Currently, there are no storm shelters in Harlan County. There are several mobile home communities throughout the county, as well as a large off-road park. The people living and visiting these areas are vulnerable to severe thunderstorms and tornados. Thunderstorms can produce tornados, floods, lightning, and damaging winds. They may occur individually, in clusters, or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios.

Severe Thunderstorms have at least one of the following:

- Wind gusts of at least 58 mph or higher, i.e. 50 knots;
- Tornado;

- Hail that is one inch or larger, i.e. at minimum the size of a quarter.

This analysis will focus on the wind profiles for each county; later sections will assess hail and tornados.[82]

Thunderstorms can be categorized by their physical characteristics, i.e., the presence or absence of rotation, the number or location of updrafts and downdrafts present. There is a continuous spectrum of storms in the sky and a storm may move from one category along this spectrum to another. The five (5) types are:

- **Ordinary or Single-Cell Storm:** Single cell storms are short-lived and usually not severe.
    - Short life, generally 30-45 minutes
    - Downdraft that forms within 15-20 minutes after cell initiation
    - Updraft that weakens in 25-30 minutes; outflow stabilizes
    - Gusty winds, usually not severe
- **Pulse Storm:** A Pulse Storm is a single-cell thunderstorm that is usually not strong; when it is of substantial intensity, it produces severe weather for short periods of time. Such a storm weakens and then generates another short burst or pulse.
    - Short life, generally 30-45 minutes
    - Usually not severe, but given the right environmental conditions, these storms can create:
        - Downburst winds, usually less than 70 mph
        - A weak tornado
    - Damage is isolated.
- **Multicellular Cluster:** This type is the most common storm, consisting of a group of ordinary cells at various stages of the thunderstorm life cycle.
    - Most common type of thunderstorm
    - May last for several hours
    - Consists of a group of cells moving as a single unit
    - Contains cells in different stage of the thunderstorm life cycle
    - Occasionally may contain supercells
    - Given the right conditions, the cells can become severe within the multicellular cluster producing:
        - Downburst winds;
        - Weak tornadoes; and
        - Heavy rainfall in a short time.
- **Multicellular Line:** This category is a long line of storms with a continuous, well developed gust front along the leading edge.
    - Frequently called squall line
    - A long line of storms with individual storm outflows merging to produce a continuous, well-developed gust front marking the leading edge of rain-cooled air
    - Line of storms often oriented north-south or northeast-southwest and usually move toward the northeast, east, or southeast
    - May be embedded along the line
    - Given the right environmental conditions, multicell line storms can produce:
        - Strong downburst winds;

[82] The TYPES section is adapted from the National Weather Service. (2011). "Weather Spotter's Field Guide." Department of Commerce. As presented in the Kentucky Hazard Mitigation Plan published by the University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP). (2018)

        - Heavy rainfall; and
        - Occasional tornadoes
- **Supercell:** A supercell is a highly organized thunderstorm with an extremely strong updraft. They exhibit persistent storm-scale rotation of the updraft-downdraft couplet or mesocyclone.
    - Classifying supercellular storms is subjective. Still, the following is generally acknowledged about supercells:
        - Highly organized storm with rotation inside
        - Updrafts can attain speeds more than 100 mph
        - Can produce strong, violent tornadoes
        - Rear-flank downdraft can produce damaging outflow winds in excess of 100 mph.
    - Supercells can produce the following elements:
        - Potentially torrential rainfall immediately adjacent to the storm updraft
        - Lighter rainfall at greater distances from the updraft
        - Rear-Flank Downdrafts (RFDs) producing strong, sometimes damaging outflows
        - Tornadoes

Damaging Winds: National Weather Service issues warnings when the winds from a thunderstorm are expected to be 58 mph (50 knots) or higher.

Downburst: This term refers to an area of strong, often damaging winds produced by air rapidly descending in a thunderstorm. Downbursts are sometimes described as a microburst when it covers an area of less than 2.5 square miles and lasts three to seven minutes. Downbursts can be referred to as microburst when they cover larger areas or last for more than seven (7) minutes. On rare occasions, downbursts can have wind speeds in excess of 150 mph.

Bow Echo: A bow-shaped line of convective cells – best seen on radar – is often associated with swaths of damaging straight-line winds and small tornadoes.

Derecho: A derecho is a widespread and usually fast-moving convectively-induced episode of damaging winds. Derechos can result from bow echoes, supercells, multicell clusters or lines, or a blend of any of these. They can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across. Due to the large area extent, an episode is usually not classified as a derecho until it is complete.

Note: When reviewing the types and impacts of thunderstorms and winds, it is important to realize that while tornadoes are typically more destructive when they occur, straightline winds can also be highly destructive and occur much more frequently. In the final analysis, straightline winds cause more damage in both injuries/deaths and property damage in the United States than do tornadoes.

TABLE 3-6: Harlan County Thunderstorm/Wind Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	3	530.25K	1.30K
1	WALLINS CREEK	HARLAN CO.	KY	6/22/1998	18:40	EST	Thunderstorm Wind	52 kts.	0	0	0.00K	0.00K
2	HARLAN	HARLAN CO.	KY	5/17/2003	18:16	EST	Thunderstorm Wind	65 kts. EG	0	0	0.00K	0.00K
3	HARLAN	HARLAN CO.	KY	6/11/2003	20:34	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
4	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/24/2003	6:45	EST	High Wind	55 kts. EG	0	0	0.00K	0.00K
5	COUNTY-WIDE	HARLAN CO.	KY	5/26/2004	15:45	EST	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
	HARLAN	HARLAN CO.	KY	5/26/2004	15:50	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
6	COUNTY-WIDE	HARLAN CO.	KY	5/31/2004	1:45	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
7	HARLAN	HARLAN CO.	KY	7/5/2004	18:10	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

8	EVARTS	HARLAN CO.	KY	7/14/2004	23:25	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
9	NOLANS-BURG	HARLAN CO.	KY	8/5/2005	14:36	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
10	LYNCH	HARLAN CO.	KY	4/17/2006	10:56	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
11	PATHFORK	HARLAN CO.	KY	8/10/2006	13:13	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
12	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/17/2006	0:00	EST-5	High Wind	80 kts. EG	0	0	150.00K	0.00K
13	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/1/2006	7:29	EST-5	High Wind	53 kts. EG	0	0	2.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/1/2006	7:29	EST-5	High Wind	53 kts. EG	0	0	5.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/1/2006	7:29	EST-5	High Wind	55 kts. EG	0	0	0.00K	0.00K

14	GRAYS KNOB	HARLAN CO.	KY	4/3/2007	21:08	EST-5	Thunderstorm Wind	55 kts. EG	0	0	15.00K	0.00K
	HARLAN	HARLAN CO.	KY	4/3/2007	21:08	EST-5	Thunderstorm Wind	55 kts. EG	0	0	50.00K	0.00K
15	ROSSPOINT	HARLAN CO.	KY	1/29/2008	23:45	EST-5	Thunderstorm Wind	54 kts. EG	0	0	10.00K	0.00K
16	BLEDSOE	HARLAN CO.	KY	3/4/2008	15:57	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
	WALLINS CREEK	HARLAN CO.	KY	3/4/2008	16:00	EST-5	Thunderstorm Wind	53 kts. EG	0	0	3.00K	0.00K
	ROSSPOINT	HARLAN CO.	KY	3/4/2008	16:10	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
17	HARLAN	HARLAN CO.	KY	5/11/2008	9:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	50.00K	0.00K
	HARLAN	HARLAN CO.	KY	5/11/2008	9:47	EST-5	Thunderstorm Wind	51 kts. EG	0	0	4.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	HARLAN	HARLAN CO.	KY	5/11/2008	9:49	EST-5	Thunderstorm Wind	54 kts. EG	0	0	7.00K	0.00K

18	COLDIRON	HARLAN CO.	KY	7/21/2008	14:30	EST-5	Thunderstorm Wind	53 kts. EG	0	0	6.00K	0.00K
	HARLAN	HARLAN CO.	KY	7/22/2008	15:45	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
19	WALLINS CREEK	HARLAN CO.	KY	7/28/2008	14:54	EST-5	Thunderstorm Wind	54 kts. EG	0	0	8.00K	0.00K
	HARLAN	HARLAN CO.	KY	7/28/2008	14:54	EST-5	Thunderstorm Wind	55 kts. EG	0	0	5.00K	0.00K
20	BLEDSOE	HARLAN CO.	KY	2/27/2009	6:29	EST-5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K
21	HARLAN	HARLAN CO.	KY	4/10/2009	16:28	EST-5	Thunderstorm Wind	53 kts. EG	0	0	2.00K	0.00K
22	LOW	HARLAN CO.	KY	6/16/2009	17:17	EST-5	Thunderstorm Wind	51 kts. EG	0	0	6.00K	0.00K
	BLEDSOE	HARLAN CO.	KY	6/16/2009	17:21	EST-5	Thunderstorm Wind	52 kts. EG	0	0	7.00K	0.00K
	LOYALL	HARLAN CO.	KY	6/16/2009	17:25	EST-5	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
	LOYALL	HARLAN CO.	KY	6/16/2009	17:25	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K

	EVARTS	HARLAN CO.	KY	6/16/2009	17:37	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
	EVARTS	HARLAN CO.	KY	6/16/2009	17:37	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
	CUMBER-LAND	HARLAN CO.	KY	6/16/2009	17:48	EST-5	Thunderstorm Wind	51 kts. EG	0	0	5.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
23	HARLAN	HARLAN CO.	KY	6/18/2009	12:51	EST-5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
	WALLINS CREEK	HARLAN CO.	KY	6/18/2009	12:55	EST-5	Thunderstorm Wind	60 kts. EG	0	0	20.00K	0.00K
	EVARTS	HARLAN CO.	KY	6/18/2009	12:55	EST-5	Thunderstorm Wind	53 kts. EG	0	0	5.00K	0.00K
	CAWOOD	HARLAN CO.	KY	6/18/2009	12:58	EST-5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
24	HARLAN	HARLAN CO.	KY	6/28/2009	15:25	EST-5	Thunderstorm Wind	51 kts. EG	0	0	1.00K	0.00K
	HOLMES MILL	HARLAN CO.	KY	6/28/2009	15:55	EST-5	Thunderstorm Wind	55 kts. EG	0	0	4.00K	0.00K
25	HARLAN	HARLAN CO.	KY	7/25/2009	17:10	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
26	VERDA	HARLAN CO.	KY	8/4/2009	16:35	EST-5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K

	EVARTS	HARLAN CO.	KY	8/5/2010	15:05	EST-5	Thunderstorm Wind	53 kts. EG	0	0	3.00K	0.00K
27	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/26/2010	11:10	EST-5	High Wind	50 kts. EG	0	0	10.00K	0.00K
28	HARLAN	HARLAN CO.	KY	4/9/2011	14:28	EST-5	Thunderstorm Wind	60 kts. EG	0	0	50.00K	0.00K
	HARLAN	HARLAN CO.	KY	4/9/2011	14:35	EST-5	Thunderstorm Wind	51 kts. MG	0	0	0.00K	0.00K
29	PUTNEY	HARLAN CO.	KY	4/25/2011	20:23	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
30	RIO VISTA	HARLAN CO.	KY	4/27/2011	18:44	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	EVARTS	HARLAN CO.	KY	4/27/2011	18:47	EST-5	Thunderstorm Wind	52 kts. EG	0	0	4.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	EVARTS	HARLAN CO.	KY	4/27/2011	18:53	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
	BLEDSOE	HARLAN CO.	KY	4/27/2011	18:53	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
31	CRANKS	HARLAN CO.	KY	6/21/2011	19:03	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.25K	0.00K

32	CUMBER-LAND	HARLAN CO.	KY	6/27/2011	17:13	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
	CUMBER-LAND	HARLAN CO.	KY	6/27/2011	17:19	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
33	GULSTON	HARLAN CO.	KY	8/14/2011	12:40	EST-5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
	CRUMMIES	HARLAN CO.	KY	8/14/2011	12:47	EST-5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
	SMITH	HARLAN CO.	KY	8/14/2011	12:50	EST-5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
34	PUTNEY	HARLAN CO.	KY	3/2/2012	19:05	EST-5	Thunderstorm Wind	60 kts. EG	0	0	5.00K	0.00K
35	EVARTS	HARLAN CO.	KY	7/5/2012	15:20	EST-5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
36	RIO VISTA	HARLAN CO.	KY	7/8/2012	21:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
37	HIRAM	HARLAN CO.	KY	7/19/2012	16:07	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
38	ROSSPOINT	HARLAN CO.	KY	8/1/2012	15:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	BIG LAUREL	HARLAN CO.	KY	8/1/2012	16:25	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K

39	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/20/2012	11:50	EST-5	High Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
40	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/11/2013	3:00	EST-5	High Wind	50 kts. EG	0	0	5.00K	0.00K
41	TOTZ	HARLAN CO.	KY	1/30/2013	9:03	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
42	HARLAN	HARLAN CO.	KY	5/21/2013	17:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	BAXTER	HARLAN CO.	KY	5/21/2013	17:05	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	EVARTS	HARLAN CO.	KY	5/21/2013	17:12	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LYNCH	HARLAN CO.	KY	5/21/2013	17:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
43	HARLAN	HARLAN CO.	KY	6/13/2013	11:58	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
44	BLEDSOE	HARLAN CO.	KY	2/21/2014	1:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	PUTNEY	HARLAN CO.	KY	2/21/2014	1:40	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
45	DRESSEN	HARLAN CO.	KY	4/28/2014	14:05	EST-5	Thunderstorm Wind	78 kts. EG	0	3	0.00K	0.00K

	CLOVER	HARLAN CO.	KY	4/28/2014	14:55	EST-5	Thunderstorm Wind	61 kts. MG	0	0	0.00K	0.00K
46	BAXTER	HARLAN CO.	KY	5/21/2014	21:50	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LONGTON	HARLAN CO.	KY	5/21/2014	21:50	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
47	LONGTON	HARLAN CO.	KY	6/10/2014	17:46	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	RIO VISTA	HARLAN CO.	KY	6/10/2014	17:50	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	BLEDSOE	HARLAN CO.	KY	6/10/2014	17:57	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	EVARTS	HARLAN CO.	KY	6/10/2014	18:02	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	LOUELLEN	HARLAN CO.	KY	6/10/2014	18:11	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
48	GATUN	HARLAN CO.	KY	7/27/2014	15:20	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
49	EVARTS	HARLAN CO.	KY	6/8/2015	15:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
50	CUMBER-LAND	HARLAN CO.	KY	7/13/2015	16:23	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

	LAYMAN	HARLAN CO.	KY	7/13/2015	16:28	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
51	BLEDSOE	HARLAN CO.	KY	5/7/2016	19:07	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
	LYNCH	HARLAN CO.	KY	7/8/2016	16:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
52	LYNCH	HARLAN CO.	KY	8/15/2016	14:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
53	COLDIRON	HARLAN CO.	KY	12/18/2016	4:50	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
54	BLEDSOE	HARLAN CO.	KY	5/27/2017	19:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
55	BIG LAUREL	HARLAN CO.	KY	6/13/2017	17:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
56	EVARTS	HARLAN CO.	KY	7/6/2017	18:06	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
57	HARLAN MEM ARPT	HARLAN CO.	KY	4/4/2018	0:15	EST-5	Thunderstorm Wind	54 kts. MG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
58	PATHFORK	HARLAN CO.	KY	6/25/2018	12:24	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
59	HARLAN	HARLAN CO.	KY	7/20/2018	20:08	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K

	CHEVROLET	HARLAN CO.	KY	7/20/2018	20:13	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
60	DRESSEN	HARLAN CO.	KY	7/31/2019	14:11	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
61	CUMBER-LAND	HARLAN CO.	KY	4/9/2020	1:12	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.10K
62	MOLUS	HARLAN CO.	KY	5/24/2020	14:43	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	1.20K
	Totals:								0	3	530.25K	1.30K

Harlan County - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 6/22/1998. The denominator is set at 20 years despite 1998 being the earliest year with this type of data. While Harlan County's data started in 1998, the next event recorded was in 2003. This translates to roughly 20 years, and keeping the denominator consistent will maintain comparability between counties.

That Harlan County experienced 62 severe thunderstorm/wind events over 20 years yields that Harlan County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every four months (i.e., 62/240). Specifically, Harlan County experienced an average of 3 severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.258 events per month. $1/.258 = 3.9 \approx 1$ severe winter storm event an average of every four months.

TABLE 3-7: Harlan County Hail Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	41.00K	0.00K
1	HARLAN	HARLAN CO.	KY	4/16/1998	18:32	EST	Hail	1.00 in.	0	0	0.00K	0.00K
2	CAWOOD	HARLAN CO.	KY	5/25/1998	21:30	EST	Hail	1.00 in.	0	0	0.00K	0.00K
3	PINE MTN	HARLAN CO.	KY	6/16/1998	13:05	EST	Hail	1.00 in.	0	0	0.00K	0.00K
4	TOTZ	HARLAN CO.	KY	5/7/1999	16:00	EST	Hail	1.00 in.	0	0	0.00K	0.00K
5	COLDIRON	HARLAN CO.	KY	6/4/2001	17:30	EST	Hail	1.00 in.	0	0	0.00K	0.00K
6	BIG LAUREL	HARLAN CO.	KY	8/26/2001	17:10	EST	Hail	1.00 in.	0	0	0.00K	0.00K
7	HARLAN	HARLAN CO.	KY	5/1/2002	20:50	EST	Hail	1.75 in.	0	0	30.00K	0.00K
8	ROSSPOINT	HARLAN CO.	KY	8/4/2003	16:40	EST	Hail	0.75 in.	0	0	0.00K	0.00K
	ROSSPOINT	HARLAN CO.	KY	8/4/2003	17:01	EST	Hail	1.75 in.	0	0	0.00K	0.00K
9	BLEDSOE	HARLAN CO.	KY	5/30/2004	15:55	EST	Hail	2.50 in.	0	0	0.00K	0.00K
	PUTNEY	HARLAN CO.	KY	5/30/2004	16:15	EST	Hail	1.75 in.	0	0	0.00K	0.00K

	TOTZ	HARLAN CO.	KY	5/30/2004	16:15	EST	Hail	1.25 in.	0	0	0.00K	0.00K
	NOLANSBURG	HARLAN CO.	KY	5/30/2004	16:30	EST	Hail	1.00 in.	0	0	0.00K	0.00K
10	BAXTER	HARLAN CO.	KY	5/12/2005	17:40	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	HARLAN	HARLAN CO.	KY	5/12/2005	17:42	EST	Hail	1.00 in.	0	0	0.00K	0.00K
11	WALLINS CREEK	HARLAN CO.	KY	6/15/2007	13:40	EST-5	Hail	1.00 in.	0	0	3.00K	0.00K
12	HARLAN	HARLAN CO.	KY	5/14/2010	16:20	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	WALLINS CREEK	HARLAN CO.	KY	5/14/2010	16:20	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
13	WALLINS CREEK	HARLAN CO.	KY	4/9/2011	14:43	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
14	COLDIRON	HARLAN CO.	KY	4/27/2011	17:27	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	RIO VISTA	HARLAN CO.	KY	4/27/2011	18:40	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	HARLAN	HARLAN CO.	KY	4/27/2011	18:43	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	HARLAN	HARLAN CO.	KY	4/27/2011	18:47	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	EVARTS	HARLAN CO.	KY	4/27/2011	18:47	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
15	WALLINS CREEK	HARLAN CO.	KY	3/2/2012	18:50	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K

	WALLINS CREEK	HARLAN CO.	KY	3/2/2012	18:56	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	HARLAN	HARLAN CO.	KY	3/2/2012	19:00	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	GRAYS KNOB	HARLAN CO.	KY	3/2/2012	19:00	EST-5	Hail	2.00 in.	0	0	0.00K	0.00K
	HARLAN	HARLAN CO.	KY	3/2/2012	19:00	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	CHEVROLET	HARLAN CO.	KY	3/2/2012	19:17	EST-5	Hail	2.75 in.	0	0	0.00K	0.00K
	GRAYS KNOB	HARLAN CO.	KY	3/2/2012	19:23	EST-5	Hail	2.00 in.	0	0	0.00K	0.00K
16	BIG LAUREL	HARLAN CO.	KY	8/1/2012	16:25	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
17	CLOVER FORK	HARLAN CO.	KY	7/27/2014	15:11	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	NOLANSBURG	HARLAN CO.	KY	7/27/2014	15:35	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	GANO	HARLAN CO.	KY	7/27/2014	15:40	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
18	BLAIR	HARLAN CO.	KY	4/25/2015	22:15	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
19	HARLAN MEM ARPT	HARLAN CO.	KY	5/5/2018	14:04	EST-5	Hail	2.50 in.	0	0	0.00K	0.00K
20	CLOSPLINT	HARLAN CO.	KY	5/7/2018	17:39	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	41.00K	0.00K

Harlan County - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The pink versus the green highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 4/16/1998. As the last date recorded for a hailstorm in Harlan County is 5/7/2018, the denominator is set at 20 years to maintain comparability across counties.

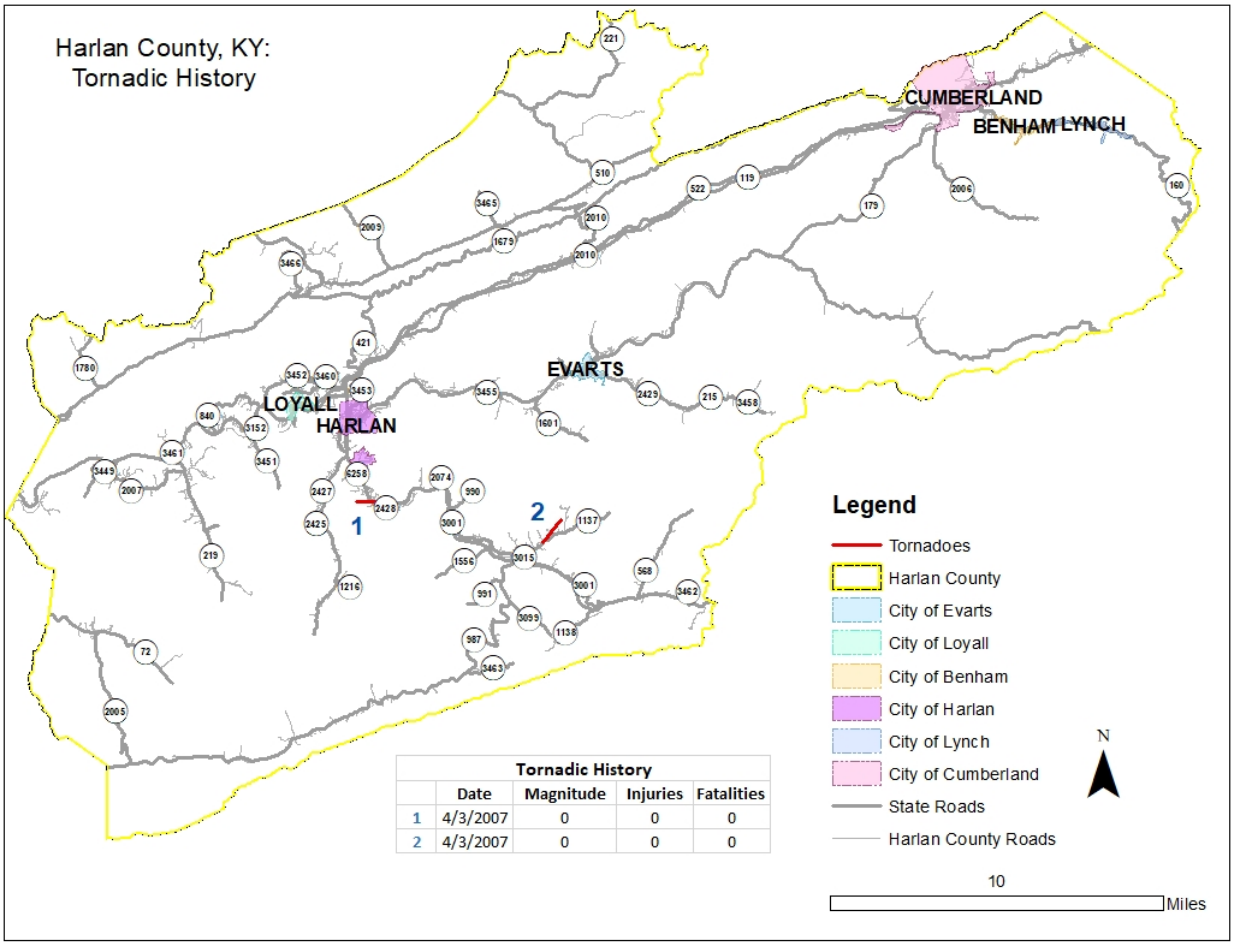
That Harlan County experienced 20 events with hail 1" or larger over 20 years yields that Harlan County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 20 months (i.e., 20/240). Specifically, Harlan County experienced an average of 1.2 severe hailstorm events every two years. Or, using December 31, 2020 as an endpoint, this is 0.08 events per month. 1/.08 = 12.5 ≈ 1 severe hailstorm event annually on average.

TABLE 3-8: Harlan County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	720.00K	0.00K
1	TWAY	HARLAN CO.	KY	4/3/2007	21:17	EST-5	Tornado	EF0	0	0	20.00K	0.00K
	CAWOOD	HARLAN CO.	KY	4/3/2007	21:25	EST-5	Tornado	EF0	0	0	700.00K	0.00K
	Totals:								0	0	720.00K	0.00K

Harlan County - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate a cluster of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. While the entire timeline of the database, from 1950 through 2020, was searched, the only event in the search was on 4/3/2007. The denominator is set at 20 years to maintain comparability across counties; the fact that many years passed without tornadoes is as valuable to know as the dates tornadoes did occur.

That Harlan County experienced 1 event with a tornado over 20 years yields that Harlan County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 20 years (i.e., 1/240). Or, using December 31, 2020 as an endpoint, this is 0.004 events per month. $1/.004 = 250 \approx 1$ tornado event an average of once every 20 years.



SEVERE WINTER WEATHER

Harlan County includes some of the most rugged terrain in the Commonwealth. Great mountain ridges are outstanding features of the topography. Pine Mountain crosses the northern part of the county from southwest to northeast. The crest rises from approximately 2,400 feet in the southwest to 2,800 feet in the northeast. Cumberland Mountain, along the southern border of Harlan County, is a mirror image of Pine Mountain. Elevations along the crest of Cumberland Mountain, which approximates the Kentucky-Virginia state boundary, range from 2,400 to 3,500 feet. The highest elevation in the county, and the highest in Kentucky, is found on Black Mountain, a massive, sinuous range lying between Cumberland and Pine Mountains. At its peak the elevation is 4,4145 feet. The mountainous terrain makes traveling during winter weather nearly impossible.[83]

Winter storms can range from a moderate snow over a few hours to a blizzard with blinding, wind-driven snow that lasts for several days.[84] Some winter storms are large enough to affect several

[83] Kentucky Geological Study. *Topography: Harlan County*. Retrieved on 6/19/2020 from http://www.uky.edu/KGS/water/library/gwatlas/Harlan/Topography.htm.
[84] US Dept of Health. Winter Storms. Retrieved on 6/19/2020 from https://www.doh.wa.gov/Portals/1/Documents/Pubs/821-043_WinterWeather_LT.pdf.

states, while others affect only a single community. Many winter storms are accompanied by dangerously low temperatures and sometimes by strong winds, icing, sleet, and freezing rain.

In order to address systematically the number of previous severe winter weather events, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from severe winter weather for the eight counties in the Cumberland Valley Area Development District in Kentucky. The tables include what the National Weather Service (NWS) labels "Heavy Snow", "Ice Storm", "Winter Storm", and "Winter Weather" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the severe winter weather event. Still, it is the best available data for a systematic illustration of severe winter weather events for CVADD counties.

Finally, it should also be noted that a portion of the severe winter weather events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for all counties as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

TABLE 3-9: Harlan County Severe Winter Storm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	32.00K	0.00K
1	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/11/1996	20:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/1/1996	16:00	EST	Heavy Snow		0	0	0.00K	0.00K
4	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/20/1996	4:00	EST	Heavy Snow		0	0	0.00K	0.00K
5	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/27/1998	11:00	EST	Heavy Snow		0	0	20.00K	0.00K
6	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
7	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
8	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/3/1999	8:00	EST	Heavy Snow		0	0	0.00K	0.00K
9	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/14/1999	21:00	EST	Heavy Snow		0	0	2.00K	0.00K
10	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/26/1999	8:00	EST	Heavy Snow		0	0	0.00K	0.00K
11	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/24/1999	9:00	EST	Heavy Snow		0	0	0.00K	0.00K
12	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/17/2000	21:00	EST	Winter Storm		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
13	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/19/2000	19:30	EST	Heavy Snow		0	0	0.00K	0.00K
14	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
15	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/25/2000	20:30	EST	Heavy Snow		0	0	0.00K	0.00K
16	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
17	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/6/2001	9:30	EST	Heavy Snow		0	0	0.00K	0.00K
18	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/21/2001	1:00	EST	Heavy Snow		0	0	0.00K	0.00K
19	HARLAN (ZONE)	HARLAN (ZONE)	KY	4/17/2001	5:00	EST	Heavy Snow		0	0	0.00K	0.00K
20	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/6/2002	5:00	EST	Heavy Snow		0	0	0.00K	0.00K
21	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/19/2002	6:30	EST	Winter Storm		0	0	0.00K	0.00K
22	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/4/2002	12:40	EST	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/4/2002	12:40	EST	Heavy Snow		0	0	0.00K	0.00K
23	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/16/2003	19:45	EST	Heavy Snow		0	0	0.00K	0.00K
24	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/23/2003	1:30	EST	Heavy Snow		0	0	0.00K	0.00K
25	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/30/2003	9:30	EST	Heavy Snow		0	0	0.00K	0.00K
26	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/29/2003	3:00	EST	Heavy Snow		0	0	0.00K	0.00K
27	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/19/2003	0:00	EST	Heavy Snow		0	0	0.00K	0.00K
28	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/9/2004	9:00	EST	Heavy Snow		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
29	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/25/2004	10:00	EST	Ice Storm		0	0	0.00K	0.00K
30	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/22/2005	20:00	EST	Heavy Snow		0	0	0.00K	0.00K
31	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2005	7:28	EST	Ice Storm		0	0	0.00K	0.00K
32	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/10/2005	6:40	EST	Heavy Snow		0	0	0.00K	0.00K
33	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/28/2005	4:00	EST	Heavy Snow		0	0	0.00K	0.00K
34	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/1/2005	0:00	EST	Heavy Snow		0	0	0.00K	0.00K
35	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/14/2006	6:00	EST	Heavy Snow		0	0	0.00K	0.00K
36	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/12/2006	6:00	EST	Heavy Snow		0	0	0.00K	0.00K
37	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/18/2006	2:25	EST	Heavy Snow		0	0	0.00K	0.00K
38	HARLAN (ZONE)	HARLAN (ZONE)	KY	4/6/2007	19:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	4/6/2007	19:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
39	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/26/2008	16:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
40	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/8/2008	2:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
41	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/21/2008	1:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/21/2008	1:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/21/2008	2:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/21/2008	3:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/21/2008	4:00	EST -5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
42	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/2/2009	6:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/3/2009	14:10	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/3/2009	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/3/2009	15:45	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/3/2009	17:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/3/2009	18:45	EST-5	Winter Weather		0	0	0.00K	0.00K
43	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/21/2009	19:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/21/2009	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
44	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/5/2009	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/5/2009	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
45	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/18/2009	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/18/2009	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/18/2009	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/18/2009	14:15	EST-5	Heavy Snow		0	0	0.00K	0.00K
46	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/4/2010	23:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/4/2010	23:00	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/5/2010	10:00	EST-5	Winter Weather		0	0	0.00K	0.00K
47	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/7/2010	12:00	EST-5	Winter Weather		0	0	0.00K	0.00K
48	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/29/2010	20:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
49	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/9/2010	21:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/9/2010	21:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
50	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/15/2010	6:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/15/2010	7:00	EST-5	Winter Weather		0	0	0.00K	0.00K
51	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/24/2010	19:15	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/24/2010	19:15	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/24/2010	19:15	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
52	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/2/2010	10:00	EST-5	Winter Weather		0	0	0.00K	0.00K
53	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/5/2010	19:02	EST-5	Winter Weather		0	0	0.00K	0.00K
54	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/12/2010	21:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/12/2010	21:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/12/2010	22:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/12/2010	23:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
55	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/15/2010	21:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/15/2010	21:00	EST-5	Ice Storm		0	0	0.00K	0.00K
56	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/24/2010	22:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/24/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/25/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
57	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/7/2011	5:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/7/2011	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
58	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
59	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/26/2011	4:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/26/2011	4:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/26/2011	4:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
60	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/9/2011	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/9/2011	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/10/2012	17:00	EST-5	Winter Weather		0	0	0.00K	0.00K
61	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/19/2012	11:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/19/2012	11:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
62	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/28/2012	11:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/28/2012	11:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/28/2012	11:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/28/2012	19:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/29/2012	0:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/29/2012	0:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/29/2012	17:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	10/29/2012	18:00	EST-5	Winter Weather		0	0	0.00K	0.00K
63	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/21/2012	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/21/2012	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
64	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/17/2013	12:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
65	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/25/2013	5:30	EST-5	Winter Storm		0	0	0.00K	0.00K
66	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/1/2013	0:00	EST-5	Winter Weather		0	0	0.00K	0.00K
67	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/24/2013	23:00	EST-5	Heavy Snow		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
68	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/27/2013	0:00	EST-5	Winter Storm		0	0	0.00K	0.00K
69	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/2/2014	5:50	EST-5	Winter Weather		0	0	0.00K	0.00K
70	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/28/2014	16:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/28/2014	16:30	EST-5	Winter Weather		0	0	0.00K	0.00K
71	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/12/2014	17:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
72	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/3/2014	4:00	EST-5	Winter Storm		0	0	0.00K	0.00K
73	HARLAN (ZONE)	HARLAN (ZONE)	KY	11/1/2014	0:00	EST-5	Winter Weather		0	0	0.00K	0.00K
74	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/16/2015	7:30	EST-5	Winter Storm		0	0	0.00K	0.00K
75	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/20/2015	23:30	EST-5	Winter Storm		0	0	0.00K	0.00K
76	HARLAN (ZONE)	HARLAN (ZONE)	KY	3/5/2015	2:30	EST-5	Winter Storm		0	0	0.00K	0.00K
77	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/20/2016	5:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
78	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/22/2016	1:30	EST-5	Winter Storm		0	0	0.00K	0.00K
79	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/14/2016	16:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
80	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/16/2018	8:15	EST-5	Winter Weather		0	0	0.00K	0.00K
81	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/9/2018	0:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
82	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/21/2018	9:45	EST-5	Heavy Snow		0	0	0.00K	0.00K
83	HARLAN (ZONE)	HARLAN (ZONE)	KY	1/17/2019	11:00	EST-5	Winter Weather		0	0	10.00K	0.00K
84	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/2/2019	1:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
85	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/10/2019	18:30	EST-5	Winter Weather		0	0	0.00K	0.00K
86	HARLAN (ZONE)	HARLAN (ZONE)	KY	2/28/2020	23:30	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
87	HARLAN (ZONE)	HARLAN (ZONE)	KY	12/24/2020	15:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	Totals: 87								0	0	32.00K	0.00K

Harlan County - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Harlan County experienced 87 severe winter weather events over 25 years yields that Harlan County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every 3.5 months (i.e., 87/300). Specifically, Harlan County experienced an average of 3.5 severe winter weather events each year. Or, using December 31, 2020, as an endpoint, this is 0.29 events per month. $1/0.29 = 3.5 \approx 1$ severe winter storm event an average of every 3.5 months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from May through September. This indicates that the winter months for Harlan County are October through April, a total of 7 months. When the frequency is calculated using the seven winter months only (87/175), it reveals that Harlan County experienced an average of 3.5 events per winter, or 0.497 events per winter month. $1/0.497 = 2$ or about 1 severe winter storm events an average of every 2 winter months. The outlying winter weather events in Harlan occurred in late October and early April, indicating a winter season only marginally longer than that of the other counties in the district. This difference could be a result of Harlan's generally higher elevation.

Harlan County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… By the time the storm end late in the day on the 23rd, 4 to 10 inches of snow had fallen across [Harlan C]ounty. An area just north of the town of Harlan had the

highest storm total snowfall of 10.1 inches. Freezing rain that occurred early in the morning of January 22nd left a coating of ice on tree limbs and other exposed objects."[85]

Harlan County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	HARLAN (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	HARLAN (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	HARLAN (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	HARLAN (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	HARLAN (ZONE)	1/27/1998	1/28/1998	Heavy Snow	
6	HARLAN (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
7	HARLAN (ZONE)	12/23/1998	12/24/1998	Winter Storm	
8	HARLAN (ZONE)	3/3/1999	3/3/1999	Heavy Snow	
9	HARLAN (ZONE)	3/14/1999	3/15/1999	Heavy Snow	
10	HARLAN (ZONE)	3/26/1999	3/26/1999	Heavy Snow	
11	HARLAN (ZONE)	12/24/1999	12/24/1999	Heavy Snow	
12	HARLAN (ZONE)	1/17/2000	1/18/2000	Winter Storm	
13	HARLAN (ZONE)	1/19/2000	1/20/2000	Heavy Snow	Heavy snow accumulated between 4 and 6 inches.
14	HARLAN (ZONE)	1/22/2000	1/22/2000	Winter Storm	

[85] "Storm Events Database Event Details – Harlan County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
15	HARLAN (ZONE)	1/25/2000	1/26/2000	Heavy Snow	
16	HARLAN (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
17	HARLAN (ZONE)	3/6/2001	3/6/2001	Heavy Snow	Heavy snow was reported across portions of the county. 4 to 6 inches of snow was reported with the greatest amount of 8 inches measured on Black Mountain.
18	HARLAN (ZONE)	3/21/2001	3/21/2001	Heavy Snow	The first full day of Spring brought heavy snow to extreme southeastern Kentucky which began around 1 am on Wednesday, March 21. Kingdom Come State Park in Harlan County received 17 inches by 8:15 am, with Big Laurel in Leslie County receiving 16 inches by 9 am. The largest total recorded in Perry County was in Leatherwood with 13 inches on the ground by 8:45 am and Skyline and Whitesburg in Letcher County reporting 4 inches on the ground by 1 pm. 3,500 people were without power in Whitesburg and several people were stranded on Pine Mountain. Snow amounts of 4 inches or more were generally reported above 2000 feet in elevation.
19	HARLAN (ZONE)	4/17/2001	4/18/2001	Heavy Snow	A powerful upper level late season storm brought snow across eastern Kentucky. Light snow showers put a wintery feel to the area. Accumulations were minor with the heaviest snow accumulating only at the highest elevations. 3 to 5 inches of snow was reported on Black Mountain, Pine Mountain and in Closplint all in Harlan County. Once the snow showers moved east of the area, freezing temperatures settled in for the overnight hours damaging much of the new spring plant growth.
20	HARLAN (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
21	HARLAN (ZONE)	1/19/2002	1/19/2002	Winter Storm	
22	HARLAN (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
	HARLAN (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
23	HARLAN (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 7 inches of snow were reported.
24	HARLAN (ZONE)	1/23/2003	1/23/2003	Heavy Snow	A maximum of 6 inches of snow were reported on Black Mountain.
25	HARLAN (ZONE)	3/30/2003	3/30/2003	Heavy Snow	An upper level system brought 4 inches of snow to the cooperative observer in Closplint.
26	HARLAN (ZONE)	11/29/2003	11/29/2003	Heavy Snow	Five inches of snow were reported on Black Mountain.
27	HARLAN (ZONE)	12/19/2003	12/20/2003	Heavy Snow	Nine inches of snow was reported by a co-operative observer in Closplint.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
28	HARLAN (ZONE)	1/9/2004	1/9/2004	Heavy Snow	Four inches of snow were reported countywide.
29	HARLAN (ZONE)	1/25/2004	1/25/2004	Ice Storm	
30	HARLAN (ZONE)	1/22/2005	1/23/2005	Heavy Snow	
31	HARLAN (ZONE)	1/29/2005	1/29/2005	Ice Storm	
32	HARLAN (ZONE)	2/10/2005	2/10/2005	Heavy Snow	
33	HARLAN (ZONE)	2/28/2005	2/28/2005	Heavy Snow	
34	HARLAN (ZONE)	3/1/2005	3/1/2005	Heavy Snow	
35	HARLAN (ZONE)	1/14/2006	1/14/2006	Heavy Snow	Four inches of snow accumulated on Black Mountain.
36	HARLAN (ZONE)	2/12/2006	2/12/2006	Heavy Snow	10.5 inches of snow fell 4 miles east southeast of Closplint.
37	HARLAN (ZONE)	2/18/2006	2/18/2006	Heavy Snow	Middle elevations received around 4 inches of snow. Highest elevations received at least 5 inches of snow.
38	HARLAN (ZONE)	4/6/2007	4/7/2007	Heavy Snow	Four and one half to 5 inches of snow on Highway 160 over Black Mountain.
	HARLAN (ZONE)	4/6/2007	4/7/2007	Heavy Snow	Five and a half inches of snow near Closplint.
39	HARLAN (ZONE)	2/26/2008	2/27/2008	Heavy Snow	A coop observer measured 8 inches of snowfall on Black Mountain.
40	HARLAN (ZONE)	3/8/2008	3/8/2008	Heavy Snow	Three inches of snow accumulated in Wallins Creek. Four to five inches was reported on highway 421 near Pine Mountain.
41	HARLAN (ZONE)	11/21/2008	11/21/2008	Winter Weather	A trained weather observer reported a snowfall of 3 inches in Closplint.
	HARLAN (ZONE)	11/21/2008	11/21/2008	Heavy Snow	A trained weather observer reported a 5 inch snowfall, with six inches of total accumulation on the ground, in Lynch.
	HARLAN (ZONE)	11/21/2008	11/21/2008	Winter Weather	A trained weather observer reported a snowfall of 2.9 inches in Cumberland.
	HARLAN (ZONE)	11/21/2008	11/21/2008	Winter Weather	The public reported a snowfall of 2 inches in Wallins Creek.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
	HARLAN (ZONE)	11/21/2008	11/21/2008	Winter Weather	A trained weather observer reported a snowfall of 0.6 inches in Harlan.
42	HARLAN (ZONE)	2/2/2009	2/2/2009	Winter Weather	The public reported that an inch of snow had fallen on Pine Mountain.
	HARLAN (ZONE)	2/3/2009	2/3/2009	Winter Weather	A trained spotter reported that 3 inches of snow had fallen in Harlan.
	HARLAN (ZONE)	2/3/2009	2/4/2009	Winter Weather	A worker at the Dept of Highways estimated that 1 to 2 inches of snow had fallen in Harlan since yesterday afternoon.
	HARLAN (ZONE)	2/3/2009	2/3/2009	Heavy Snow	Six inches of snow fell at the Pine Mountain Settlement School.
	HARLAN (ZONE)	2/3/2009	2/4/2009	Heavy Snow	The Harlan County Dept of Highways reported that 8 to 10 inches of snow had accumulated on Pine Mountain and that an countywide average of 4 inche of snow had occurred countywide.
	HARLAN (ZONE)	2/3/2009	2/3/2009	Winter Weather	Two inches of snow fell in Harlan.
43	HARLAN (ZONE)	2/21/2009	2/22/2009	Winter Weather	A total snow accumulation of 2.5 inches occurred between midnight and 8:40 am 3 miles south southeast of Harlan.
	HARLAN (ZONE)	2/21/2009	2/22/2009	Winter Weather	A spotter that 3 inches of snow had fallen in Wallins Creek since 10 pm Saturday.
44	HARLAN (ZONE)	12/5/2009	12/5/2009	Winter Weather	Two inches of snow fell in Harlan.
	HARLAN (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch of snow fell in Harlan.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
45	HARLAN (ZONE)	12/18/2009	12/18/2009	Heavy Snow	Four to 5 inches of snow had accumulated in Harlan mainly between 2 and 7 pm.
	HARLAN (ZONE)	12/18/2009	12/19/2009	Heavy Snow	A coop weather observer measured 16 inches of snow on Black Mountain on December 22nd. The observer was not on site during the storm that dumped the snow, but did measure a snow depth of 18 inches of snow on Sunday, December 20th. Most or all of this snow accumulated on the mountain between Friday afternoon on December 18th and late in the day on Saturday, December 19th.
	HARLAN (ZONE)	12/18/2009	12/18/2009	Heavy Snow	A resident near the base of Pine Mountain reported 4-5 inches of snow on the ground.
	HARLAN (ZONE)	12/18/2009	12/18/2009	Heavy Snow	The television media reported an estimated snowfall of 6 inches on Black Mountain.
46	HARLAN (ZONE)	1/4/2010	1/5/2010	Winter Weather	A member of the public observed 3.5 inches of snow on Little Black Mountain since yesterday.
	HARLAN (ZONE)	1/4/2010	1/5/2010	Winter Weather	The county EM reported 1/2 to 1 inch of snow accumulation around the lower elevations with 2 to 3 inches over the higher terrain.
	HARLAN (ZONE)	1/5/2010	1/5/2010	Winter Weather	A trained weather observer reported an average snow depth on Black Mountain of 13 inches, with up to 16 inches in spots.
47	HARLAN (ZONE)	1/7/2010	1/8/2010	Winter Weather	Five inches of snow fell on top of Little Black Mountain at 3700 feet. Most of the snow fell between noon on January 7th and 4 am on January 8th.
48	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public reported that 11 inches of snow was reported on the top of Little Black Mountain at the KY and VA state line.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Winter Weather	The Harlan county Dept of Highways estimated around 1 inch of snow accumulation countywide.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public reported that 8.3 inches of snow had fallen in Loyall since 8 pm the night before. Three tenths of an inch of that snow had accumulated since 1145 am this morning.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept estimated 10 inches of snow county wide with higher amounts on roads in the higher elevations. A driver reported about 16 inches on Black Mountain.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A trained spotter reported 11 inches of snow on the ground in Wallins Creek and still snowing.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A trained weather spotter measured 11 inches of snow in Wallins creek since 12:36 pm on January 29th.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A trained spotter measured 6.25 inches of snow in Wallins Creek.
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A trained weather spotter reported that 7 inches of snow had fallen in Wallins Creek since 8 pm the night before.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
	HARLAN (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A spotter reported that around 8 inches of snow had fallen in Evarts.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
49	HARLAN (ZONE)	2/9/2010	2/10/2010	Heavy Snow	More than a foot of snow was measured on Black Mountain along with 8 inches on Pine Mountain.
	HARLAN (ZONE)	2/9/2010	2/10/2010	Heavy Snow	Three inches of snow fell in the valleys, with 6 to 7 inches on Pine Mountain and 10 to 12 inches on Black Mountain. These amounts were new snow that had fallen since last night.
50	HARLAN (ZONE)	2/15/2010	2/16/2010	Heavy Snow	Eight inches of new snow fell on Black Mountain over a 24 hour period. The estimated total snow depth was 17 inches.
	HARLAN (ZONE)	2/15/2010	2/16/2010	Winter Weather	The 24 hour and storm total snowfall 1 mile south of Harlan was 2 inches.
	HARLAN (ZONE)	2/15/2010	2/15/2010	Winter Weather	A member of the public reported that 1/4 of an inch of snow fell in Harlan.
	HARLAN (ZONE)	2/15/2010	2/16/2010	Winter Weather	The 24 hour snowfall total in Baxter was 2 inches.
51	HARLAN (ZONE)	2/24/2010	2/25/2010	Heavy Snow	Eight inches of snow fell on Black Mountain since yesterday. The total current snow depth at time of report was 16 inches.
	HARLAN (ZONE)	2/24/2010	2/24/2010	Heavy Snow	Up to 4 inches of snow fell on Highway 421 over Pine Mountain. Only a dusting of snow fell in Harlan.
	HARLAN (ZONE)	2/24/2010	2/24/2010	Winter Weather	Two inches of new snow fell in Cumberland between 8 and 9 pm.
52	HARLAN (ZONE)	3/2/2010	3/2/2010	Winter Weather	A worker at the FAA site on Black Mountain reported that 3 inches of snow had fallen on the mountain during the day.
53	HARLAN (ZONE)	11/5/2010	11/5/2010	Winter Weather	An inch of snow has fallen over the past hour. There was also a tenth of ice accumulation.
54	HARLAN (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 9 inches.
	HARLAN (ZONE)	12/12/2010	12/13/2010	Heavy Snow	The total snowfall was 15.5 inches.
	HARLAN (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A trained spotter reported that 15.5 inches of snow had fallen in Wallins Creek.
	HARLAN (ZONE)	12/12/2010	12/13/2010	Heavy Snow	A trained spotter reported that 9 inches of snow fell in Wallins Creek.
55	HARLAN (ZONE)	12/15/2010	12/16/2010	Winter Weather	Black ice and freezing rain created hazardous driving conditions along US119 from about 5 miles south of Harlan to Cumberland.
	HARLAN (ZONE)	12/15/2010	12/16/2010	Ice Storm	A half of an inch of ice accumulated in Harlan.
56	HARLAN (ZONE)	12/24/2010	12/26/2010	Heavy Snow	Five and a half inches of snow fell on Little Black Mountain overnight at an elevation of 3800 feet. Between 9 and 11 inches of snow had fallen since Friday night and it was snowing heavily when this report was called in.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
	HARLAN (ZONE)	12/24/2010	12/26/2010	Winter Weather	AF4YJ reported that 6 inches of snow was on the ground in Baxter, at an elevation of 1200 feet.
	HARLAN (ZONE)	12/25/2010	12/26/2010	Winter Weather	Three and a half inches of snow fell in Baxter at an elevation of 1200 feet.
57	HARLAN (ZONE)	1/7/2011	1/7/2011	Heavy Snow	Four inches of snow fell 4 miles northwest of Crummies.
	HARLAN (ZONE)	1/7/2011	1/7/2011	Winter Weather	A half an inch of snow had fallen in Harlan.
58	HARLAN (ZONE)	1/20/2011	1/20/2011	Winter Weather	The state police in Harlan reported that a skiff snow had fallen and that roads around the county were becoming slick and hazardous.
	HARLAN (ZONE)	1/20/2011	1/20/2011	Winter Weather	The state highway garage estimated that 3 inches of snow had fallen on Pine Mountain.
59	HARLAN (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow plow driver estimated 3 inches of snow along RT. 221 at 2100 feet near the junction of Harlan, Perry, and Leslie counties.
	HARLAN (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow plow driver estimated 3 inches of snow along route 421 on top of Pine Mountain near 26oo feet.
	HARLAN (ZONE)	1/26/2011	1/26/2011	Heavy Snow	The snow plow driver estimated at least 6 inches of snow along route 160 on Black Mountain near 3700 feet.
60	HARLAN (ZONE)	2/9/2011	2/9/2011	Winter Weather	Two inches of snow fell in Loyall.
	HARLAN (ZONE)	2/9/2011	2/9/2011	Winter Weather	A half an inch of snow fell in Harlan.
	HARLAN (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2 inches.
	HARLAN (ZONE)	2/10/2012	2/11/2012	Winter Weather	An inch of snow fell in Baxter.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
61	HARLAN (ZONE)	2/19/2012	2/19/2012	Winter Weather	An inch of snow fell in Baxter.
	HARLAN (ZONE)	2/19/2012	2/19/2012	Heavy Snow	The deputy EM Director of Harlan county reported that 10 to 12 inches of snow had fallen in 3 to 4 miles south of Clover.
	HARLAN (ZONE)	2/19/2012	2/19/2012	Winter Weather	Three inches of snow fell in Harlan.
	HARLAN (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Four inches of snow fell in Wallins Creek.
62	HARLAN (ZONE)	10/28/2012	10/29/2012	Winter Weather	An estimated two inches of snow had fallen where Hwy 160 crosses Big Black Mountain above Lynch at an elevation of 3700 feet.
	HARLAN (ZONE)	10/28/2012	10/30/2012	Heavy Snow	A foot of snow had fallen where Hwy 160 crosses Black Mountain. The snow drifts at this location were up to 3 feet deep.
	HARLAN (ZONE)	10/28/2012	10/29/2012	Heavy Snow	Ten inches of snow had fallen where Hwy 160 crosses Big Black Mountain at 3700 feet elevation.
	HARLAN (ZONE)	10/28/2012	10/30/2012	Heavy Snow	Six inches of snow was reported in the Cloverlick Community just outside of Benham at an elevation of 2310 feet.
	HARLAN (ZONE)	10/29/2012	10/30/2012	Heavy Snow	Six inches of snow had fallen on Hwy 421 where it crosses Pine Mountain.
	HARLAN (ZONE)	10/29/2012	10/30/2012	Heavy Snow	Nine inches of snow fell at Kingdom Come State Park.
	HARLAN (ZONE)	10/29/2012	10/30/2012	Heavy Snow	Four and three tenths of an inch of snow was measured along Hwy 421 on Pine Mountain at 2000 feet elevation.
	HARLAN (ZONE)	10/29/2012	10/29/2012	Winter Weather	Three inches of snow had fallen where US 421 crosses Pine Mountain at 2600 feet elevation.
63	HARLAN (ZONE)	12/21/2012	12/21/2012	Winter Weather	Two and a half inches of snow fell on Black Mountain.
	HARLAN (ZONE)	12/21/2012	12/21/2012	Winter Weather	An inch of snow fell in Harlan.
64	HARLAN (ZONE)	1/17/2013	1/17/2013	Heavy Snow	Snowfall amounts ranged from 2 inches in Harlan upwards to 6.3 inches in Cumberland. There was little variance between the valleys around Cumberland and the top of Black Mountain where 6 was reported by the Highway Department.
65	HARLAN (ZONE)	1/25/2013	1/25/2013	Winter Storm	Freezing rain accumulated up to 4/10 on Pine Mountain with lesser amounts of freezing rain, sleet and snow in Harlan.
66	HARLAN (ZONE)	2/1/2013	2/1/2013	Winter Weather	Snowfall amounts ranged from a little over 2 inches in Harlan up to 6 inches on Hwy 160 over Black Mountain.
67	HARLAN (ZONE)	3/24/2013	3/26/2013	Heavy Snow	Snowfall amounts ranged from 2 to 4 inches in the lower elevations, with 5 to 12 inches reported on Pine and Black Mountains.

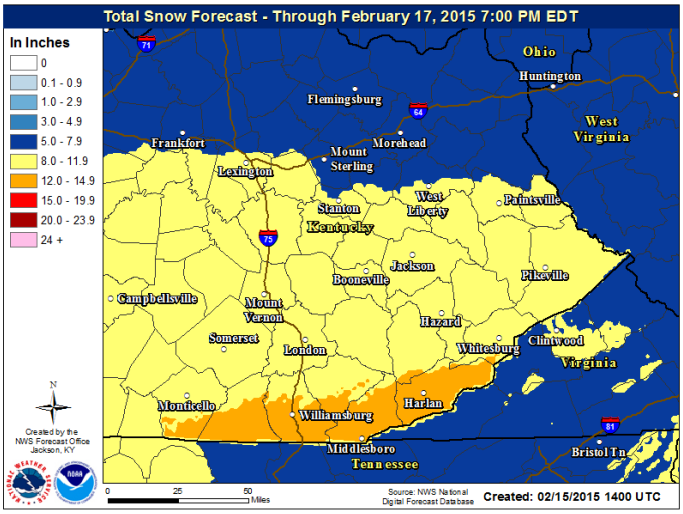
Count	County	Begin Date	End Date	Type	Extent: Event Narrative
68	HARLAN (ZONE)	11/27/2013	11/28/2013	Winter Storm	Four to six inches of snow fell across the higher elevations of Harlan County. A trained spotter five miles south-southeast of Cumberland reported four inches of snow as of 10:30 am EST the 27th.
69	HARLAN (ZONE)	1/2/2014	1/2/2014	Winter Weather	The Harlan State Police were working a four car accident near Coxton. The accident was caused by slick roads caused by freezing rain.
70	HARLAN (ZONE)	1/28/2014	1/28/2014	Winter Weather	An inch and a half of snow fell 1 mile west of Cranks.
	HARLAN (ZONE)	1/28/2014	1/28/2014	Winter Weather	The state police post in Harlan reported that about 2 inches of snow had fallen on Pine Mountain. Several cars became stranded on the mountain and Highway 421 had to be temporarily shut down due to hazardous road conditions. It was still snowing heavily at the time this report was called in.
71	HARLAN (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Snowfall amounts ranged from a little over four inches in Harlan up to eleven inches near Cumberland.
72	HARLAN (ZONE)	3/3/2014	3/3/2014	Winter Storm	Two to five tenths of an inch of ice due to freezing rain was reported across Harlan county. The highest ice accumulations occurred in the Cumberland, Lynch, and Leatherwood areas. One to one and a half inches of snow fell on top of the ice. Two tenths of an inch of sleet was also reported in Harlan.
73	HARLAN (ZONE)	11/1/2014	11/1/2014	Winter Weather	Snowfall amounts over the county ranged from an inch in Harlan and most lower elevation locations with four to six inches on the higher elevations of Pine and Black Mountains.
74	HARLAN (ZONE)	2/16/2015	2/17/2015	Winter Storm	Between 1205 and 1210 pm, 2 to 3 inches of snow had accumulated in the city of Harlan, while 4 inches had already piled up in Baxter. Harlan had 4 inches of snow as of 214 pm. Four to 8 inches of snow had fallen across the county by the time the storm had blown itself out. The highest snow fall total was recorded in Bledsoe, where 8 inches of snow fell. Baxter came in a close second with 7 inches.
75	HARLAN (ZONE)	2/20/2015	2/21/2015	Winter Storm	Harlan county was particularly hard hit by this storm. Between 944 am and 3 pm on the 21st, 4 to 12 inches snow had fallen across the county. The highest snowfall total of 12 inches occurred a few miles south of Benham. The city of Harlan received 8 inches of snow. The other major issue caused by this storm was roof collapses that resulted from heavy wet snow piling up on buildings and homes. Locations that experienced this type of damage were the Gulf/Commissary gas station in Harlan where the station canopy collapsed, and the Guthrie Memorial Airport where a partial roof and structure collapse occurred.
76	HARLAN (ZONE)	3/5/2015	3/5/2015	Winter Storm	At least half an inch of sleet, and around 2 inches of snow accumulated across portions of Harlan county.
77	HARLAN (ZONE)	1/20/2016	1/20/2016	Heavy Snow	Around four inches of snow was reported at several locations across the county.
78	HARLAN (ZONE)	1/22/2016	1/23/2016	Winter Storm	By the time the storm end late in the day on the 23rd, 4 to 10 inches of snow had fallen across the county. An area just north of the town of Harlan had the highest storm total snowfall of

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
					10.1 inches. Freezing rain that occurred early in the morning of January 22nd left a coating of ice on tree limbs and other exposed objects.
79	HARLAN (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 3 to 5 inches across the county. Some freezing rain and sleet also mixed in but amounts were inconsequential.
80	HARLAN (ZONE)	1/16/2018	1/16/2018	Winter Weather	
81	HARLAN (ZONE)	12/9/2018	12/9/2018	Heavy Snow	
82	HARLAN (ZONE)	12/21/2018	12/22/2018	Heavy Snow	
83	HARLAN (ZONE)	1/17/2019	1/17/2019	Winter Weather	
84	HARLAN (ZONE)	12/2/2019	12/2/2019	Heavy Snow	
85	HARLAN (ZONE)	12/10/2019	12/11/2019	Winter Weather	
86	HARLAN (ZONE)	2/28/2020	2/29/2020	Winter Weather	
87	HARLAN (ZONE)	12/24/2020	12/25/2020	Heavy Snow	A Co-op observer reported 7.5 inches of snowfall as of 8am on 12/25.
88	HARLAN (ZONE)	2/1/2021	2/2/2021	Winter Weather	A volunteer weather observer reported that 1.5 inches of snow had fallen in Dressen.
89	HARLAN (ZONE)	2/7/2021	2/7/2021	Heavy Snow	A member of the public reported that 8.3 inches of snow had fallen since midnight near Gatun. Two to six inches of wet snow coated power lines and tree limbs. Some eventually broke and fell onto nearby power lines which caused some power outages.
	HARLAN (ZONE)	2/7/2021	2/7/2021	Heavy Snow	A member of the public reported that 8 to 9 inches of snow had fallen near Mary Alice.
	HARLAN (ZONE)	2/7/2021	2/7/2021	Heavy Snow	A member of the public reported that 9.8 inches of snow had fallen near Rock House.
	HARLAN (ZONE)	2/7/2021	2/7/2021	Heavy Snow	A member of the public reported that 6 inches of snow had fallen near Wallins Creek.
	HARLAN (ZONE)	2/7/2021	2/7/2021	Heavy Snow	A member of the public reported that 6.5 inches of snow had fallen near Loyall.
90	HARLAN (ZONE)	2/11/2021	2/11/2021	Ice Storm	Very little if any ice accumulation due to freezing rain occurred in the valleys, but a quarter of an inch of ice accumulation was estimated to have occurred on the trees on the tops of ridges around the county. Multiple trees around the county were downed due to the weight of ice on them.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
91	HARLAN (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Four inches of snow was estimated to have fallen in Smith.
	HARLAN (ZONE)	2/17/2021	2/18/2021	Winter Storm	Around 4 inches of snow and some sleet was reported at Fresh Meadows near Dayhoit.
	HARLAN (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Three to four inches of snow was estimated to have fallen in Coburn.

PAST WINTER STORMS

In February 2015 the National Guard was deployed to Harlan County where flooding and heavy snow had caused several problems. The heavy snowfall led to at least 25 reported roof collapses throughout the county which included two Dollar General Stores and the Discount Carpets. During this event hundreds of people were without water. The Red Cross, Kentucky Emergency Management, and the National Guard assisted with recovery and gave out bottled water to those affected.



A month later, a major late winter storm hit Harlan County. Heavy rain coupled with melting high elevation snowpack containing considerable water content, caused extensive runoff and produced widespread flooding.

In January of 2018 temperatures plummeted to near zero resulting in over 100 to 150 Harlan County residents losing power. During the power outage the Courthouse was opened as a warming station as well as Christ's Hands, Harlan Center, Cumberland and Benham Schoolhouse Inn. Emergency workers performed well being checks on people affected by the power outage. During this power outage incident, the electricity was restored very quickly, which is not always the case.

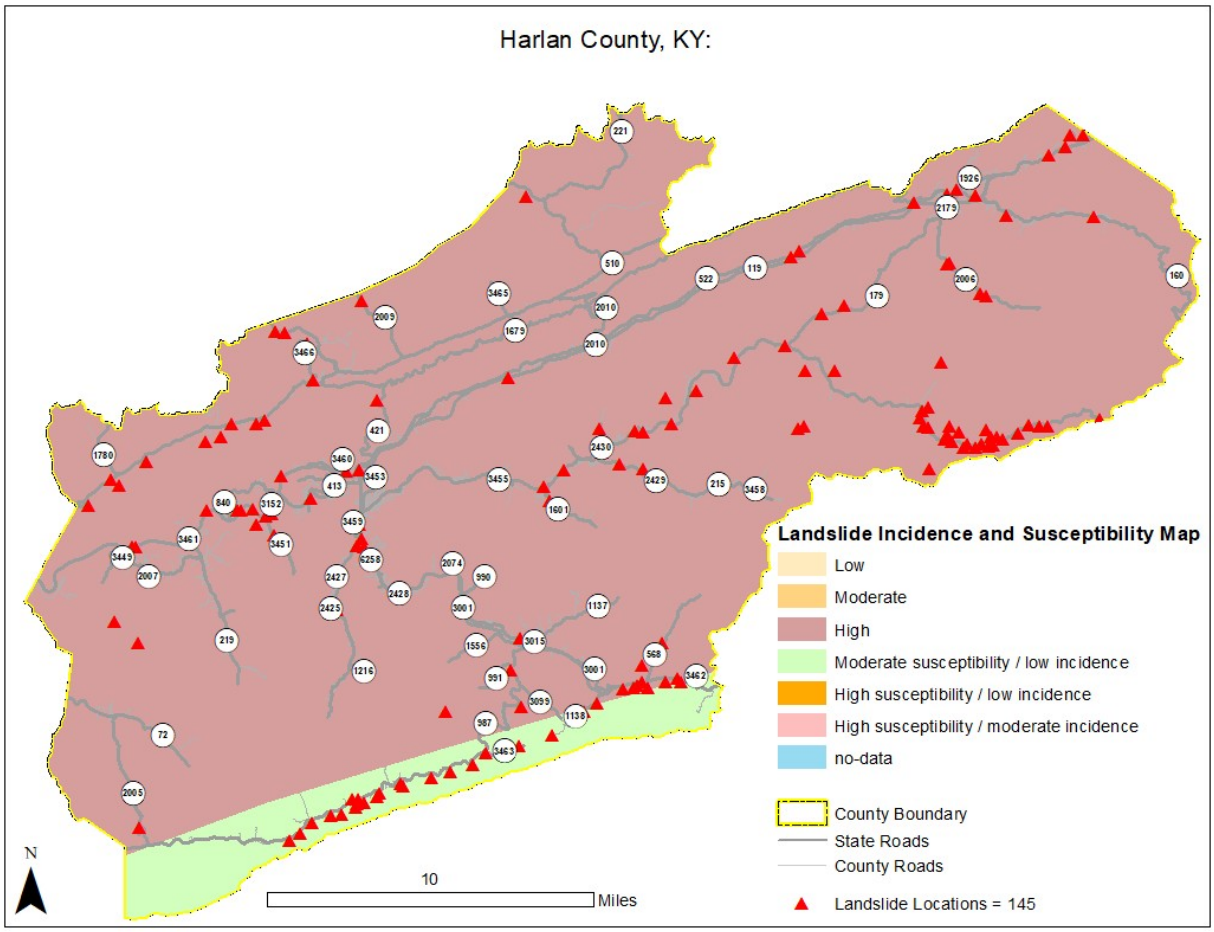
Severe winter weather threatens utilities, critical facilities, and vulnerable populations. Emergency personnel and road crews work around the clock to assist and manage the winter weather dangers. Reviewing past severe winter storms can reveal vulnerabilities within the county and cities enabling emergency management to better plan and prepare for future disasters.

LANDSLIDES

The steep mountainous terrain of Harlan County is beautiful and benefits the county with adventure tourism opportunities, however, it also has a negative impact on the county. The Kentucky Geological Survey has documented 120 landslides in Harlan County between the years 1973-2014. These landslides have damage buildings and homes, knocked over electric poles, and blocked, and/or damaged roads.

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field.

Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils. The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.



Source: Crawford, Matthew. *KGS Landslide Inventory*. Kentucky Geological Survey, www.uky.edu

All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
1	Harlan	Louellen	KY 38		2002										
2	Harlan	Louellen	KY 179		5/3/2011	Slide	Spoil								
3	Harlan	Nolansburg	KY 38		5/3/2011	Landslide	Sandstone; Shale; Siltstone								
4	Harlan	Louellen	KY 38		3/9/2012	Slide	Sandstone; Siltstone; Shale; Coal								
5	Harlan	Wallins Creek	KY 221	Above Road	12/9/2013	Rockfall	Shale; Siltstone; Sandstone; Coal							Yes	
6	Harlan	Bledsoe	KY 221	Above Road	2013	Landslide	Shale; Sandstone; Coal							Yes	$ 20,625
7	Harlan	Ewing	KY 2005	Above Road	2013	Landslide	Sandstone		200 feet					Yes	
8	Harlan	Louellen	KY 522		2/21/2015	Slide	Shale; Siltstone; Sandstone; Coal							Road Closure	
9	Harlan	Louellen	KY 38	Above Road	3/25/2015	Landslide	Sandstone; Shale; Siltstone; Coal								
10	Harlan	Nolansburg	KY 38	Above Road	5/1/2016	Landslide; Soil and Rock	Sandstone; Shale; Siltstone							Two Lanes of KY 38 Blocked	

11	Harlan	Nolans-burg	KY 38	Above Road; Stream at Bottom	5/2/2016	Land-slide; Soil and Rock	Sandstone ; Shale; Siltstone							Two Lanes of KY 38 Blocked	
12	Harlan	Rose Hull	KY 987		12/6/2016	Rock-slide	Shale; Siltstone; Sandstone ; Coal							Road Blocked	
13	Harlan	Rose Hill	KY 987	Above Road	4/22/2017	Debris Flow	Shale; Siltstone; Sandstone ; Coal							Home Threat-ened	
14	Harlan	Wallins Creek	US 119		2017										
15	Harlan	Wallins Creek	US 119	Road Cut	2017	Rockfall	Sandstone ; Shale; Siltstone; Coal							Road Closure for a Month	
16	Harlan	Lou-ellen	KY 179		2018		Siltstone; Shale; Sandstone ; Coal							Road Blocked	
17	Harlan	Bledsoe	US 421		2/24/2019		Sandstone ; Shale								
18	Harlan	Appa-lachia	KY 160		2019		Sandstone ; Siltstone; Shale								
19	Harlan	Sand-gap	US 421		2019		Sandstone								
20	Harlan	Wallins Creek	KY 840		2019		Sandstone ; Shale; Siltstone								
21	Harlan	Bledsoe	KY 413		2020		Siltstone; Shale; Sandstone ; Coal								

22	Harlan	Ewing	KY 2005		2020		Sandstone ; Shale; Siltstone; Coal; Underclay								
23	Harlan		KY 221		2020		Sandstone ; Shale; Coal							Break in Pavemen t	
24	Harlan	Bledsoe	US 421	Above and Below Road	2021		Shale							Slide Repair	
25	Harlan	Wallins Creek	KY 2007		2021		Siltstone; Shale; Sandstone ; Limestone ; Coal							Slide Repair	
26	Harlan	Bledsoe	(36.924166, -83.368888)												
27	Harlan	Bledsoe	(36.918611, -83.351388)												
28	Harlan	Bledsoe	KY 2009	Above and Below Road			Shale; Sandstone ; Coal		275 feet					Road Failure	
29	Harlan	Bledsoe	KY 3466				Sandstone ; Shale; Siltstone; Coal; Limestone		100 feet					Road Failure	
30	Harlan	Bledsoe	US 421				Sandstone ; Shale; Siltstone; Coal		120 feet						
31	Harlan	Bledsoe	US 421				Sandstone ; Shale		90 feet						

32	Harlan	Lou-ellen	KY 179			Land-slide	Sandstone ; Shale; Siltstone; Coal							Yes		
33	Harlan	Lou-ellen	(36.900277, -83.060277)													
34	Harlan	Nolans-burg	(36.890216, -83.15406)			Land-slide	Sandstone ; Shale; Coal									
35	Harlan	Nolans-burg	US 119													
36	Harlan	Nolans-burg	(36.981388, -83.228055)													
37	Harlan	Nolans-burg	(36.877777, -83.191388)													
38	Harlan	Nolans-burg	(36.893333, -83.1375)													
39	Harlan	Wallins Creek	US 119			Soil/ Mud	Sandstone ; Siltstone; Shale; Coal				16-30 feet			Yes		
40	Harlan	Wallins Creek	KY 3467													
41	Harlan	Wallins Creek	(36.839166, -83.381944)													

Harlan County Landslides - Probability as Frequency of Event Occurrence

Harlan County, unincorporated (and its unincorporated cities) independently experienced 41 landslide events over 30 years. Thus, Harlan County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every 8.8 months (i.e., 41/30). Specifically, Harlan County, unincorporated and its unincorporated cities experienced an average of 1.4 landslide events each year. Or, using December 31, 2021, as an endpoint, 41/360 months is 0.1139 events per month. $1/0.1139 = 8.779 \approx 1$ landslide event an average of every 8.8 months.

Count	County	City	Location	Failure Loca-tion	Failure or Observed Date	Type	Type: Lithology	Extent : Track Length	Extent : Width	Extent : Head Scarp Height	Extent: Slip Surface Depth	Extent : Slope Angle	Extent : Move-ment Rate	Impact: Damage Narrative	Impact: Cost
1	Harlan	Benham	Short St		12/10/1972	Land-slide; Rota-tional	Sandstone; Siltstone; Shale; Coal	600 feet	500 feet		50 feet		Slow	Yes	
2	Harlan	Benham	KY 2006	Above Road; Stream at Bottom	3/17/2012	Slide	Sandstone; Siltstone; Shale; Coal							Yes	
3	Harlan	Benham	KY 38		6/18/2012	Land-slide	Siltstone; Shale; Sandstone; Coal							Yes	$ 15,633
4	Harlan	Benham	KY 2006		2012										
5	Harlan	Benham	KY 2006		1/19/2013		Sandstone; Siltstone; Shale; Coal							Yes	
6	Harlan	Benham	KY 160	Above Road	3/6/2015	Debris Flow	Sandstone; Siltstone; Shale; Coal						Fast	Road Closure	
7	Harlan	Benham	Railroad St	Above Road	2/16/2016	Land-slide	Shale; Siltstone; Sandstone; Coal							Damaged Home Foundation; Material in Roadway	
8	Harlan	Benham	KY 38		2019		Sandstone; Siltstone; Shale								
9	Harlan	Benham	(36.966944, -82.963333)												

Benham Landslides - Probability as Frequency of Event Occurrence

Incorporated Benham independently experienced 9 landslide events within its city limits over 30 years. Therefore, Benham experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every three years (i.e., 9/30). Or, using December 31, 2021, as an endpoint, 9/360 months is 0.025 events per month. 1/0.025 = 40 ≈ 1 landslide event an average of every forty (40) months, or one every three (3) years.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
0	Harlan	Cumberland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cumberland Landslides - Probability as Frequency of Event Occurrence

Incorporated Cumberland has no record of a landslide in the state-maintained database.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narrative	Impact: Cost
1	Harlan	Evarts	Mills Lane		9/21/2011	Slide	Siltstone; Sandstone; Shale; Coal					25-27 degrees		Yes	
2	Harlan	Evarts	Redbud Hill Rd		1/26/2012	Land-slide	Siltstone; Sandstone; Shale; Coal							Yes	
3	Harlan	Evarts	Gilbertsville Rd	Above Home	3/4/2015	Slide; Soil and Rock	Siltstone; Sandstone; Shale; Coal						Fast	Damaged Home	
4	Harlan	Evarts	KY 3001		2016	Land-slide	Siltstone; Shale; Sandstone; Coal							Damaged Roadway: Closed for 4 Days	
5	Harlan	Evarts	KY 987	Below Road; Stream at Bottom	2016		Siltstone; Sandstone; Shale; Coal								
6	Harlan	Evarts	KY 38		2/17/2018		Siltstone; Sandstone; Shale; Coal							Slide Blocking Both Lanes	
7	Harlan	Evarts	KY 1601		2018		Siltstone; Sandstone; Shale; Coal								
8	Harlan	Evarts	KY 38												
9	Harlan	Evarts	(36.763333, -83.174444)												

10	Harlan	Evarts	(36.755, -83.238333)												
11	Harlan	Evarts	(36.781944, -83.160277)												
12	Harlan	Evarts	(36.765, -83.171388)												
13	Harlan	Evarts	KY 987				Siltstone; Sandstone; Shale; Coal		200 feet					Road Failure	
14	Harlan	Evarts	Sulfur Springs Rd	Above Road			Siltstone; Sandstone; Shale; Coal							Home Threatened	
15	Harlan	Evarts	KY 38				Siltstone; Sandstone; Shale; Coal		600 feet						

Evarts Landslides - Probability as Frequency of Event Occurrence

Incorporated Evarts independently experienced 15 landslide events within its city limits over 30 years. Therefore, Evarts experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every two years (i.e., 15/30). Specifically, Evarts experienced an average of 0.5 landslide events each year. Or, using December 31, 2021, as an endpoint, 6/360 months is 0.0416 events per month. $1/0.0416 = 24 \approx 1$ landslide event an average of every 24 months, or one every two (2) years.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent : Track Length	Extent : Width	Extent : Head Scarp Height	Extent: Slip Surfac e Depth	Extent : Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact : Cost
1	Harlan	Har-lan	US 421		12/1/197 8		Siltstone; Shale; Sandstone; Coal				20 feet			Yes	
2	Harlan	Har-lan	US 421		3/16/197 9		Siltstone; Shale; Sandstone; Coal							Yes	
3	Harlan	Har-lan	US 421		5/7/1979	Wedg e Failur e	Siltstone; Shale; Sandstone; Coal							Yes	
4	Harlan	Har-lan	Pope Hill Rd		6/23/201 1	Slide	Siltstone; Shale; Sandstone; Coal								
5	Harlan	Har-lan	KY 3451	Natural Slope	6/13/201 3	Land-slide	Siltstone; Shale; Sandstone; Coal		400 feet				Contin-uous-Rapid	Yes	
6	Harlan	Har-lan	(36.85023 6, -83.351799)		2016	Land-slide	Siltstone; Shale; Sandstone; Coal							Damaged Road; Damaged Cemetery	
7	Harlan	Har-lan	KY 72		2/7/2019	Slide	Sandstone; Siltstone; Carbonaceou s Shale; Coal							Road Blocked	
8	Harlan	Har-lan	KY 1556		2021		Siltstone; Shale; Sandstone; Coal							Slide Repair	

9	Harlan	Har-lan	KY 1556		2021		Siltstone; Shale; Sandstone; Coal							Slide Repair	
10	Harlan	Har-lan	KY 72												
11	Harlan	Har-lan	US 119	Below Road; Stream at Bottom		Earth Slide	Siltstone; Shale; Sandstone								
12	Harlan	Har-lan	US 119	General Road Embank-ment			Shale; Clay Shale; Sandstone; Coal							Yes	
13	Harlan	Har-lan	(36.754166, -83.28)												
14	Harlan	Har-lan	KY 72	Above Road			Siltstone; Shale; Sandstone; Coal							Road Blocked	

Harlan Landslides - Probability as Frequency of Event Occurrence

Incorporated Harlan independently experienced 6 landslide events within its city limits over 30 years. Therefore, Harlan experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every five years (i.e., 6/30). Specifically, Harlan experienced an average of 1.5 landslide events each year. Or, using December 31, 2021, as an endpoint, 6/360 months is 0.0167 events per month. $1/0.0167 = 60 \approx 1$ landslide event an average of every 60 months, or one every five (5) years.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
0	Harlan	Loyall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

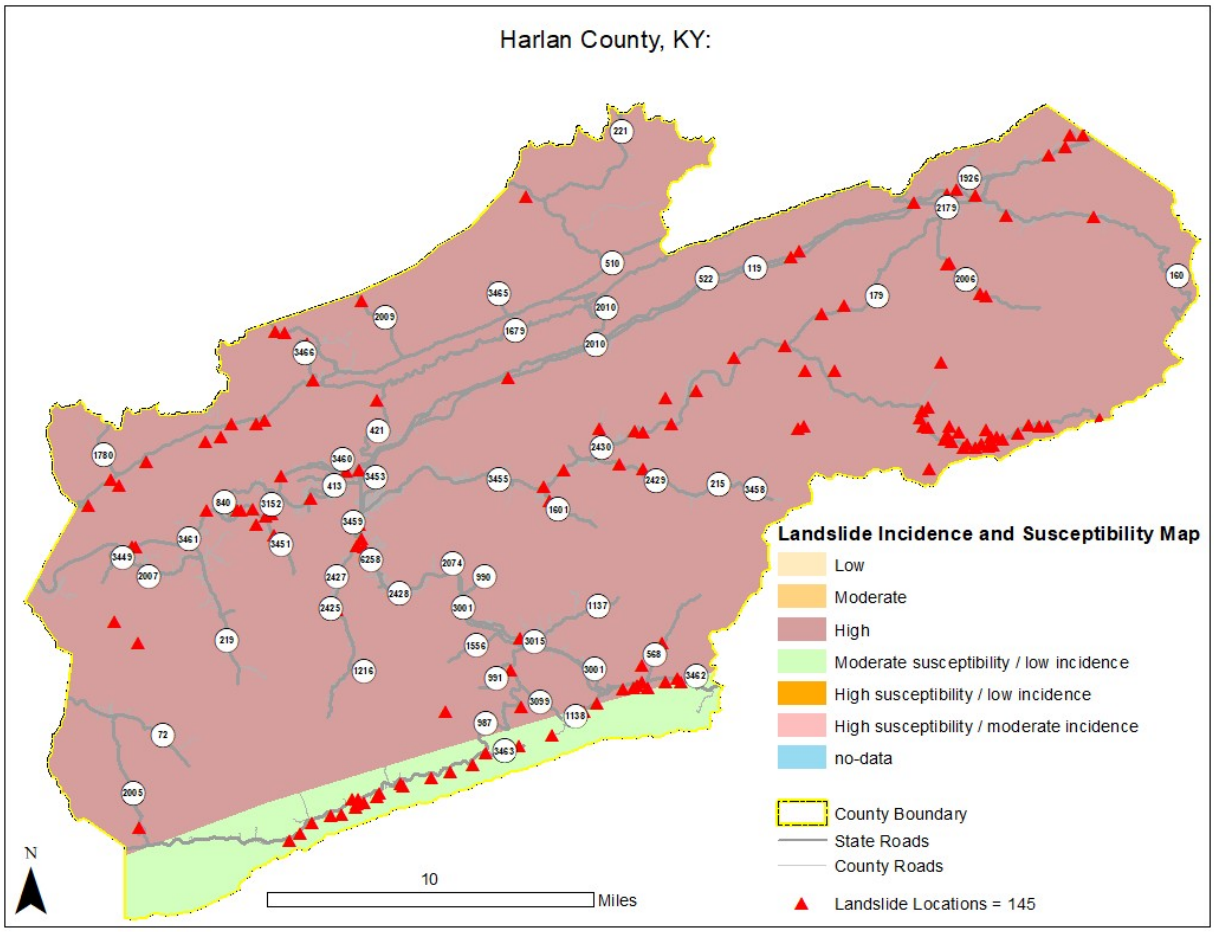
Loyall Landslides - Probability as Frequency of Event Occurrence

Incorporated Loyall has no record of a landslide in the state-maintained database.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
0	Harlan	Lynch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Lynch Landslides - Probability as Frequency of Event Occurrence

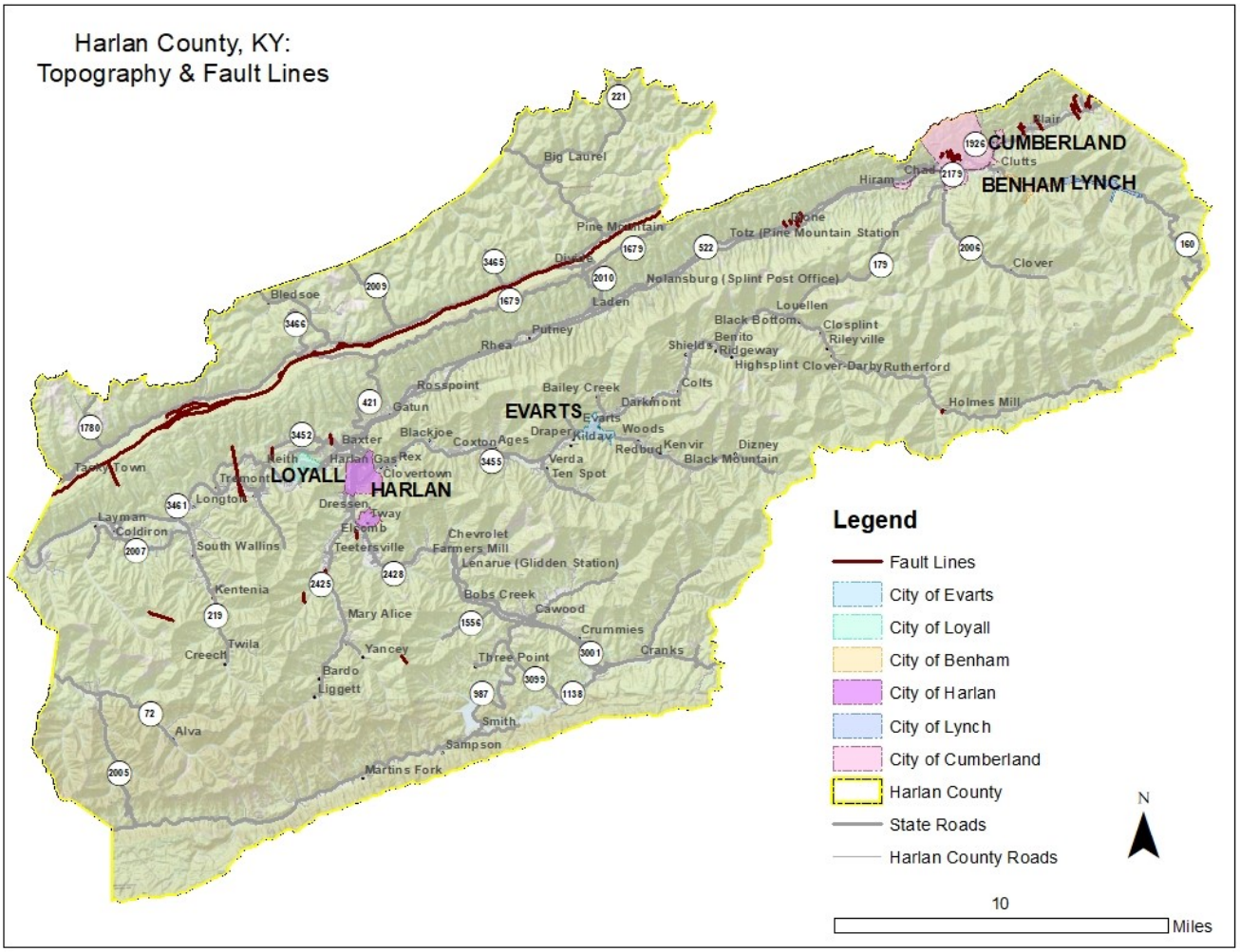
Incorporated Lynch has no record of a landslide in the state-maintained database.



Source: Crawford, Matthew. *KGS Landslide Inventory*. Kentucky Geological Survey, www.uky.edu/KGS/.

Earthquakes can happen any time of the year and without warning. The risk in Kentucky is higher in identified seismic zones such as the New Madrid Fault Zone in the western part of the state. In addition to the listed activity in Harlan County, it would experience shaking from potential future, larger earthquakes in the region, particularly from the Eastern Tennessee seismic zones. The following is a list of the recorded earthquakes in Harlan County from 1900 through 2018 and a map of fault lines in the county.

Harlan County Historical Earthquakes 1/1/1900 – 1/31/2018				
Location	**Magnitude**	**Depth**	**Date**	**Time**
6 km N of Loyall	2.5	19.9km	05/16/2017	20:42:25 (UTC)
Explosion Eastern KY	3.9	0.0km	04/19/2016	08:50:15 (UTC)
Rock Burst Eastern KY	3.3	1.0km	03/11/1995	09:50:04 (UTC)
Rock Burst Eastern KY	3.7	1.0km	03/11/1995	08:15:52 (UTC)
Rock Burst Eastern KY	3.2	1.0km	11/08/1990	10:08:28 (UTC)
Rock Burst Eastern KY	2.7	1.0km	11/08/1990	10:02:12 (UTC)
Eastern KY	4.0	10.0km	08/17/1990	21:01:17 (UTC)
Source: USGS Earthquake Hazard Program				



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Harlan County was about 63 persons in 2010 (the latest data available in Census Quickfacts[9]). This small population size and commensurate low density of structures would indicate that the impact of an earthquake would be on the lower damage level estimated for that point on the Richter Scale. The US Geological Survey states[10]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For

example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake in written history occurred in 1960 off the coast of Chile and had a magnitude of 9.5.
Michigan Technological University's Earthquake Magnitude Scale[11] puts a number to the potential for damage:

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

Harlan County has had seven earthquakes recorded in the USGS Earthquake Hazard Program database. Three of the earthquakes fell in the 2.5-5.4 magnitude on the Earthquake Magnitude Scale, which identifies the extent as "often felt, but only causes minor damage". Given the history of earthquakes in Harlan County, it is safe to say that the probability of an earthquake of 5.5 or above in magnitude, where damage to structures begins, would be very rare.[12],[13] There have been no recorded events at 5.5 or above on the Earthquake Magnitude Scale and thus there are no recorded past damages and impacts from earthquakes for Harlan County and its incorporated cities.

WILDFIRE

In November 2016 several forest fires overwhelmed Harlan County. At one point there were five different wildfires occurring simultaneously throughout the county with the largest one being the Nolansburg Fire. This fire burnt 7,400 acres. The Cabinet for Health and Family Services issued a smoke inhalation advisory due to the wildfires causing poor air quality. The air quality tests conducted in some areas of Harlan County by the Kentucky Department for Environmental Protection (KDEP) showed values that were unhealthy for sensitive groups, including people with respiratory disorders.

Then-Gov. Matt Bevin declared a statewide emergency enabling greater state resources to help battle the fires. The National Guard was dispatched to Harlan County. Helicopters dropped water on the Pine Mountain wildfire. These wildfires forced some people to evacuate from their homes. A few outbuildings and an abandoned house were destroyed in the fires.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke

that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[86]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

[86] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

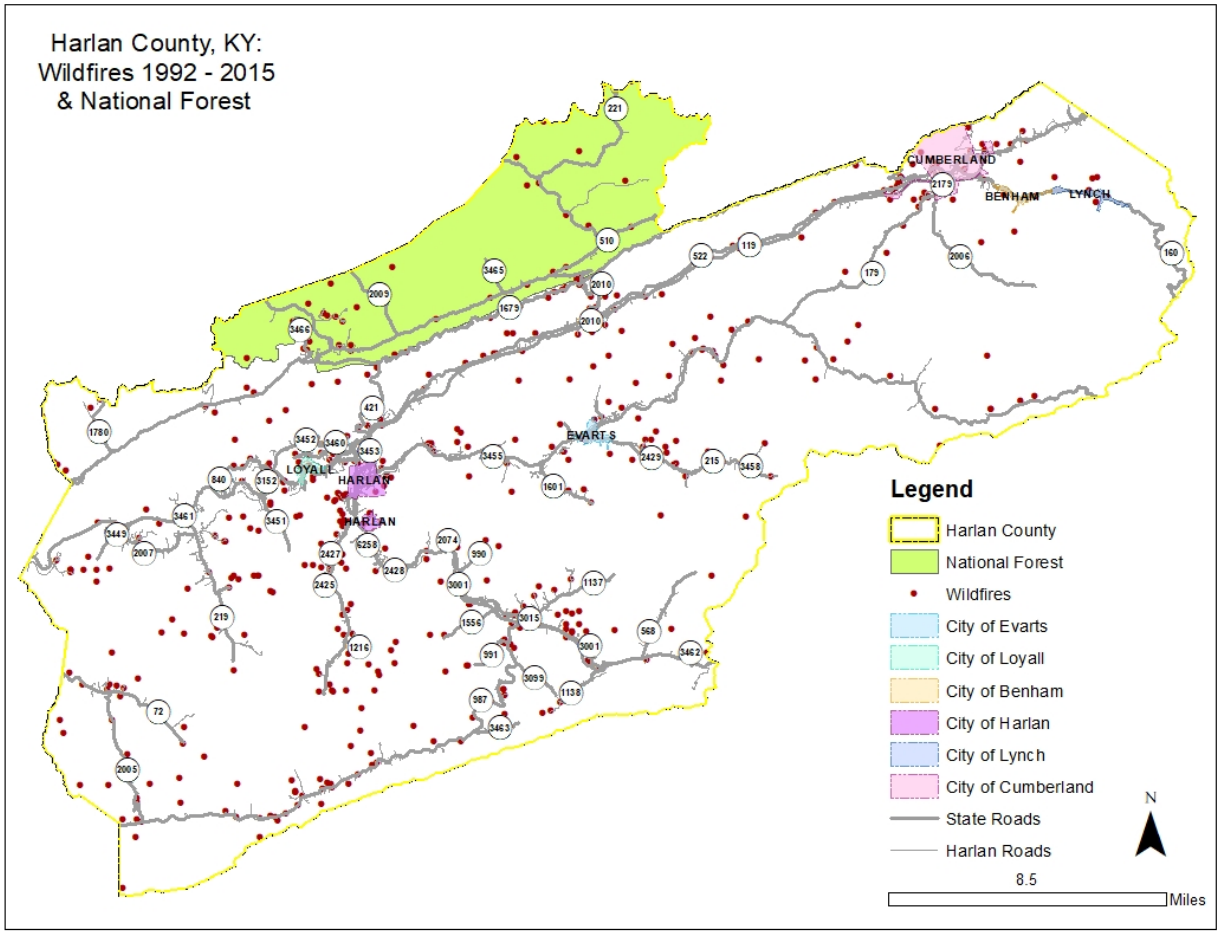
Summary of Fire Occurrences in Harlan County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	0	0.4	0.000%
Class B	0.25 to 9 Acres	34	86.3	80.952%
Class C	10 to 99 Acres	7	21.0	16.667%
Class D	100 to 299 Acres	1	0.0	2.381%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Harlan	2013	26	553.0	100,180
	2014	31	2425.0	
	2015	22	1186.0	
	2016	54	11265.0	
	2017	23	837.5	
	2018	10	857.0	
	2019	28	225.0	
	2020	14	185.1	

Table 1-4 Harlan County Summary of Impacts From Wildfires, 2019-2020		
# of Fires		42
Injuries		0
Fatalities		0
Suppression Costs	$	54,512
# Houses Saved		18
Value of Houses Saved	$	1,079,650
# Houses Lost		0
Value of Houses Lost	$	-
# Structures Saved		15
Value of Structures Saved	$	55,089
# Structures Lost		0
Value of Structures Lost	$	-

In 2019-2020 (the last years for which data is available), Harlan County suffered 42 wildfires of all class types. Two years equals 730 days. Thus, there were 42/730 fires per day, or 0.0575 fires per day, or 1 wildfire of all class types every 17.39 days (1/0.0575). Within particular wildfire classes, there were no Class A wildfires between 2019-2020. There were 34 Class B wildfires between 2019-2020. This translates to 34/730 fires where between 0.25 to 9 acres were burned, or 0.0466 Class B fires per day, or one (1) Class B wildfire about every 21.46 days (1/0.0466). There were 7 Class C wildfires between 2019-2020. This translates to 7/730 fires where between 10 to 99 acres were burned, or 0.0096 Class C fires per day, or one (1) Class C wildfire about every 104.17 days (1/0.0096). There was 1 Class D wildfire between 2019-2020. This translates to 1/730 fires where between 100 to 299 acres were burned, or 0.0014 Class D fires per day, or one (1) Class D wildfire about every 714.28 days (1/0.0014). There were no Class E to Class G wildfires – fires where 300 to 5,000 or more acres were burned – in 2019-2020 in Harlan County.

All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current.



ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Harlan County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Harlan County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Harlan County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Harlan County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Harlan County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Harlan County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

HARLAN COUNTY GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

Objective(s)

1.1 Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive areas.

Goal #2 *Protect Harlan County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

Objective(s)

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Harlan County's most vulnerable populations and structures.
2.2 Decrease the number of FEMA-identified "repetitive loss properties."

Goal #3 *Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

Objective(s)

3.1 Increase the level of knowledge and awareness for Harlan County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.
3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

Goals Correlation to Hazards			
Hazards	**Goal #1**	**Goal #2**	**Goal#3**
Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Replace wooden bridges in County.	✓				Completed in 2014.
Purchase generator for Evarts water plant, Harlan water plant, Cawood water district plant.			✓		Cawood and Harlan water plants have generators. Continue to seek funding for other generators.
Generators for sewer plants and lift stations; Evarts, Harlan, & Loyall.			✓		Harlan has a backup generator, but pump stations do not. Continue to seek funding for generators at other facilities.
3-phase generator for Harlan County Road Department.				✓	Has not been purchased. Continue to seek funding.
Generators for Fire Departments within the County.				✓	Harlan County Rescue Squad has a generator. Continue to seek funding for generators at other fire departments.
Warning siren system. 10 sirens placed near lake, off				✓	Has not been implemented. Continue to seek funding.

road park, campgrounds, and cities.					

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

HARLAN COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Purchase and install a generator for the county road garage building.	All Hazards	County	X				Long Term	1	5	1	Grants	1
Purchase and install a generator for the state highway department building.	All Hazards	KYTC	X				Long Term	1	5	1	Grants & KYTC	4
Build storm shelters at vulnerable areas such as the county's 5 different trailer parks.	Severe Thunderstorms & Tornados	County and/or City	X				Long Term	1	3	1	Grants	1
Build storm shelter at the Black Mountain Off Road Park.	Severe Thunderstorms & Tornados	County and Harlan Co. Outdoor Recreation Board	X				Long Term	1	3	1	Grants	4
Acquisition of Pineview Trailer Park at Blair.	Flood	County	X				Long Term	1	2	1	Grants	3
Purchase and install generators at various schools within the county.	All Hazards	Board of Education	X				Long Term	1	5	1	Grants	2
Install tiles, drains, and or culverts at West KY-72.	Flood	KYTC	X				Long Term	1	5	1	Grants & KYTC	2
Trim trees near roads and power lines.	Winter storms & Severe Storms	KU, LGE, KYTC, County, and City		X			Continuous	1	1	3	Grants	4
Purchase and install emergency sirens at Black Mountain Off Road Park.	Severe Thunderstorms & Tornados	Harlan Co. Outdoor Recreation Board		X			Long Term	1	5	1	Grants	3

Purchase and install emergency sirens at vulnerable areas such as the trailer parks and post offices within the county.	Severe Thunderstorms & Tornados	County/City		X			Long Term	1	5	1	Grants	2
Complete an engineering study at US 421 to determine mitigation strategies. Road may require elevation and/or drains, and tiles replaced.	Flood	KYTC	X				Long Term/ Continuous	1	1	1	KYTC & Grants	1
Clean debris from rivers, creeks, and streams.	Flood	County		X			Continuous	1	1	1	County & Grants	2
Replace culvert at Fairview Holler up Rain Street.	Flood	City of Harlan	X				Long Term	1	1	1	City & Grants	1
Provide education to community members about the hazards impacting Harlan County.	All Hazards	Multi-agency				X	Continuous	1	5	1	Grants & Multi-Agency	2
Establish safe havens for vulnerable areas within County.	All Hazards	Multi-agency		X			Long Term	1	3	1	Grants & Multi-agency	3
Seek funding to hire Building Inspector for County.	All Hazards	County			X		Continuous	1	1	1	County & Grants	4
Purchase wildland fire truck and various equipment for wildfire mitigation.	Wildfire	County/City		X			Continuous	1	5	1	Grants	1
Evaluate bridge tonnage within the county. Bridges may need to be replaced or repaired to handle more tonnage enabling emergency vehicles and school buses to safely pass over.	All Hazards	KYTC, Federal, County, & City	X				Continuous	1	1	1	Grants	1
Acquisition of Treemont Trailer Park.	Flood	County	X				Long Term	1	5	1	Grants	1

Acquisition of homes at Cawood Branch.	Flood	County	X				Long Term	1	5	1	Grants	1
Complete an engineer study at City of Harlan.	Flood	County		X			Long Term	1	5	1	Grants & City	3
Complete an engineer study at the City of Cumberland.	Flood	City		X			Long Term	1	5	1	Grants & City	3
Purchase rescue equipment and provide training for fire departments.	All Hazards	County & City		X			Continuous	1	1	5	Grants	1
Increase culvert size in trouble areas within the county.	Flood	County	X				Long Term	1	3	1	Grants	1

Jackson County, KY:
Hazard Mitigation Overview

VIII. JACKSON COUNTY OVERVIEW

Jackson County is located in the coalfield area of southeastern Kentucky and is known as the place where the mountains and the bluegrass blends. One fourth of Jackson County is comprised of Daniel Boone National Forest (56,000 acres), making it a representative of Eastern Kentucky's unique Appalachian topography, wildlife, and heritage. Jackson County has several attractions and recreation spots such as Flat Lick Falls, S-Tree Campground, Turkey Foot Campground, and the centermost trailhead of the historic Sheltowee Trace.

Jackson County, KY: Quick Facts	
Total Population, July 1, 2019	13,329
Population per Square Miles, 2010	39.1
Land Area in Square Miles, 2010	345.20
Housing Units, July 1, 2016	6,518
Persons in Poverty, percent	31.9%
Median Value of Owner-Occupied Housing Units, 2011-2015	$79,400
Median Household Income, 2012-2016	$30,884
Total Employment, 2015	1,325
Total Employer Establishments, 2015	92
Source: U.S. Census Bureau	

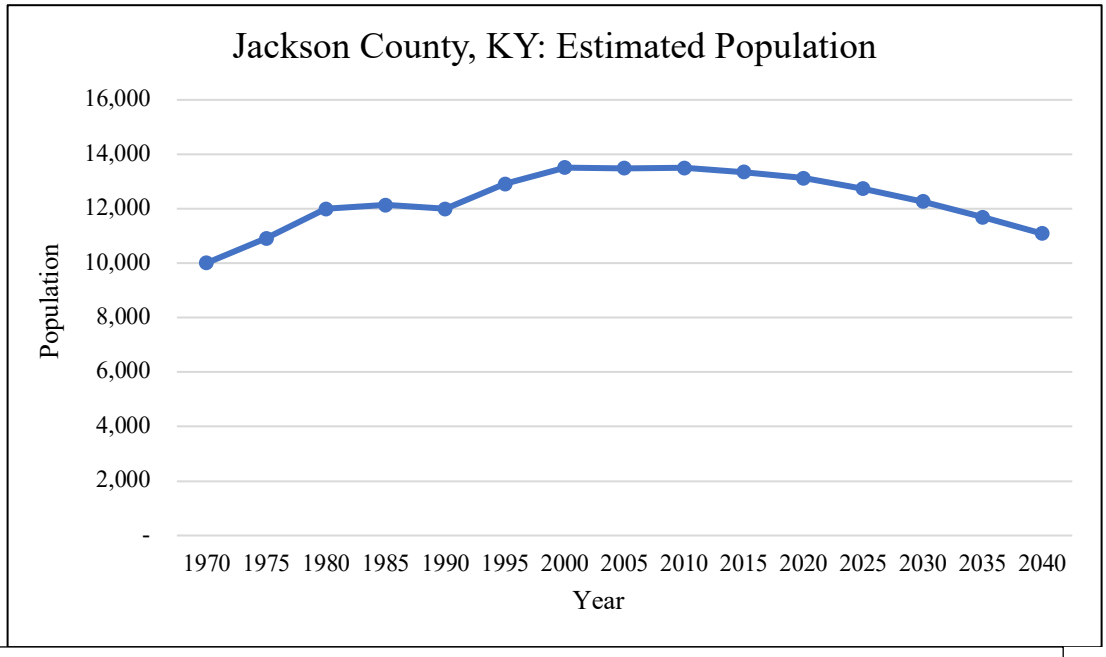
JACKSON COUNTY POPULATION:

In 2019, Jackson County had a total population of 13,329[87]. In 2020, the City of McKee, which is the county seat, had a population of 785.[88] Between 2010 and 2019, Jackson County's population decreased by 1.2%. The population is expected to continue to drop.

Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Jackson County	13,475	13,357	13,329	1% fewer	
City of McKee	792	789	785	1% fewer	
Source: U.S. Census Bureau					

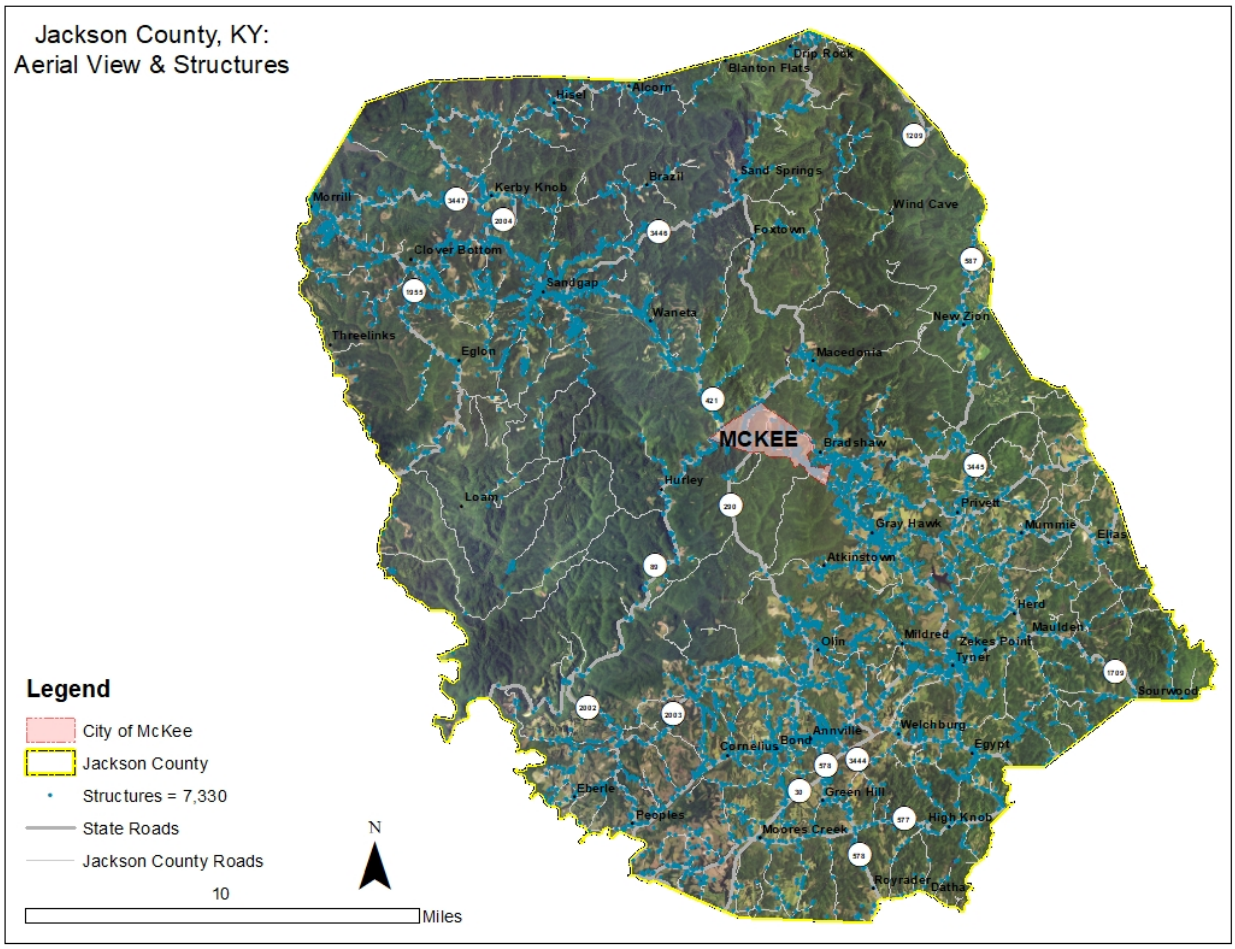
[87] Quickfacts: Jackson County Kentucky. *US Census Bureau*. Retrieved on 6/23/2020 from https://www.census.gov/quickfacts/jacksoncountykentucky.

[88] McKee Population Review 2020. *World Population Review*. Retrieved on 6/23/2020 from https://worldpopulationreview.com/us-cities/mckee-ky-population/.



Source: U.S. Census Bureau & KY State Data Center

According to the United States Census there were 6,643 housing units located in Jackson County in 2019. The following map illustrates where the residential & commercial structures are located based on CVADD ArcGIS database.



COMMUNITY CAPABILITIES

Jackson County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Jackson County Fiscal Court is comprised of a Judge Executive and 3 Magistrates. The City of McKee is a Home Rule class city lead by a Mayor-Council government. Both the Fiscal Court and City Council have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation.

Jackson County Plans & Programs									
	Emergency Operations Plan	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Jackson County	✓		✓		✓	✓	✓	✓	
City of McKee	✓		✓		✓	✓	✓	✓	

EMERGENCY MANAGEMENT

To prepare for future natural hazards Jackson County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Jackson County THIRA.

THIRA Hazard Ranking	
1	Flood
2	Winter Storm
3	Active Shooter

The Jackson County Emergency Management is currently working on developing and implementing a Local Emergency Planning Committee (LEPC). This committee, once established, will meet quarterly and will promote emergency planning and preparedness. The LEPC will include members from various professions and will be open to the public. For more information about Jackson County's THIRA and LEPC meetings contact the Emergency Management Director.

JACKSON COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. The following chart summarizes the natural hazards that have had a negative impact on the people and places of Jackson County. These hazards were discussed and reviewed during the community meetings.

Rank	Natural Hazards
1	Flash Floods
2	Severe Thunderstorms - Wind
3	Severe Winter Weather
4	Wildfire
5	Karsts

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

FLOOD

Jackson County is an upland area characterized by deeply entrenched streams and cliff-lined valleys.[89] Elevations of more than 1000 feet prevail over most of the county. Elevations less than 1000 feet are found only along a few of the larger streams. There are several streams, creeks, branches, and forks within Jackson County. Jackson County has several communities that are low-lying and become inundated with flood waters.

In 2009 - 2010 Jackson County experienced severe flash flooding as residents saw flood water in areas that have never flooded before. During flash floods some communities become inaccessible due water covering the roads. Flash floods have also washed out tiles and drains. Currently, Jackson County is working on a mitigation project to resolve flooding issues at Mae Gumm Road.
Flooding may cause fatalities or injuries, disrupt or destroy infrastructure (roads, bridges, culverts, water, wastewater, gas, electric), disrupt drinking water supplies, and cause erosion and landslides.

Floods can occur anytime during the year and are Kentucky's most costly natural hazard. Reviewing past flood events can identify vulnerabilities within the county and city enabling emergency management to better prepare for future disasters.

In order to address systematically the number of previous flooding occurrences, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from flooding for Jackson County, Kentucky, and for its incorporated city, McKee. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive, and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still,

[89] Kentucky Geological Survey. *Topography: Jackson County*. Retrieved on 6/19/2020 from http://www.uky.edu/KGS/water/library/gwatlas/Jackson/Topography.htm.

it is the best available data for a systematic illustration of flooding events for Jackson County and for its unincorporated and incorporated cities.

The only incorporated city in Jackson County is the City of McKee. In order to capture “Flood” and “Flash Flood” events specific to McKee, the below tables include all “Flood” and “Flash Flood” events having searched the entire date range of available data within the NCEI “Storm Events Database,” i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of “probability”), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Jackson County and the City of McKee, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines “probability” in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the “Flood” and “Flash Flood” events that were reported and subsequently recorded in the NCEI “Storm Events Database” are recorded for Jackson County as a “Zone.” These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: “PrD” is “Property Damage Estimated Amount.” “CrD” is “Crop Damage Estimated Amount.” “Dth” is “Deaths Reported.” “Inj” is “Injuries Reported.”

Table 4-1: Jackson County Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	134.00K	0.00K
1	MORRILL	JACKSON CO.	KY	3/3/1997	8:00	EST	Flood		0	0	0.00K	0.00K
2	ANNVILLE	JACKSON CO.	KY	4/16/1998	16:00	EST	Flash Flood		0	0	10.00K	0.00K
3	MOORES CREEK	JACKSON CO.	KY	8/3/2000	18:09	EST	Flash Flood		0	0	0.00K	0.00K
4	MAULDEN	JACKSON CO.	KY	12/16/2000	18:00	EST	Flash Flood		0	0	1.00K	0.00K
5	ANNVILLE	JACKSON CO.	KY	5/1/2002	20:33	EST	Flash Flood		0	0	0.00K	0.00K
	COUNTYWIDE	JACKSON CO.	KY	5/2/2002	13:00	EST	Flash Flood		0	0	25.00K	0.00K
6	COUNTYWIDE	JACKSON CO.	KY	5/17/2002	22:40	EST	Flash Flood		0	0	0.00K	0.00K
7	SANDGAP	JACKSON CO.	KY	6/2/2002	18:10	EST	Flash Flood		0	0	0.00K	0.00K
8	GRAY HAWK	JACKSON CO.	KY	5/15/2003	14:30	EST	Flash Flood		0	0	0.00K	0.00K
9	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/6/2004	7:00	EST	Flood		0	0	0.00K	0.00K
	COUNTYWIDE	JACKSON CO.	KY	2/6/2004	3:03	EST	Flash Flood		0	0	0.00K	0.00K
10	TYNER	JACKSON CO.	KY	7/26/2004	15:41	EST	Flash Flood		0	0	0.00K	0.00K
11	JACKSON (ZONE)	JACKSON (ZONE)	KY	9/17/2004	8:30	EST	Flood		0	0	0.00K	0.00K

12	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/8/2005	0:01	EST	Flood		0	0	0.00K	0.00K
13	DEESE	JACKSON CO.	KY	5/4/2009	6:22	EST-5	Flash Flood		0	0	0.00K	0.00K
14	OLIN	JACKSON CO.	KY	5/8/2009	18:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
15	WELCHBURG	JACKSON CO.	KY	8/14/2010	20:40	EST-5	Flood		0	0	0.00K	0.00K
16	MORRILL	JACKSON CO.	KY	2/25/2011	0:00	EST-5	Flood		0	0	0.00K	0.00K
17	ANNVILLE	JACKSON CO.	KY	4/16/2011	1:13	EST-5	Flash Flood		0	0	0.00K	0.00K
18	SANDGAP	JACKSON CO.	KY	2/29/2012	16:00	EST-5	Flash Flood		0	0	30.00K	0.00K
19	WELCHBURG	JACKSON CO.	KY	3/18/2013	12:20	EST-5	Flood		0	0	0.00K	0.00K
20	BRADSHAW	JACKSON CO.	KY	4/30/2014	7:41	EST-5	Flood		0	0	0.00K	0.00K
21	OLIN	JACKSON CO.	KY	7/27/2014	13:30	EST-5	Flash Flood		0	0	1.00K	0.00K
22	CLOVER BOTTOM	JACKSON CO.	KY	4/3/2015	7:57	EST-5	Flash Flood		0	0	1.00K	0.00K
	CLOVER BOTTOM	JACKSON CO.	KY	4/3/2015	8:07	EST-5	Flash Flood		0	0	1.00K	0.00K
23	ANNVILLE	JACKSON CO.	KY	7/1/2015	21:20	EST-5	Flash Flood		0	0	1.00K	0.00K

24	BRADSHAW	JACKSON CO.	KY	5/12/2016	18:30	EST-5	Flash Flood		0	0	0.00K	0.00K
25	ANNVILLE	JACKSON CO.	KY	7/3/2017	15:19	EST-5	Flash Flood		0	0	0.00K	0.00K
26	ANNVILLE	JACKSON CO.	KY	5/18/2018	19:45	EST-5	Flash Flood		0	0	0.00K	0.00K
27	SANDGAP	JACKSON CO.	KY	5/31/2018	14:00	EST-5	Flash Flood		0	0	0.50K	0.00K
28	CLOVER BOTTOM	JACKSON CO.	KY	6/26/2018	14:25	EST-5	Flash Flood		0	0	0.00K	0.00K
29	NATHANTON	JACKSON CO.	KY	6/9/2019	23:30	EST-5	Flash Flood		0	0	0.00K	0.00K
30	GRAY HAWK	JACKSON CO.	KY	7/30/2019	18:31	EST-5	Flash Flood		0	0	1.50K	0.00K
	ATKINSON	JACKSON CO.	KY	7/30/2019	21:29	EST-5	Flood		0	0	0.00K	0.00K
31	GRAY HAWK	JACKSON CO.	KY	5/19/2020	9:05	EST-5	Flood		0	0	0.00K	0.00K
	TYNER	JACKSON CO.	KY	5/19/2020	9:05	EST-5	Flood		0	0	0.00K	0.00K
	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	DEESE	JACKSON CO.	KY	5/19/2020	9:10	EST-5	Flood		0	0	35.00K	0.00K
32	EGYPT	JACKSON CO.	KY	9/13/2020	11:00	EST-5	Flood		0	0	2.00K	0.00K
	TYNER	JACKSON CO.	KY	9/13/2020	11:00	EST-5	Flood		0	0	4.00K	0.00K
	HERD	JACKSON CO.	KY	9/13/2020	11:00	EST-5	Flood		0	0	2.00K	0.00K
	MILDRED	JACKSON CO.	KY	9/13/2020	11:00	EST-5	Flood		0	0	2.00K	0.00K

	ANNVILLE	JACKSON CO.	KY	9/13/2020	11:00	EST-5	Flood		0	0	2.00K	0.00K
	MILDRED	JACKSON CO.	KY	9/13/2020	11:00	EST-5	Flood		0	0	5.00K	0.00K
	TYNER	JACKSON CO.	KY	9/13/2020	11:30	EST-5	Flash Flood		0	0	10.00K	0.00K
	Totals:										134.00K	0.00K

Jackson County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate assumed clusters of discrete events that comprise, in actuality, one event for the purpose of defining a denominator for illustrating frequency. The orange versus the green highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

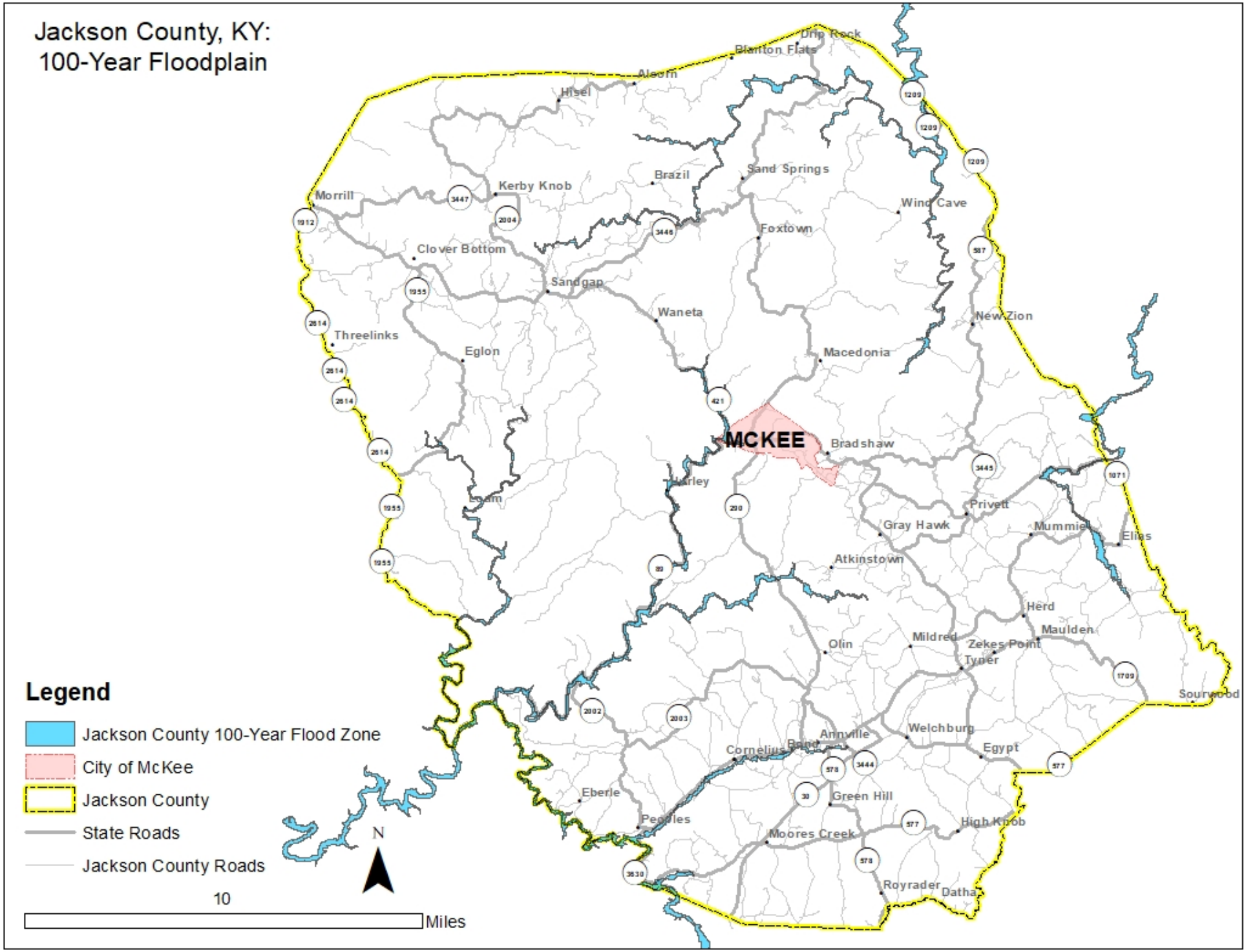
That Jackson County, unincorporated (and its unincorporated cities) independently experienced 32 flooding events over 25 years yields that Jackson County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every nine months (i.e., 32/25). Specifically, Jackson County, unincorporated and its unincorporated cities experienced an average of 1.28 flooding events each year. Or, using December 31, 2020 as an endpoint, 32/300 months is 0.1067 events per month. $1/0.1067 = 9.27 \approx 1$ flooding event an average of every nine (9) months.

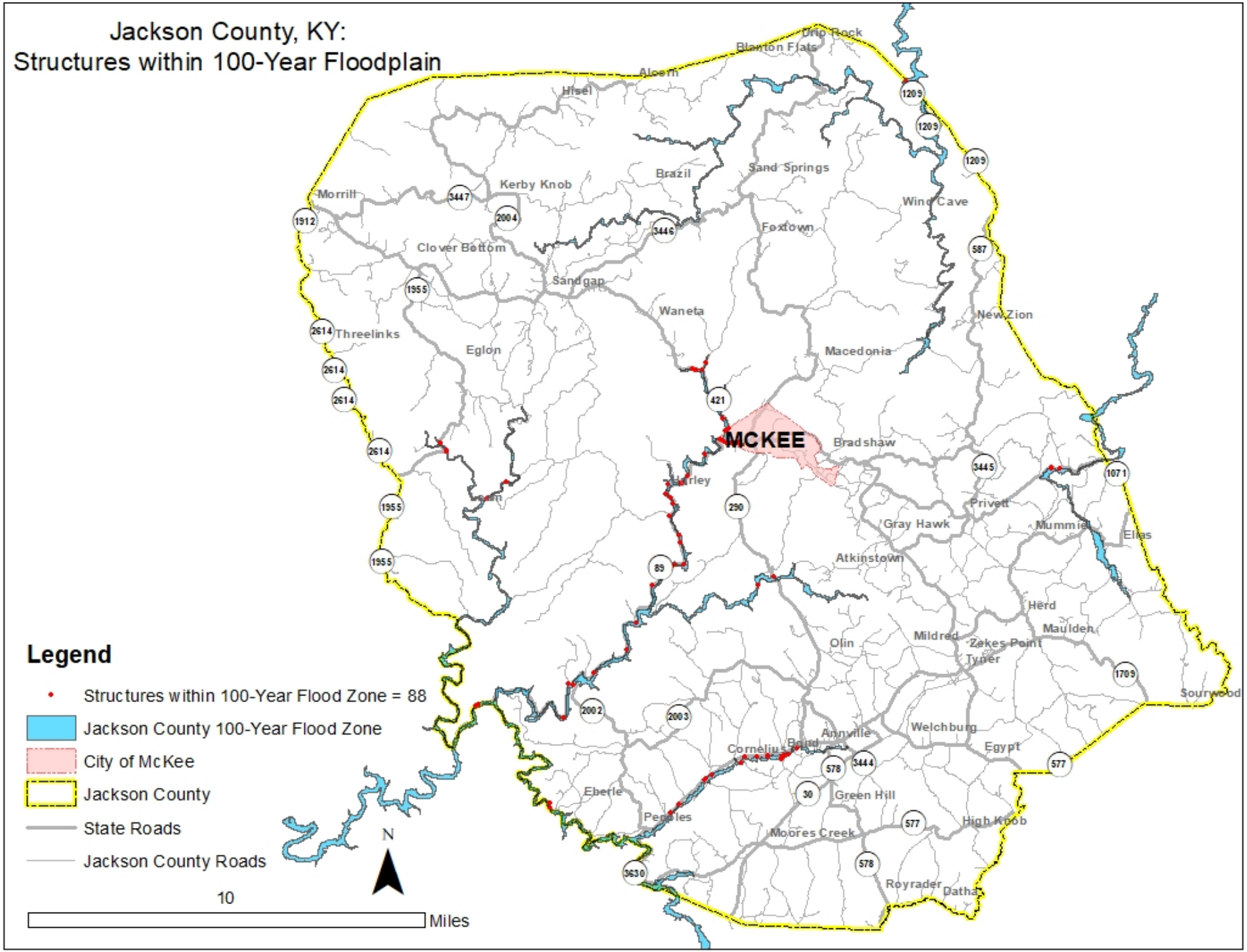
Table 4-2: City of McKee Flooding Events, 1996-2020

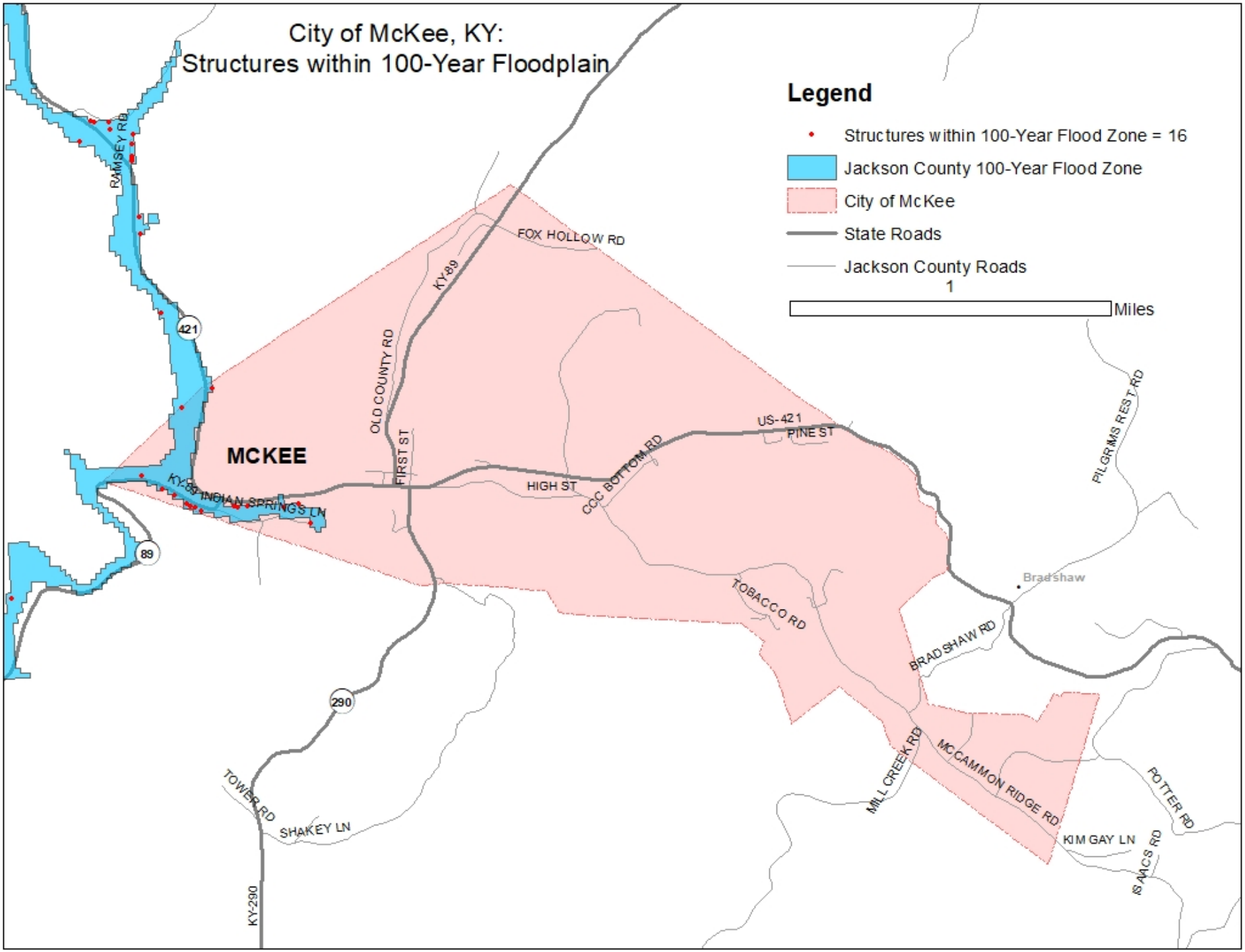
No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	MC KEE	JACKSON CO.	KY	1/7/1998	17:45	EST	Flash Flood		0	0	0.00K	0.00K
2	MC KEE	JACKSON CO.	KY	6/15/2003	18:30	EST	Flash Flood		0	0	0.00K	0.00K
3	MC KEE	JACKSON CO.	KY	8/4/2003	5:53	EST	Flash Flood		0	0	150.00K	0.00K
4	MC KEE	JACKSON CO.	KY	5/19/2020	9:10	EST-5	Flood		0	0	0.00K	0.00K
	Totals:								0	0	150K	0.00K

City of McKee - Probability as Frequency of Event Occurrence

That the City of McKee independently experienced four (4) flooding events over 25 years yields that the City of McKee experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every six and a quarter (6.25) years (i.e., 4/25).


Jackson County, KY:
100-Year Floodplain
Drip Rock
Blanton Flats
Hisel
Brazil
Sand Springs
Kerby Knob
Morrill
Wind Cave
Foxtown
Clover Bottom
Sandgap
Waneta
New Zion
Threelinks
Eglon
Macedonia
MCKEE
Bradshaw
Harley
Privett
Gray Hawk
Mummie
Elias
Atkinstown
Herd
Maulden
Olin
Mildred
Zekes Point
Tyner
Sourwood
Welchburg
Annville
Egypt
Cornelius
Eberle
Green Hill
Peoples
Moores Creek
High Knob
Royrader
Datha
N
10
Miles
Legend
Jackson County 100-Year Flood Zone
City of McKee
Jackson County
State Roads
Jackson County Roads


Jackson County, KY:
Structures within 100-Year Floodplain
Drip Rock
Blanton Flats
Aloeth
Hisel
Brazil
Sand Springs
Kerby Knob
Morrill
Wind Cave
Foxtown
Clover Bottom
Sandgap
Waneta
New Zion
Threelinks
Eglon
Macedonia
MCKEE
Bradshaw
Harley
Privett
Gray Hawk
Mummie
Elias
Atkinstown
Herd
Maulden
Olin
Mildred
Zekes Point
Tyner
Sourwood
Welchburg
Annville
Egypt
Eberle
Green Hill
Peggles
Moores Creek
High Knob
Royrader
Datha
1209
1209
1209
3447
2004
1912
3446
587
1955
2614
2614
2614
2614
421
3445
1071
290
1955
1955
89
1709
2002
2003
578
3444
577
30
577
578
3630
Legend
Structures within 100-Year Flood Zone = 88
Jackson County 100-Year Flood Zone
City of McKee
Jackson County
State Roads
Jackson County Roads
N
10
Miles


City of McKee, KY:
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 16
Jackson County 100-Year Flood Zone
City of McKee
State Roads
Jackson County Roads
1
Miles
MCKEE
RAMSEY RD
421
89
290
KY-89
OLD COUNTY RD
FIRST ST
FOX HOLLOW RD
HIGH ST
INDIAN SPRINGS LN
CCC BOTTOM RD
US-421
PINE ST
PILGRIMS REST RD
Bradshaw
TOBACCO RD
BRADSHAW RD
MILL CREEK RD
MCCAMMON RIDGE RD
KIM GAY LN
POTTER RD
SAMCS RD
TOWER RD
SHAKEY LN
KY-290

ASSESSING VULNERABILITY: IDENTIFYING ASSESTS

Using best available data CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the County. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

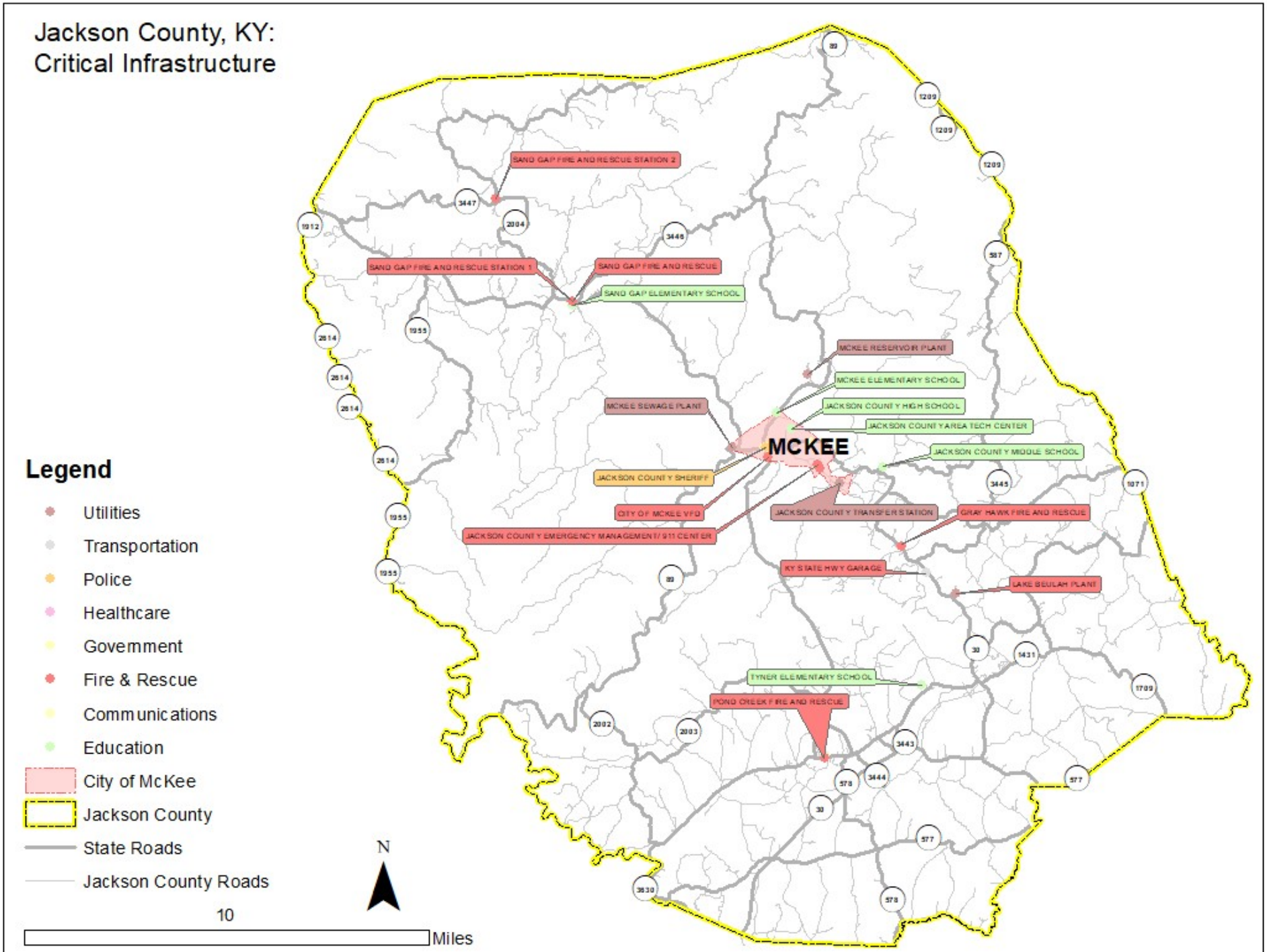
Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 2 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Jackson County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

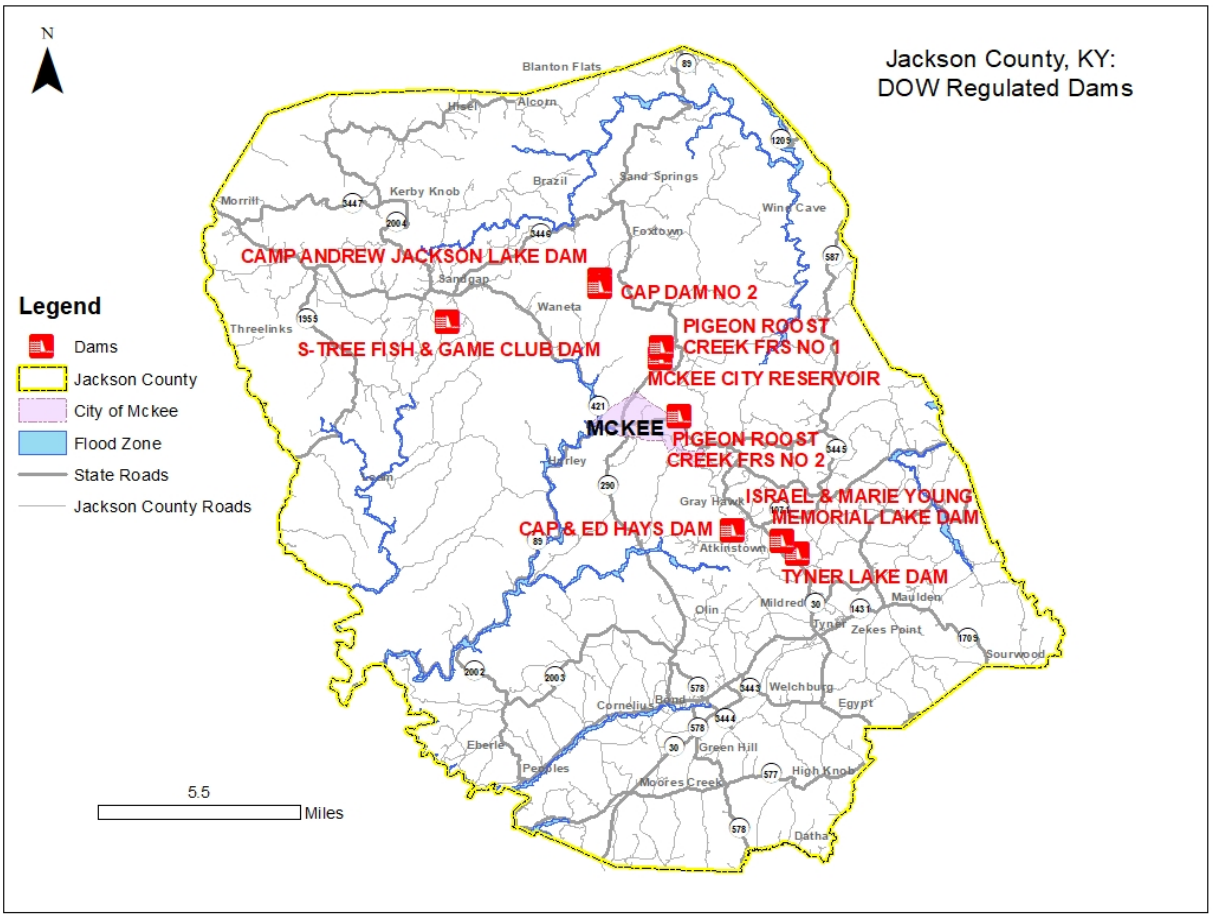
Jackson County Critical Infrastructure		***Structures Located in Floodplain**
Location	**Address**	**Property Replacement Values**
City of McKee		
Daniel Boone Transit		TBD
McKee City Hall	201 Main St. North McKee, KY 40447	$750,000
McKee Manor Apartment	106 McKee Manor Dr	TBD
Jackson County Court House	100 Main St. McKee, KY 40447	$750,000
Jackson County EMS	464 Main St. South McKee, KY 40447	$500,000
Jackson County Sheriff's Department	175 1st Street McKee, KY 40447	$200,000
Jackson County Emergency Operation Center	1035 McCammon Ridge RD McKee, KY 40447	$1,100,000
McKee Medical Clinic	25 Hwy 290	TBD
Jackson County Detention Center	1893 McCammon Ridge RD McKee, KY 40447	$3,000,000
Jackson County Road Department/Garage	155 Pleasant Valley RD McKee, KY 40447	$650,000
Jackson County Judicial Center	First Street McKee, KY 40447	$3,500,000
Rite Aid	551 Main St McKee, KY 40447	TBD
Shell Gas Station	361 Main St. McKee, KY 40447	TBD
Sav A Lot	971 S Main St. McKee, KY 40447	TBD
Dollar General	1296 S Main St. McKee, KY 40447	TBD
Phoenix Products	106 Bethford RD McKee, KY 40447	TBD
Horizon Adult Day	244 Water St. McKee, KY 40447	TBD
White House Clinic	906 S Main St. McKee, KY 40447	TBD
State Highway Department	6962 US 421 South McKee, KY	TBD
City of Annville		
Jackson Manor Nursing Home	Hwy 3444 Annville, KY 40408	$3,480,000
Annville Adult Day	68 Hwy 3444 Annville, KY 40408	TBD
Pharmacy	78 Hwy 3444 Annville, KY 40408	TBD
Dollar General	3500 Hwy 3630 Annville, KY 40408	TBD
Town & Country Market	4368 Hwy 30 W Annville, KY 40402	TBD

Annville Road Department District 2		TBD
Community of Sand Gap		
Whistle Stop	57 Hwy 2004 McKee, KY 40447	TBD
Sand Gap Road Department		TBD
Schools		
Jackson County Board of Education	3331 Hwy 421 S, McKee, KY 40447	TBD
School Bus Garage	772 Hwy 421 McKee, KY 40447	TBD
Jackson County High School	560 Education Mountain Dr. McKee, KY 40447	$7,000,000
Jackson Co. Area Technology Center	562 Education Mountain Dr. McKee, KY 40447	$3,400,000
McKee Elementary	1005 Hwy 89 North McKee, KY 40447	$3,200,000
Tyner Elementary	Tyner Elementary 1340 Hwy 30 Tyner, KY 40447	$3,500,000
Annville Christian Academy	190 Campus Drive Annville, KY 40408	$350,000
Jackson County Middle School	139 HWY 587 McKee, KY 40447	
Sand Gap Elementary	6783 US Hwy 421 North McKee, Ky 40447	
Volunteer Fire Departments		
Gray Hawk Fire & Rescue	78 Old Gray Hawk Schools RD	$400,000
Pond Creek Fire & Rescue	4615 HWY 3630 Annville, KY 40402	$400,000
Sand Gap Fire & Rescue	6827 US HWY 421 Sand Gap, KY 40487	$400,000
McKee Volunteer Fire Department	223 Main Street., McKee, KY 40447	$400,000
McKee Volunteer Fire Department Station #2	253 HWY 290, McKee, KY 40447	TBD
McKee Volunteer Fire Department Station #3	1143 McCammon Ridge RD McKee, KY 40447	TBD
Water Treatment		
City of McKee	2195 HWY 89 N, McKee, KY 40447	$750,000
Jackson County Water Association	186 Beulah Lake Rd McKee, KY 40447	$5,000,000
Waste Water Treatment		
City of McKee Sewer Plant	HWY 89 South McKee, KY 40447	$3,000,000
Electrical Infrastructure		
Jackson Energy	115 Jackson Energy Lane McKee, KY 40447	TBD
Gas Infrastructure		
Delta Natural Gas Company	2011 S. Main St. Corbin, KY 40701	TBD
Area Solid Waste Removal		
Jackson County Transfer Station	97 Pleasant Valley RD McKee, KY 40447	TBD
Jackson County Medial List		
Jackson County Sun	187 Main St. North McKee, KY 40447	$150,000
WWAG	1680 State Road 1071 Tyner, KY 40486	$630,000
KYAI	188 South Belle 188 South Belle, McKee KY 38104	TBD
People's Rural Telephone Cooperative	1080 West Main St. McKee, KY 40447	TBD
Communication Towers		

Bird Ridge Rd, Moore Kirby Knob, Happy Top, 290		TBD
EOC Building Tower		TBD

Jackson County, KY: Critical Infrastructure





**Pigeon Roost Creek FRS NO. 3 is located one mile east of McKee off US-421 S.*

ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Jackson	88	$79,400.00	$6,987,200.00
City of McKee	16		$1,270,400.00

JACKSON COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Jackson County, Unincorporated and the **City of McKee** both possess zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe

Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

JACKSON COUNTY/McKEE FLOODING EXTENT

With 36 flood events in Jackson County between 1996 and July 2021, flooding has ranged from flash floods with water over the roads at some places (May 8, 2009) through flooding making roads impassable and even roads broken up by heavy flooding. Examples of flooding[90] on May

1, 2021, were shown by a local television station, WYMT, on television and online:

[90] "Officials say flooding situation in Jackson County has calmed down". WYMT.com, Hazard, KY. Retrieved on 3-16-22 from Officials say flooding situation in Jackson County has calmed down (wymt.com).

The NCEI Storm Database Jackson County, Unincorporated Flooding and Flash-Flooding Events, 1996-2021, lists the following extents and impacts from the above-pictured flood (no indication that the above photos are from the below described areas, just in the same county during the same widespread event):

CLOVER BOTTOM: The flooding of low-lying areas continues in the community of Clover Bottom. Water is rising, having gone up a few feet in the last 2 hours. There is now at least 1 to 2 feet over a roadway in the community (roadway unspecified).

MORRILL: Flooding of roads and low-lying areas was reported in the Clover Bottom area. No specifics were given.

PEOPLES: The intersection of KY Highways 577 and 3630 are covered by high water.

THREELINKS: Moderate flooding was reported in the low-lying area along Horse Lick Creek.

Figure 1. Photos of 1981 flooding in McKee, KY

Flooding is historically also a problem in McKee, the only incorporated town in the county. Below are photos of flooding in the town from 1981 and 2004[91]:

Photos of 2004 flooding in McKee, KY, photos by Chuck Gibson

[91] Retrieved on 4-6-22 from Microsoft Word - Web- figure 1.doc (townnews.com).

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community.[92] These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain coordinators are fundamental to the effective management of floodplain resources and flood mitigation. The following are the floodplain coordinators for Jackson County.

Floodplain Coordinators				
Community Name	**Name**	**Job Title**	**Address**	**Phone Number**
Jackson Co.	Shane Gabbard	Judge Executive	P.O. Box 175 McKee, KY 40447	606-287-8562
McKee	Greg Hayes	Public Works Supervisor	P.O Box 455 McKee, KY 40447	606-287-9979

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210118#	Jackson Co.	Jackson	11/11/77	07/01/87	08/03/09(M)	07/01/87	No
210119#	McKee	Jackson	05/10/74	07/17/86	08/03/09(M)	07/17/86	No

NFIP FINANCIAL CLAIMS

Since 1978 a total of 17 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $88,015 in claims. To put it in perspective that is an average of $5,177.35 per claim or $2,200.38 per year spent on repairing flood damages. There are 21 flood insurance policies in effect as of March 2018 and 88 identified structures located within the 100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Jackson Co.	14,930	1	12	13	53	2,380	2,433	1	2	3	0	18,204	18,204
McKee	24,653	0	8	8	0	2,876	2,876	9	5	14	53,303	16,508	69,811

[92] FEMA. *Floodplain Management*. Retrieved on 6/19/2020 from https://www.fema.gov/floodplain-management.

Total	39,583	1	20	21	53	5,256	5,309	10	7	17	53,303	34,712	88,015
													Nfipservices.floodsmart.gov

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

SEVERE THUNDERSTORMS

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures.

Mobile homes are highly vulnerable to severe storms and tornados. There are around five different mobile home communities which vary in sizes from 4 residents to as many as 15 to 20. For some people they must seek shelter in nearby homes of neighbors, friends, and family as Jackson County does not have storm shelters.

Thunderstorms can produce tornados, floods, lightning and damaging winds. They may occur individually, in clusters or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios. Through studying past severe thunderstorm events, the county and city, can become better prepared for future disasters.

Severe Thunderstorms have at least one of the following:

- Wind gusts of at least 58 mph or higher, i.e. 50 knots;
- Tornado;
- Hail that is one inch or larger, i.e. at minimum the size of a quarter.

This analysis will focus on the wind profiles for each county; later sections will assess hail and tornados.[93]

Thunderstorms can be categorized by their physical characteristics, i.e., the presence or absence of rotation, the number or location of updrafts and downdrafts present. There is a continuous spectrum of storms in the sky and a storm may move from one category along this spectrum to another. The five (5) types are:

[93] The TYPES section is adapted from the National Weather Service. (2011). "Weather Spotter's Field Guide." Department of Commerce. As presented in the Kentucky Hazard Mitigation Plan published by the University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP). (2018)

- **Ordinary or Single-Cell Storm:** Single cell storms are short-lived and usually not severe.
    - Short life, generally 30-45 minutes
    - Downdraft that forms within 15-20 minutes after cell initiation
    - Updraft that weakens in 25-30 minutes; outflow stabilizes
    - Gusty winds, usually not severe
- **Pulse Storm:** A Pulse Storm is a single-cell thunderstorm that is usually not strong; when it is of substantial intensity, it produces severe weather for short periods of time. Such a storm weakens and then generates another short burst or pulse.
    - Short life, generally 30-45 minutes
    - Usually not severe, but given the right environmental conditions, these storms can create:
        - Downburst winds, usually less than 70 mph
        - A weak tornado
    - Damage is isolated.
- **Multicellular Cluster:** This type is the most common storm, consisting of a group of ordinary cells at various stages of the thunderstorm life cycle.
    - Most common type of thunderstorm
    - May last for several hours
    - Consists of a group of cells moving as a single unit
    - Contains cells in different stage of the thunderstorm life cycle
    - Occasionally may contain supercells
    - Given the right conditions, the cells can become severe within the multicellular cluster producing:
        - Downburst winds;
        - Weak tornadoes; and
        - Heavy rainfall in a short time.
- **Multicellular Line:** This category is a long line of storms with a continuous, well developed gust front along the leading edge.
    - Frequently called squall line
    - A long line of storms with individual storm outflows merging to produce a continuous, well-developed gust front marking the leading edge of rain-cooled air
    - Line of storms often oriented north-south or northeast-southwest and usually move toward the northeast, east, or southeast
    - May be embedded along the line
    - Given the right environmental conditions, multicell line storms can produce:
        - Strong downburst winds;
        - Heavy rainfall; and
        - Occasional tornadoes
- **Supercell:** A supercell is a highly organized thunderstorm with an extremely strong updraft. They exhibit persistent storm-scale rotation of the updraft-downdraft couplet or mesocyclone.

- Classifying supercellular storms is subjective. Still, the following is generally acknowledged about supercells:
  - Highly organized storm with rotation inside
  - Updrafts can attain speeds more than 100 mph
  - Can produce strong, violent tornadoes
  - Rear-flank downdraft can produce damaging outflow winds in excess of 100 mph.
- Supercells can produce the following elements:
  - Potentially torrential rainfall immediately adjacent to the storm updraft
  - Lighter rainfall at greater distances from the updraft
  - Rear-Flank Downdrafts (RFDs) producing strong, sometimes damaging outflows
  - Tornadoes

Damaging Winds: National Weather Service issues warnings when the winds from a thunderstorm are expected to be 58 mph (50 knots) or higher.

Downburst: This term refers to an area of strong, often damaging winds produced by air rapidly descending in a thunderstorm. Downbursts are sometimes described as a microburst when it covers an area of less than 2.5 square miles and lasts three to seven minutes. Downbursts can be referred to as microburst when they cover larger areas or last for more than seven (7) minutes. On rare occasions, downbursts can have wind speeds in excess of 150 mph.

Bow Echo: A bow-shaped line of convective cells – best seen on radar – is often associated with swaths of damaging straight-line winds and small tornadoes.

Derecho: A derecho is a widespread and usually fast-moving convectively-induced episode of damaging winds. Derechos can result from bow echoes, supercells, multicell clusters or lines, or a blend of any of these. They can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across. Due to the large area extent, an episode is usually not classified as a derecho until it is complete.

Note: When reviewing the types and impacts of thunderstorms and winds, it is important to realize that while tornadoes are typically more destructive when they occur, straightline winds can also be highly destructive and occur much more frequently. In the final analysis, straightline winds cause more damage in both injuries/deaths and property damage in the United States than do tornadoes.

Table 4-3: Jackson County Thunderstorm/Wind Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	331.30K	6.00K
1	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/14/2001	10:04	EST	High Wind	50 kts. E	0	0	3.00K	0.00K
2	SANDGAP	JACKSON CO.	KY	5/5/2003	14:18	EST	Thunderstorm Wind	65 kts. EG	0	0	0.00K	0.00K
3	MC KEE	JACKSON CO.	KY	7/12/2003	12:37	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
4	JACKSON (ZONE)	JACKSON (ZONE)	KY	11/24/2003	8:55	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
5	MC KEE	JACKSON CO.	KY	5/26/2004	15:10	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
6	SANDGAP	JACKSON CO.	KY	5/31/2004	0:30	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
7	MC KEE	JACKSON CO.	KY	7/5/2004	17:04	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	TYNER	JACKSON CO.	KY	7/5/2004	17:30	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
8	PEOPLES	JACKSON CO.	KY	7/13/2004	22:15	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
9	MC KEE	JACKSON CO.	KY	4/22/2005	20:17	EST	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
10	EGYPT	JACKSON CO.	KY	7/27/2005	13:45	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
11	MC KEE	JACKSON CO.	KY	11/15/2005	23:00	EST	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
12	MC KEE	JACKSON CO.	KY	3/9/2006	20:48	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
13	SANDGAP	JACKSON CO.	KY	4/7/2006	21:48	EST	Thunderstorm Wind	60 kts. EG	0	0	4.00K	0.00 K
	ANNVILLE	JACKSON CO.	KY	4/7/2006	22:11	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
14	MC KEE	JACKSON CO.	KY	5/11/2006	16:09	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
15	MC KEE	JACKSON CO.	KY	5/26/2006	23:16	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
16	GRAY HAWK	JACKSON CO.	KY	5/31/2006	17:00	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
17	PEOPLES	JACKSON CO.	KY	6/11/2006	19:43	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
18	MC KEE	JACKSON CO.	KY	7/21/2006	19:08	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
19	MORRILL	JACKSON CO.	KY	8/10/2006	16:56	EST	Thunderstorm Wind	53 kts. EG	0	0	6.00K	0.00 K
20	MORRILL	JACKSON CO.	KY	8/20/2006	7:33	EST	Thunderstorm Wind	53 kts. EG	0	0	4.00K	0.00 K
	MC KEE	JACKSON CO.	KY	8/20/2006	7:48	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
	HERD	JACKSON CO.	KY	8/20/2006	8:03	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
21	MC KEE	JACKSON CO.	KY	9/23/2006	16:35	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/1/2006	7:33	EST -5	High Wind	53 kts. EG	0	0	0.00K	0.00 K
	PEOPLES	JACKSON CO.	KY	4/3/2007	20:28	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
22	GRAY HAWK	JACKSON CO.	KY	7/18/2007	15:38	EST -5	Thunderstorm Wind	55 kts. EG	0	0	5.00K	0.00 K
	MC KEE	JACKSON CO.	KY	7/18/2007	15:48	EST -5	Thunderstorm Wind	60 kts. EG	0	0	25.00 K	0.00 K
	WELCHBURG	JACKSON CO.	KY	7/18/2007	16:34	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K
23	CLOVER BOTTOM	JACKSON CO.	KY	1/29/2008	22:19	EST -5	Thunderstorm Wind	53 kts. EG	0	0	10.00 K	0.00 K
	ANNVILLE	JACKSON CO.	KY	1/29/2008	22:32	EST -5	Thunderstorm Wind	58 kts. EG	0	0	70.00 K	0.00 K
24	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/17/2008	12:00	EST -5	High Wind	56 kts. EG	0	0	15.00 K	0.00 K
25	MC KEE	JACKSON CO.	KY	3/4/2008	14:37	EST -5	Thunderstorm Wind	53 kts. EG	0	0	5.00K	0.00 K
	PARROT	JACKSON CO.	KY	3/4/2008	14:47	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K
	OLIN	JACKSON CO.	KY	3/4/2008	14:52	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K
	ANNVILLE	JACKSON CO.	KY	3/4/2008	14:59	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K
	WELCHBURG	JACKSON CO.	KY	3/4/2008	14:59	EST -5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K
26	SAND SPGS	JACKSON CO.	KY	3/19/2008	15:30	EST -5	Thunderstorm Wind	53 kts. EG	0	0	2.00K	0.00 K
27	ANNVILLE	JACKSON CO.	KY	6/28/2008	17:50	EST -5	Thunderstorm Wind	53 kts. EG	0	0	4.00K	0.00 K
28	SANDGAP	JACKSON CO.	KY	7/22/2008	15:00	EST -5	Thunderstorm Wind	55 kts. EG	0	0	10.00 K	0.00 K
	MAULDEN	JACKSON CO.	KY	7/22/2008	15:10	EST -5	Thunderstorm Wind	54 kts. EG	0	0	7.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
29	MORRILL	JACKSON CO.	KY	7/28/2008	12:34	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00 K
	SANDGAP	JACKSON CO.	KY	7/28/2008	12:42	EST -5	Thunderstorm Wind	55 kts. EG	0	0	8.00K	0.00 K
30	ALCORN	JACKSON CO.	KY	4/5/2009	20:56	EST -5	Thunderstorm Wind	55 kts. EG	0	0	30.00 K	0.00 K
31	MC KEE	JACKSON CO.	KY	5/31/2009	2:23	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00 K
32	SHIRLEY	JACKSON CO.	KY	6/18/2009	11:29	EST -5	Thunderstorm Wind	55 kts. EG	0	0	25.00 K	0.00 K
33	GRAY HAWK	JACKSON CO.	KY	7/1/2009	0:55	EST -5	Thunderstorm Wind	54 kts. EG	0	0	5.00K	0.00 K
34	WELCHBURG	JACKSON CO.	KY	10/9/2009	15:25	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00 K
35	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/9/2009	11:20	EST -5	High Wind	52 kts. EG	0	0	5.00K	0.00 K
36	CLOVER BOTTOM	JACKSON CO.	KY	5/15/2010	17:35	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00 K
37	MC KEE	JACKSON CO.	KY	8/5/2010	13:29	EST -5	Thunderstorm Wind	55 kts. EG	0	0	10.00 K	0.00 K
38	ANNVILLE	JACKSON CO.	KY	10/26/2010	14:40	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
39	ANNVILLE	JACKSON CO.	KY	4/4/2011	16:07	EST -5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00 K
40	MC KEE	JACKSON CO.	KY	4/9/2011	13:28	EST -5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00 K
41	SANDGAP	JACKSON CO.	KY	4/27/2011	8:43	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00 K
	MC KEE	JACKSON CO.	KY	4/27/2011	9:23	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
42	MOORES CREEK	JACKSON CO.	KY	5/22/2011	14:33	EST -5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00 K
	NEW ZION	JACKSON CO.	KY	5/22/2011	14:58	EST -5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00 K
43	MC KEE	JACKSON CO.	KY	6/21/2011	18:44	EST -5	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00 K
44	ANNVILLE	JACKSON CO.	KY	8/8/2011	14:30	EST -5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00 K
45	MORRILL	JACKSON CO.	KY	9/26/2011	8:40	EST -5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00 K
46	MC KEE	JACKSON CO.	KY	1/17/2012	14:25	EST -5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00 K
47	PRIVETT	JACKSON CO.	KY	3/15/2012	18:56	EST -5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00 K
48	ANNVILLE	JACKSON CO.	KY	7/1/2012	22:00	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	TYNER	JACKSON CO.	KY	7/1/2012	22:05	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
49	SANDGAP	JACKSON CO.	KY	7/5/2012	14:06	EST -5	Thunderstorm Wind	55 kts. EG	0	0	2.00K	0.00 K
	TYNER	JACKSON CO.	KY	7/5/2012	14:19	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00 K
	MC KEE	JACKSON CO.	KY	7/5/2012	14:30	EST -5	Thunderstorm Wind	48 kts. EG	0	0	1.00K	0.00 K
50	MC KEE	JACKSON CO.	KY	7/8/2012	18:15	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
51	SANDGAP	JACKSON CO.	KY	7/19/2012	17:00	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	WIND CAVE	JACKSON CO.	KY	7/19/2012	17:00	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	GRAY HAWK	JACKSON CO.	KY	7/19/2012	17:06	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
52	DEESE	JACKSON CO.	KY	8/9/2012	12:12	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
53	MC KEE	JACKSON CO.	KY	1/30/2013	7:03	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
54	SANDGAP	JACKSON CO.	KY	5/21/2013	16:20	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	ANNVILLE	JACKSON CO.	KY	5/21/2013	16:25	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	MC KEE	JACKSON CO.	KY	5/21/2013	16:25	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
55	SANDGAP	JACKSON CO.	KY	9/12/2013	17:50	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
56	MC KEE	JACKSON CO.	KY	11/1/2013	0:55	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	EGYPT	JACKSON CO.	KY	11/1/2013	1:15	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
57	SANDGAP	JACKSON CO.	KY	2/20/2014	23:40	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	NEW ZION	JACKSON CO.	KY	2/21/2014	0:05	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
58	SANDGAP	JACKSON CO.	KY	5/21/2014	20:40	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	MC KEE	JACKSON CO.	KY	5/21/2014	20:45	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	MC KEE	JACKSON CO.	KY	5/21/2014	20:45	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	NEW ZION	JACKSON CO.	KY	5/21/2014	20:45	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	GRAY HAWK	JACKSON CO.	KY	5/21/2014	20:50	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	GREENHILL	JACKSON CO.	KY	5/21/2014	20:57	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	ANNVILLE	JACKSON CO.	KY	5/21/2014	20:57	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	TYNER	JACKSON CO.	KY	5/21/2014	20:57	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
59	TYNER	JACKSON CO.	KY	6/10/2014	17:22	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00 K
60	TYNER	JACKSON CO.	KY	9/2/2014	15:05	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	ANNVILLE	JACKSON CO.	KY	9/2/2014	16:35	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
	TYNER	JACKSON CO.	KY	9/2/2014	16:37	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00 K
61	GRAY HAWK	JACKSON CO.	KY	7/9/2015	13:32	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
62	OLIN	JACKSON CO.	KY	5/11/2016	22:30	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
63	PEOPLES	JACKSON CO.	KY	7/4/2016	16:01	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
64	GREENHILL	JACKSON CO.	KY	3/17/2018	17:09	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	2.00 K
65	BRADSHAW	JACKSON CO.	KY	7/20/2018	18:00	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00 K
66	MC KEE	JACKSON CO.	KY	5/26/2019	17:26	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00 K
67	BRADSHAW	JACKSON CO.	KY	7/11/2019	16:33	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
68	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/11/2020	21:55	EST -5	High Wind	51 kts. EG	0	0	0.00K	2.00 K
69	BRADSHAW	JACKSON CO.	KY	4/9/2020	0:00	EST -5	Thunderstorm Wind	59 kts. EG	0	0	15.00 K	1.00 K
70	BRADSHAW	JACKSON CO.	KY	5/3/2020	19:05	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.30K	0.10 K
71	DEESE	JACKSON CO.	KY	5/18/2020	18:12	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.10 K
72	EGLON	JACKSON CO.	KY	6/10/2020	17:20	EST -5	Thunderstorm Wind	51 kts. EG	0	0	10.00 K	0.20 K
	WANETA	JACKSON CO.	KY	6/10/2020	17:27	EST -5	Thunderstorm Wind	50 kts. EG	0	0	8.00K	0.10 K
	FOXTOWN	JACKSON CO.	KY	6/10/2020	17:35	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.10 K
	ANNVILLE	JACKSON CO.	KY	6/10/2020	17:44	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.20 K
73	DABOLT	JACKSON CO.	KY	6/21/2020	14:20	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.10 K
	MAULDEN	JACKSON CO.	KY	6/21/2020	18:44	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.10 K
	Totals:								0	0	331.30K	6.00 K

Jackson County - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically, this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually “next” to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 12/14/2001. The denominator is set at 20 years, keeping the denominator consistent to maintain comparability between counties.

That Jackson County experienced 73 severe thunderstorm/wind events over 20 years yields that Jackson County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every four months (i.e., 73/240). Specifically, Jackson County experienced an average of 3 severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.304 events per month. $1/.304 = 3.3 \approx 1$ severe winter storm event an average of every four months.

Table 4-4: Jackson County Hail Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	45.00K	10.00K
1	GRAY HAWK	JACKSON CO.	KY	3/28/1997	22:30	EST	Hail	2.75 in.	0	0	30.00K	10.00K
	MC KEE	JACKSON CO.	KY	3/28/1997	22:30	EST	Hail	1.75 in.	0	0	10.00K	0.00K
2	ANNVILLE	JACKSON CO.	KY	4/15/1998	13:15	EST	Hail	1.00 in.	0	0	0.00K	0.00K
3	MC KEE	JACKSON CO.	KY	4/17/2002	19:15	EST	Hail	1.00 in.	0	0	0.00K	0.00K
4	SANDGAP	JACKSON CO.	KY	6/2/2002	16:05	EST	Hail	1.75 in.	0	0	0.00K	0.00K
5	SANDGAP	JACKSON CO.	KY	5/30/2004	14:15	EST	Hail	1.00 in.	0	0	0.00K	0.00K
6	MC KEE	JACKSON CO.	KY	7/18/2007	16:01	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
7	ANNVILLE	JACKSON CO.	KY	6/2/2009	14:21	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
8	GRAY HAWK	JACKSON CO.	KY	7/1/2009	1:00	EST-5	Hail	1.00 in.	0	0	5.00K	0.00K
9	HISEL	JACKSON CO.	KY	5/15/2010	17:01	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	KERBY KNOB	JACKSON CO.	KY	5/15/2010	17:31	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
10	MC KEE	JACKSON CO.	KY	6/9/2011	15:55	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
	TURKEY FOOT	JACKSON CO.	KY	6/9/2011	16:00	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
11	WIND CAVE	JACKSON CO.	KY	6/11/2011	14:24	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
12	HISEL	JACKSON CO.	KY	3/15/2012	16:05	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
13	ANNVILLE	JACKSON CO.	KY	4/3/2012	14:15	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
14	SHIRLEY	JACKSON CO.	KY	4/26/2012	15:00	EST-5	Hail	2.50 in.	0	0	0.00K	0.00K
15	SANDGAP	JACKSON CO.	KY	4/29/2014	19:53	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
16	HISEL	JACKSON CO.	KY	7/27/2014	9:31	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
17	ANNVILLE	JACKSON CO.	KY	8/20/2014	15:08	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
18	CLOVER BOTTOM	JACKSON CO.	KY	4/25/2015	19:28	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	MC KEE	JACKSON CO.	KY	4/25/2015	19:40	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
19	ANNVILLE	JACKSON CO.	KY	3/1/2017	9:11	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
20	ANNVILLE	JACKSON CO.	KY	3/27/2017	18:32	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
21	TYNER	JACKSON CO.	KY	3/17/2018	17:09	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
22	MC KEE	JACKSON CO.	KY	4/3/2018	21:52	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
23	MC KEE	JACKSON CO.	KY	6/19/2020	19:15	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	45.00K	10.00K

Jackson County - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The pink versus the green highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 3/28/1997. Although the last date recorded for a hail storm in Jackson County is 6/19/2020, the denominator is set at 20 years to maintain comparability across counties.

That Jackson County experienced 23 events with hail 1" or larger over 20 years yields that Jackson County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 10 and a half months (i.e., 23/240). Specifically, Jackson County experienced an average of one (1) severe hailstorm event annually. Or, using December 31, 2020 as an endpoint, this is 0.05 events per month. $1/.096 = 10.42 \approx 1$ severe hailstorm event an average of every 10 and a half months.

Table 4-5: Jackson County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	1	500.00K	0.00K
1	ANNVILLE	JACKSON CO.	KY	7/14/2000	19:00	EST	Tornado	F1	0	1	500.00K	0.00K
2	GREEN HALL	JACKSON CO.	KY	5/31/2004	1:00	EST	Tornado	F0	0	0	0.00K	0.00K
	Totals:								0	1	500.00K	0.00K

Jackson County Tornados - Probability as Frequency of Event Occurrence

While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 7/14//2000. Although the last date recorded for a tornado in Jackson County is 5/31/2004, the denominator is set at 20 years to maintain comparability across counties. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen.

That Jackson County experienced 2 events with tornados over 20 years yields that Jackson County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 10 years and five months (i.e., 2/240). Specifically, Jackson County experienced an average of 1.2 tornado events every two years. Or, using December 31, 2020 as an endpoint, this is 0.008 events per month. $1/.008 = 20 \approx 1$ tornado event an average of every 125 month, or once every 10 years and five months.

SEVERE WINTER WEATHER

Severe winter weather threatens utilities, critical facilities, and vulnerable populations. The loss of electricity and water is a constant possibility. During past winter weather events people have become stranded at home due to slick road conditions. One of the biggest challenges for First Responders during winter weather is managing the terrain and elevation changes on slick road conditions. Previously, there was an emergency where EMS was unable to get to a patient due to slick roads. The Emergency Manager had to use a SUV to get patient to EMS staged nearby. There was another instance where Emergency Management had to transport both the patient and EMS to the hospital due to dangerous road conditions. Emergency personnel have also transported dialysis patients to clinics to receive treatment. The fire departments and sheriff's office work around the clock removing vehicles from ditches. For people without electricity, the courthouse has been used as a warming shelter. There have been several churches in different communities used as warming shelters as well.

Severe winter weather threatens utilities, critical facilities, and vulnerable populations. Emergency personnel and road crews work diligently to assist and manage the winter weather dangers. Reviewing past severe winter storms can reveal vulnerabilities within the county and city, enabling emergency management to better plan and prepare for future disasters.

In order to address systematically the number of previous severe winter weather events, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from severe winter weather for the eight counties in the Cumberland Valley Area Development District in Kentucky. The tables include what the National Weather Service (NWS) labels "Heavy Snow", "Ice Storm", "Winter Storm", and "Winter Weather" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the severe winter weather event. Still, it is the best available data for a systematic illustration of severe winter weather events for CVADD counties.

Finally, it should also be noted that a portion of the severe winter weather events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for all counties as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 4-6: Jackson County Severe Winter Weather Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	1	1.00K	0.00K
1	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/11/1996	20:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/1/1996	16:00	EST	Heavy Snow		0	0	0.00K	0.00K
4	JACKSON (ZONE)	JACKSON (ZONE)	KY	3/20/1996	4:00	EST	Heavy Snow		0	0	0.00K	0.00K
5	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
7	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/24/1999	9:00	EST	Heavy Snow		0	0	0.00K	0.00K
8	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/17/2000	21:00	EST	Winter Storm		0	0	0.00K	0.00K
9	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
10	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
11	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/20/2001	3:00	EST	Heavy Snow		0	0	0.00K	0.00K
12	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/22/2001	5:25	EST	Winter Storm		0	0	0.00K	0.00K
13	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/6/2002	6:00	EST	Heavy Snow		0	0	0.00K	0.00K
14	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/19/2002	6:30	EST	Heavy Snow		0	0	0.00K	0.00K
15	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/6/2002	13:30	EST	Heavy Snow		0	0	0.00K	0.00K
16	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/4/2002	14:00	EST	Heavy Snow		0	0	1.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/4/2002	14:00	EST	Heavy Snow		0	0	1.00K	0.00K
17	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/16/2003	20:34	EST	Heavy Snow		0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
18	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/19/2003	7:00	EST	Heavy Snow		0	0	0.00K	0.00K
19	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/25/2004	11:30	EST	Ice Storm		0	0	0.00K	0.00K
20	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/17/2007	13:10	EST -5	Winter Weather		0	0	0.00K	0.00K
21	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/11/2008	21:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
22	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/23/2008	17:05	EST -5	Winter Weather		0	0	0.00K	0.00K
23	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/27/2009	2:30	EST -5	Ice Storm		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/27/2009	3:30	EST -5	Ice Storm		0	0	0.00K	0.00K
24	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/3/2009	22:40	EST -5	Winter Weather		0	0	0.00K	0.00K
25	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/5/2009	5:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/5/2009	5:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/5/2009	5:00	EST -5	Winter Weather		0	0	0.00K	0.00K
26	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/18/2009	22:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
27	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/29/2010	16:55	EST -5	Heavy Snow		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/29/2010	16:55	EST -5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/29/2010	16:55	EST -5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/29/2010	16:55	EST -5	Winter Weather		0	0	0.00K	0.00K
28	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/9/2010	20:00	EST -5	Winter Weather		0	0	0.00K	0.00K
29	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/15/2010	4:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/15/2010	5:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/15/2010	6:00	EST -5	Heavy Snow		0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/15/2010	6:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
30	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/26/2010	23:00	EST-5	Winter Weather		0	0	0.00K	0.00K
31	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/15/2010	21:00	EST-5	Winter Storm		0	0	0.00K	0.00K
32	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
33	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/26/2011	8:00	EST-5	Winter Weather		0	0	0.00K	0.00K
34	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/9/2011	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
35	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/14/2012	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K
36	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/15/2013	14:45	EST-5	Ice Storm		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/15/2013	14:59	EST-5	Ice Storm		0	0	0.00K	0.00K
37	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/25/2013	6:30	EST-5	Ice Storm		0	0	0.00K	0.00K
38	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/2/2014	5:30	EST-5	Winter Weather		0	1	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/2/2014	6:46	EST-5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/2/2014	7:30	EST-5	Winter Weather		0	0	0.00K	0.00K
39	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/25/2014	5:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
40	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/4/2014	19:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/4/2014	21:05	EST-5	Winter Weather		0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
41	JACKSON (ZONE)	JACKSON (ZONE)	KY	3/2/2014	20:00	EST-5	Winter Storm		0	0	0.00K	0.00K
42	JACKSON (ZONE)	JACKSON (ZONE)	KY	11/1/2014	2:00	EST-5	Winter Weather		0	0	0.00K	0.00K
43	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/16/2015	5:00	EST-5	Winter Storm		0	0	0.00K	0.00K
44	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/18/2015	10:00	EST-5	Winter Storm		0	0	0.00K	0.00K
45	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/20/2015	23:00	EST-5	Winter Storm		0	0	0.00K	0.00K
46	JACKSON (ZONE)	JACKSON (ZONE)	KY	3/4/2015	22:00	EST-5	Winter Storm		0	0	0.00K	0.00K
47	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/22/2016	3:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
48	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/14/2016	16:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
49	JACKSON (ZONE)	JACKSON (ZONE)	KY	1/16/2018	5:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
50	JACKSON (ZONE)	JACKSON (ZONE)	KY	3/11/2018	22:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
51	JACKSON (ZONE)	JACKSON (ZONE)	KY	11/27/2018	4:00	EST-5	Winter Weather		0	0	0.00K	0.00K
52	JACKSON (ZONE)	JACKSON (ZONE)	KY	2/7/2020	3:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
53	JACKSON (ZONE)	JACKSON (ZONE)	KY	12/24/2020	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	Totals: 53								0	1	1.00K	0.00K

Jackson County Severe Winter Weather - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually “next” to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Jackson County experienced 53 severe winter weather events over 25 years yields that Jackson County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every 5 2/3 months (i.e., 53/300). Specifically, Jackson County experienced an average of 2 severe winter weather events each year. Or, using December 31, 2020 as an endpoint, this is 0.1767 events per month. $1/0.1767 = 5.66 \approx 1$ severe winter storm event an average of every 5 2/3 months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through October. This indicates that the winter months for Jackson County are November through March, a total of 5 months. When the frequency is calculated using the five winter months only (58/125), it reveals that Jackson County experienced an average of 2.32 events per winter, or 0.464 events per winter month. $1/0.464 = 2.32$ or about 1 severe winter storm events an average of every 2 winter months.

Jackson County Winter Storm Extent

A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Storm total snowfall amounts of 12 to 18 inches occurred around [Jackson C]ounty.[94]"

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	JACKSON (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	JACKSON (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	JACKSON (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	JACKSON (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	JACKSON (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
6	JACKSON (ZONE)	12/23/1998	12/24/1998	Winter Storm	
7	JACKSON (ZONE)	12/24/1999	12/24/1999	Heavy Snow	
8	JACKSON (ZONE)	1/17/2000	1/18/2000	Winter Storm	
9	JACKSON (ZONE)	1/22/2000	1/22/2000	Winter Storm	A mixture of snow and freezing rain fell across portions of Eastern Kentucky. Snowfall totals ranged from 3 to 5 inches.
10	JACKSON (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
11	JACKSON (ZONE)	1/20/2001	1/20/2001	Heavy Snow	
12	JACKSON (ZONE)	2/22/2001	2/22/2001	Winter Storm	
13	JACKSON (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
14	JACKSON (ZONE)	1/19/2002	1/19/2002	Heavy Snow	

[94] "Storm Events Database Event Details – Jackson County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
15	JACKSON (ZONE)	2/6/2002	2/6/2002	Heavy Snow	
16	JACKSON (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported.Power lines were down.
	JACKSON (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported.Power lines were down.
17	JACKSON (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 4 inches of snow were reported.
18	JACKSON (ZONE)	12/19/2003	12/20/2003	Heavy Snow	Five inches of snow were reported in the community of McKee.
19	JACKSON (ZONE)	1/25/2004	1/25/2004	Ice Storm	
20	JACKSON (ZONE)	2/17/2007	2/17/2007	Winter Weather	Estimated 2.5 inches of snowfall in McKee.
21	JACKSON (ZONE)	12/11/2008	12/11/2008	Heavy Snow	Four inches of snow was measured in Annville.
22	JACKSON (ZONE)	12/23/2008	12/23/2008	Winter Weather	One tenth of an inch of ice accretion from freezing rain accumulated on sidewalks, with a glaze of ice on roadways in and around Drip Rock.
23	JACKSON (ZONE)	1/27/2009	1/28/2009	Ice Storm	Jackson county dispatch reported around one quarter of an inch of ice accumulation from freezing rain in McKee.
	JACKSON (ZONE)	1/27/2009	1/28/2009	Ice Storm	The Jackson County dispatch reported around a quarter of an inch of ice accumulation from freezing rain in McKee.
24	JACKSON (ZONE)	2/3/2009	2/4/2009	Winter Weather	Three inches of snow fell in McKee.
25	JACKSON (ZONE)	12/5/2009	12/5/2009	Winter Weather	Eight tenths of an inch of snowfall was measured near McKee.
	JACKSON (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch of snow fell in Annville.
	JACKSON (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch of snow fell 1 mile west of Annville.
26	JACKSON (ZONE)	12/18/2009	12/19/2009	Heavy Snow	An observer measure 6 inches of snow at 9 am in Alcorn.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
27	JACKSON (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A weather observer measured a snowfall of 6 inches 8 miles north of McKee.
	JACKSON (ZONE)	1/29/2010	1/30/2010	Winter Weather	One and two tenths of an inch of snow had fallen in Annville.
	JACKSON (ZONE)	1/29/2010	1/30/2010	Winter Weather	One inch of snow had fallen in McKee and countywide.
	JACKSON (ZONE)	1/29/2010	1/30/2010	Winter Weather	Two inches of snow had fallen in Annville.
28	JACKSON (ZONE)	2/9/2010	2/10/2010	Winter Weather	One and eight tenths of an inch of snow fell in Sandgap.
29	JACKSON (ZONE)	2/15/2010	2/16/2010	Winter Weather	The county dispatcher and state highway garage reported about 3-4 inches of new snow since 4 am. The winds were picking up causing the snow to drift onto roads in spots in McKee.
	JACKSON (ZONE)	2/15/2010	2/15/2010	Winter Weather	Two and two tenths of an inch of snow fell in Sandgap.
	JACKSON (ZONE)	2/15/2010	2/16/2010	Heavy Snow	Five to six inches of snow fell at Gray Hawk.
	JACKSON (ZONE)	2/15/2010	2/16/2010	Winter Weather	Five inches of new snow fell in Sandgap between 825 am Monday and 825 am Tuesday. The storm total snowfall was 7 inches.
	JACKSON (ZONE)	2/15/2010	2/16/2010	Winter Weather	Four inches of new snow fell 9 miles northwest of McKee between 6 am Monday and 6 am Tuesday. The storm total snowfall was 6.3 inches.
	JACKSON (ZONE)	2/15/2010	2/16/2010	Heavy Snow	Three to five inches of snow fell county wide.
30	JACKSON (ZONE)	2/26/2010	2/27/2010	Winter Weather	One and three tenths of an inch of snow fell in Sandgap.
31	JACKSON (ZONE)	12/15/2010	12/16/2010	Winter Storm	A quarter of an inch of ice accumulated in Annville.
32	JACKSON (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estimated that an inch of snow had fallen in McKee and that roads were very slick.
33	JACKSON (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 2 inches.
34	JACKSON (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 2.5 inches.
	JACKSON (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 1.5 inches.
	JACKSON (ZONE)	2/9/2011	2/10/2011	Winter Weather	The snow accumulated 1 inch.

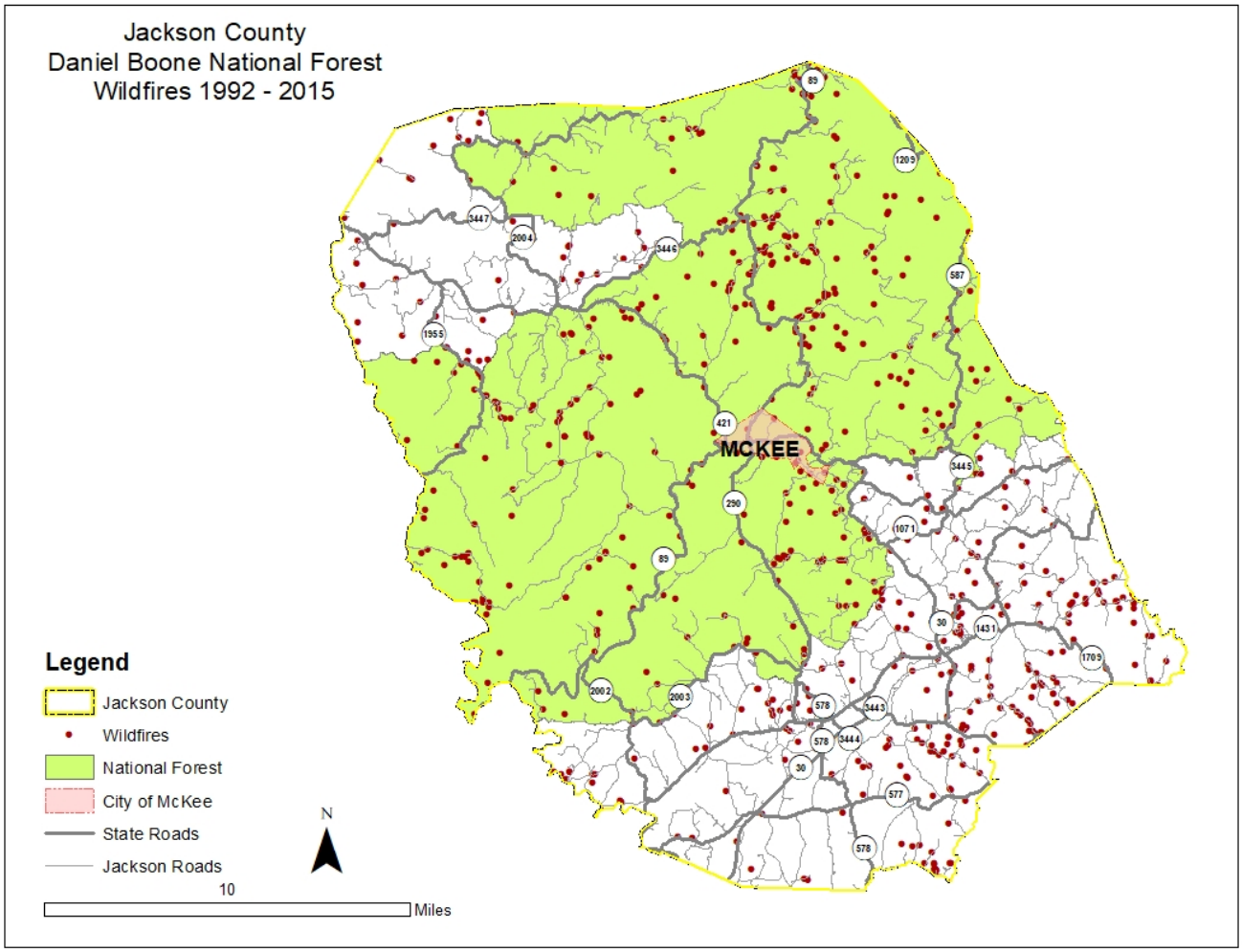
Count	County	Begin Date	End Date	Type	Extent: Event Narrative
35	JACKSON (ZONE)	1/14/2012	1/15/2012	Winter Weather	One and on tenth of an inch of additional snow fell 12 miles southwest of Booneville, with a inch of snow on the ground.
36	JACKSON (ZONE)	1/15/2013	1/16/2013	Ice Storm	Half an inch of ice was observed on tree limbs. The weight of the ice was causing some of the smaller limbs to break and fall from the trees.
	JACKSON (ZONE)	1/15/2013	1/16/2013	Ice Storm	Jackson Energy reported 468 customers without power in the Bills Branch area.
37	JACKSON (ZONE)	1/25/2013	1/25/2013	Ice Storm	Ice amounts ranged from 1/10 in the northwest end of the county, up to 1/4 near Annville.
38	JACKSON (ZONE)	1/2/2014	1/2/2014	Winter Weather	There 8 separate accidents reported in Jackson county, involving 20 vehicles. One injury was reported. The wrecks occurred due to icy road conditions.
	JACKSON (ZONE)	1/2/2014	1/2/2014	Winter Weather	Social media reported that Highway 290 outside of McKee had been closed due to icy conditions. Multiple vehicles were reported to have slid off the road.
	JACKSON (ZONE)	1/2/2014	1/2/2014	Winter Weather	Highway 290 outside of McKee was shutdown due to hazardous road conditions caused by black ice.
39	JACKSON (ZONE)	1/25/2014	1/25/2014	Heavy Snow	A trained spotter reported up to 4.6 of snow fell in McKee.
40	JACKSON (ZONE)	2/4/2014	2/5/2014	Winter Weather	An eight of an inch of ice had accumulated on trees in the area.
	JACKSON (ZONE)	2/4/2014	2/5/2014	Winter Weather	A tenth of an inch of ice accumulation occurred in Sandgap.
41	JACKSON (ZONE)	3/2/2014	3/3/2014	Winter Storm	Four to nearly seven inches of snow and sleet had accumulated across the county by storms end. At one point, an inch and a half of sleet had accumulated in McKee. Just over 5 inches of snow was reported near Clover Bottom.
42	JACKSON (ZONE)	11/1/2014	11/1/2014	Winter Weather	Snowfall amounts ranged from a dusting in most locations up to 2.2 inches in Clover Bottom.
43	JACKSON (ZONE)	2/16/2015	2/16/2015	Winter Storm	The first official snow fall measurement on this day came via a volunteer weather observer in Clover Bottom, where 1.2 inches of snow was measured at 7:00 am. Final storm total snow amounts from around Jackson county were quite impressive. The northern portion of the county received between 10 and 15 inches of snow by the time the flakes stopped piling up. The rest of the county received between 8 and 12 inches of snow. McKee reported a storm total snow fall of 10 inches while Sandgap picked up a foot. The highest snow fall total was measured by a COOP observer just to the southwest of Clover Bottom, where 15.2 inches of snow ended up falling.
44	JACKSON (ZONE)	2/18/2015	2/18/2015	Winter Storm	Three to four inches of snow accumulated around the county.
45	JACKSON (ZONE)	2/20/2015	2/21/2015	Winter Storm	Two to three tenths of an inch of ice accumulated on objects and various surfaces around the county. Heavy wet snow also caused the partial collapse of the courthouse roof in McKee.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
46	JACKSON (ZONE)	3/4/2015	3/5/2015	Winter Storm	Jackson county experienced a plethora of winter weather types during this event. The Dept of Highways reported that an estimated quarter of an inch of ice had accumulated on various objects and surfaces during the storm. Three to five inches of snow and sleet also were reported at various locations through out the county.
47	JACKSON (ZONE)	1/22/2016	1/23/2016	Heavy Snow	Storm total snowfall amounts of 12 to 18 inches occurred around the county.
48	JACKSON (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 4 to 5 inches across the county.
49	JACKSON (ZONE)	1/16/2018	1/16/2018	Heavy Snow	
50	JACKSON (ZONE)	3/11/2018	3/12/2018	Heavy Snow	
51	JACKSON (ZONE)	11/27/2018	11/27/2018	Winter Weather	A Cooperative Observer reported a storm total snowfall of 1 inch in Clover Bottom.
52	JACKSON (ZONE)	2/7/2020	2/7/2020	Heavy Snow	
53	JACKSON (ZONE)	12/24/2020	12/25/2020	Heavy Snow	A 4 inch report was made in the Annville community at 8:28 pm EST on 12/24, accumulating since 2 pm EST. Elsewhere across the county saw below warning amounts of between 2 and 4 inches.
54	JACKSON (ZONE)	2/1/2021	2/2/2021	Winter Weather	A member of the public reported that 3 inches of snow had fallen in Sandgap.
	JACKSON (ZONE)	2/1/2021	2/2/2021	Winter Weather	A volunteer weather observer near Loam reported 1.5 inches of snow.
	JACKSON (ZONE)	2/1/2021	2/2/2021	Winter Weather	A volunteer weather observer reported that 2.2 inches of snow had fallen near Clover Bottom on 2-2-21, with a two day total of 3.5 inches reported.
55	JACKSON (ZONE)	2/7/2021	2/7/2021	Winter Weather	A volunteer weather observer reported that an inch of snow had fallen near Clover Bottom.
56	JACKSON (ZONE)	2/11/2021	2/11/2021	Ice Storm	The State Highway Dept reported that one half to three quarters of an inch of ice accumulation due to freezing rain had occurred across northern parts of the county.
	JACKSON (ZONE)	2/11/2021	2/11/2021	Winter Weather	Two tenths of an inch of ice accumulation due to freezing rain had occurred near Clover Bottom.
57	JACKSON (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Three and a half inches of snow was observed near Kerby Knob.
	JACKSON (ZONE)	2/17/2021	2/18/2021	Heavy Snow	An estimated 3.5 inches of snow fell in McKee.

WILDFIRE

In November 2012 Jackson County experienced a large wildfire in the Daniel Boone National Forest on KY-89 just five miles north of the City of McKee. This fire burned over hundred acres of national forest. The fire occurred in a remote location, no homes or private property were damaged. In April 2013, another fire occurred in the Daniel Boone National Forest destroying more than 700 acres of forest. No homes were damaged during the fire.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of



grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties

for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[95]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Jackson County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	3	15.2	10.000%
Class B	0.25 to 9 Acres	25	11,096.9	83.333%
Class C	10 to 99 Acres	2	88,775.2	6.667%
Class D	100 to 299 Acres	0	39,378.1	0.000%
Class E	300 to 999 Acres	0	40,300.0	0.000%
Class F	1,000 to 4,999 Acres	0	16,694.0	0.000%

[95] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

Class G	5,000 or More Acres	0	7,400.0	0.000%

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Jackson	2013	24	473.5	174,480
	2014	34	423.5	
	2015	20	110.1	
	2016	17	83.0	
	2017	23	186.5	
	2018	6	37.0	
	2019	21	75.1	
	2020	9	32.6	

Table 1-4 Jackson County Summary of Impacts From Wildfires, 2019-2020	
# of Fires	30
Injuries	0
Fatalities	0
Suppression Costs	$ 9,766
# Houses Saved	15
Value of Houses Saved	$ 925,000
# Houses Lost	0
Value of Houses Lost	$ -
# Structures Saved	2
Value of Structures Saved	$ 3,500
# Structures Lost	0
Value of Structures Lost	$ -

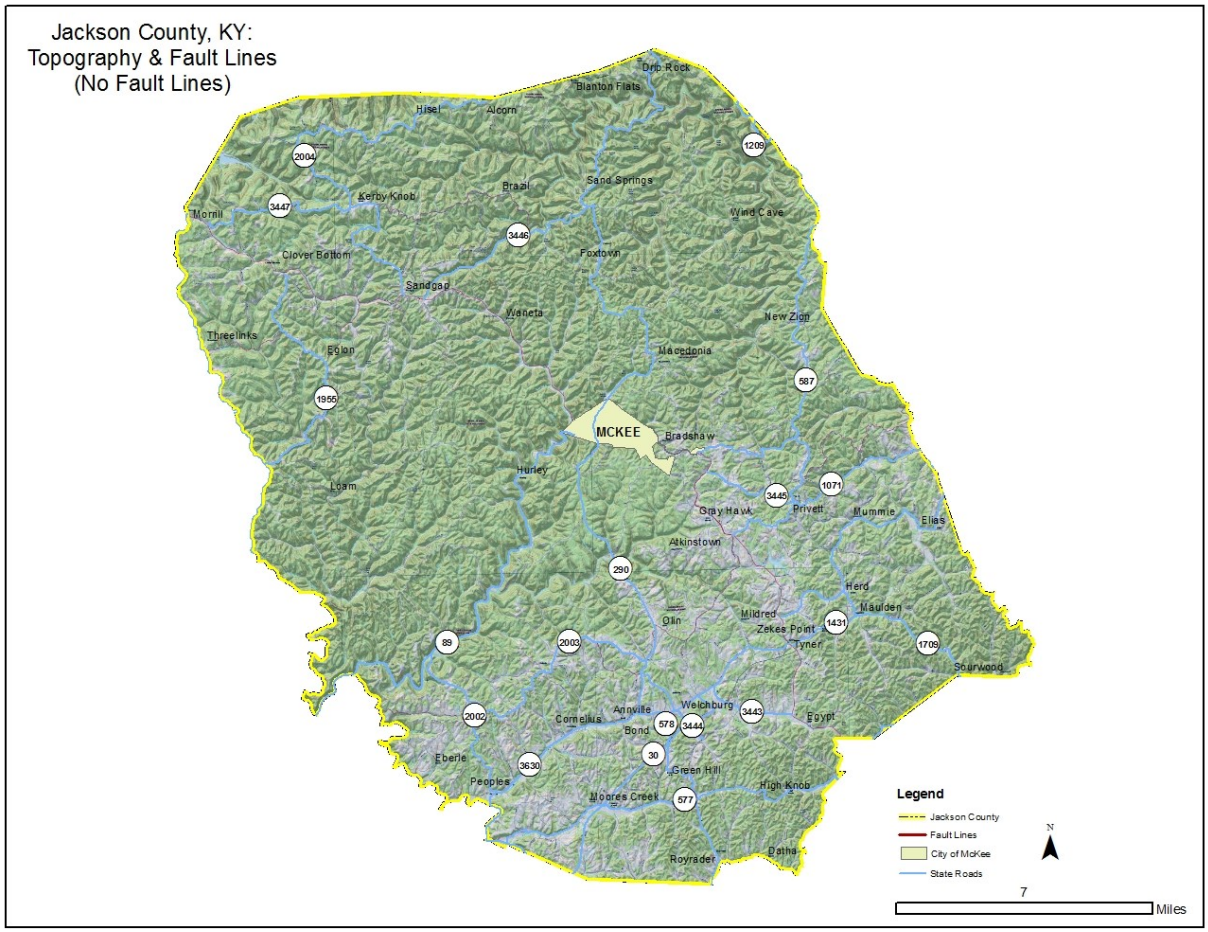
In 2019-2020 (the last years for which data is available), Jackson County suffered 30 wildfires of all class types. Two years equals 730 days. Thus, there were 30/730 fires per day, or 0.0411 fires per day, or 1 wildfire of all class types every 24.33 days (1/0.0411). Within particular wildfire classes, there were three (3) Class A wildfire between 2019-2020. This translates to 3/730 fires where less than 0.25 acres were burned, or 0.0041 Class A fires per day, or 1 Class A wildfire about every 243.9 days (1/0.0041). There were 25 Class B wildfires between 2019-2020. This translates to 25/730 fires where between 0.25 to 9 acres were burned, or 0.0345 Class B fires per day, or one (1) Class B wildfire about every 28.99 days (1/0.0345). There were 2 Class C wildfires between 2019-2020. This translates to 2/730 fires where between 10 to 99 acres were burned, or 0.0026 Class C fires per day, or one (1) Class C wildfire about every 384.62 days (1/0.0026). There were no Class D to Class G wildfires – fires where 100 to 5,000 or more acres were burned – in 2019-2020 in Jackson County.

All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current.

EARTHQUAKES

Earthquakes can happen anytime of the year and without warning. The risk is higher in identified seismic zones such as the New Madrid Fault Zone in western Kentucky. Earthquakes have occurred in Jackson County in the past. The following is a list of the recorded earthquake. As the below map shows, there are no earthquake fault lines in Jackson County.

Jackson County Historical Earthquakes 1/1/1900 - 1/31/2018				
Location	**Magnitude**	**Depth**	**Date**	**Time**
37.445 Lat/-84.157 Long	2.5	23km	5/16/1999	15:40:15



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Jackson County was about 39.1 persons in 2010 (the latest data available in Census Quickfacts[14]). This small population size and commensurate low density of structures suggest that the impact of an earthquake would be at the lower end of the range estimated for a given earthquake magnitude. The US Geological Survey states[15]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake in written history occurred in 1960 off the coast of Chile and had a magnitude of 9.5.
The Michigan Technological University's Earthquake Magnitude Scale[16] puts a number to the potential for damage: The Jackson County earthquake had a magnitude of 2.5 on the Earthquake Magnitude Scale, which identifies the extent as "often felt, but only causes minor damage". Given the history of earthquakes in Jackson County, it is safe to say that the probability of an earthquake of 5.5 or above in magnitude, where damage to structures begins, would be very rare.[17],[18] There have been no recorded events at 5.5 or above on the Earthquake Magnitude Scale and thus there are no recorded past damages and impacts from earthquakes for Jackson County and its incorporated city.

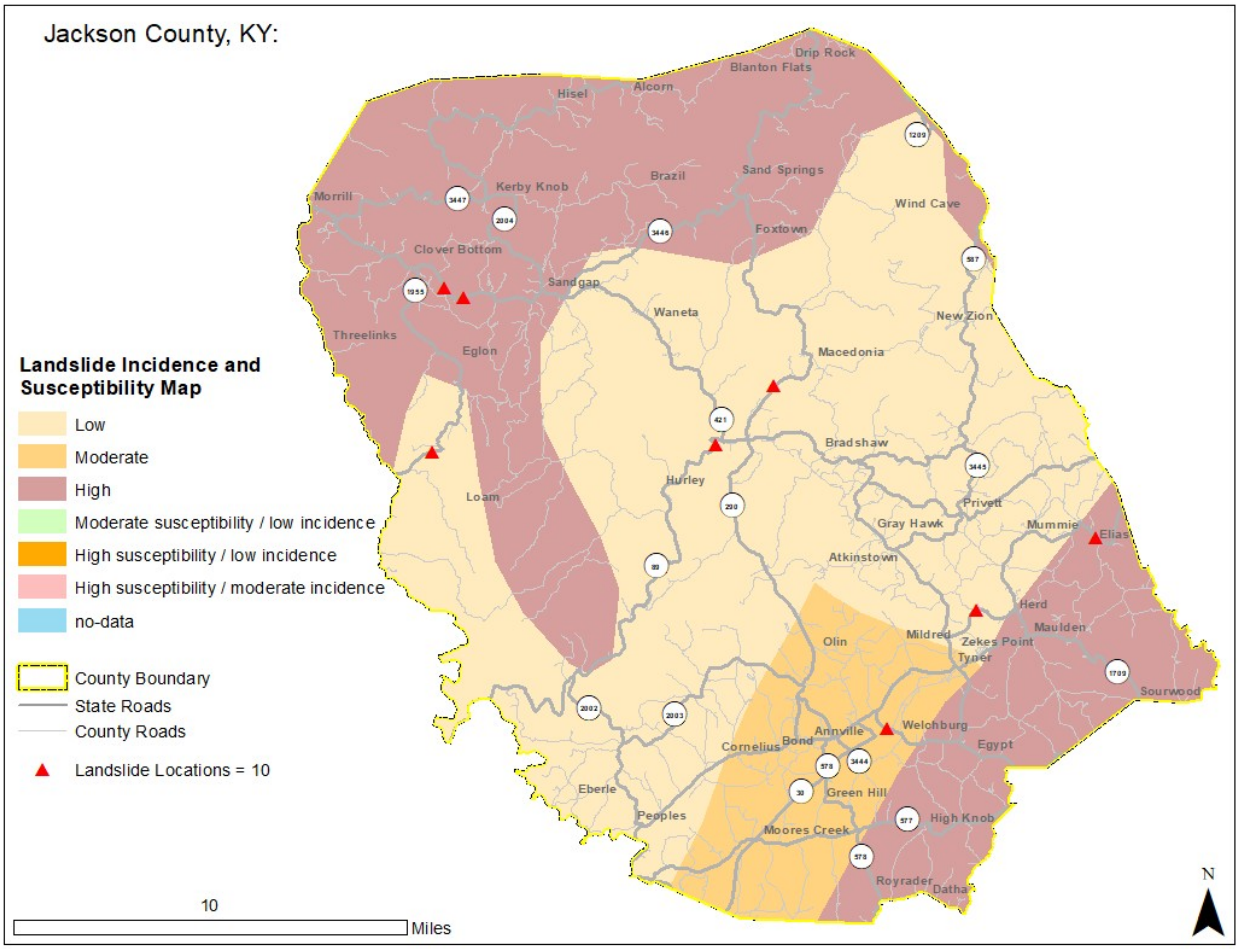
Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

LANDSLIDES

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field.

Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils. The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.



Source: Crawford, Matthew. *KGS Landslide Inventory*. Kentucky Geological Survey, www.uky.edu/KGS/.

All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

Count	County	City	Loca-tion	Failure Loca-tion	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
1	Jackson	Stur-geon	KY 30		8/9/2011	Rock-fall	Shale; Siltstone; Sandstone; Coal; Underclay							Yes	
2	Jackson	Tyner	KY 3443		2015	Land-slide	Sandstone; Shale; Coal							Road Blocked	
3	Jackson	Tyner	KY 30	Below Road	2/18/2018		Sandstone; Shale; Coal								
4	Jackson	Alcorn	KY 2004		2019		Sandstone; Siltstone; Shale								
5	Jackson	Sand-gap	US 421		2019		Sandstone								
6	Jackson	Tyner	KY 577		5/20/2020		Sandstone; Shale; Coal							Yes	
7	Jackson	Johnetta	KY 1955												
8	Jackson	Johnetta	US 421												
9	Jackson	Johnetta	US 421												
10	Jackson	Sand-gap	KY 89												
11	Jackson	Sand-gap	KY 89												
12	Jackson	Sand-gap	KY 89				Shale; Siltstone; Sandstone; Dolomite; Limestone								

Jackson County Landslides - Probability as Frequency of Event Occurrence

Jackson County, unincorporated (and its unincorporated cities) independently experienced 12 landslide events over 30 years. Thus, Jackson County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every 30 months (i.e., 12/30). Or, using December 31, 2021, as an endpoint, 12/360 months is 0.0333 events per month. 1/0.0333 = 30.0300 ≈ 1 landslide event an average of every 30 months.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
1	Jackson	McKee	(37.45, -83.985555)												

McKee Landslides - Probability as Frequency of Event Occurrence

Incorporated McKee independently experienced 1 landslide event within its city limits over 30 years. Therefore, McKee experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every 30 years (i.e., 1/30). Or, using December 31, 2021, as an endpoint, 1/360 months is 0.0028 events per month. 1/0.0028 = 357 ≈ 1 landslide event an average of every 360 months, or one every 30 years.

MAN-MADE HAZARDS

During the community meeting the community members had several concerns about man-made hazards to the county. The following is a list of these concerns.

Rank	Man-Made Hazards
1	Active Shooter
2	Terrorism/Harm to Critical Infrastructure
3	Cyber/Internet Threat (EOC & 911 Center)
4	Drug Problems

It was discussed that Jackson County has experienced an active shooter/hostage situation in the past. In September 1989 a high school classroom containing 11 students was taken hostage by a high school student. The hostage situation lasted for several hours and none of the students were harmed during the event.

Community members were also concerned with protecting their critical infrastructure from terrorist events such as destroying/tampering with the water treatment plants which would cripple the county. Discussion of protecting these facilities through increased security measures were deliberated.

Jackson County's 911 Emergency Operation Center (EOC) is a state of the art building with no copper wiring. The 911 call system is established through fiber optics which power the entire building. If the fiber optic lines were damaged, the entire 911 system would be shutdown. There have been incidents in the past where damage, through accidents, have occurred to the outside line shutting down the ability to call in to 911. Backup resources had to be used during these events.

Another concern was the increase of drug problems throughout the county. Not only are drug related health concerns a large problem for the county, but also the residue of the drug making process. There are places within the county that are littered with chemicals and byproducts.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Jackson County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Jackson County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Jackson County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Jackson County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Jackson County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Jackson County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. For mitigation to be effective, action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

JACKSON COUNTY GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

Objective(s)

1.1 Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive areas.

Goal #2 *Protect Jackson County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

Objective(s)

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Jackson County's most vulnerable populations and structures.

2.2 Decrease the number of FEMA-identified "repetitive loss properties."

Goal #3 *Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

Objective(s)

3.1 Increase the level of knowledge and awareness for Jackson County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

Goals Correlation to Hazards			
Hazards	**Goal #1**	**Goal #2**	**Goal#3**

Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update

	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Generator for Jackson County Water Association				✓	Has not been purchased. Continue to seek funding.
Purchase 2 generators for McKee water plant & sewer plant.				✓	Has not been purchased. Continue to seek funding.
Restore stream behind Farm Office to McKee sewer plant.	✓				Built watershed project.
Culverts replaced by bridges at Cave Springs Rd, Rock Lick Rd, Gray Hawk Park Rd, and Walkers Branch Rd.			✓		Cave Springs Rd and Walkers Branch Rd have been worked on. Continue to seek funding for replacement of culverts at these locations.
Culvert replaced by bridge on Gregory Rd.	✓				Project has been completed.

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable

as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

JACKSON COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Extend Pilgrims Rest Road to create another entrance/exit to Jackson County High School.	All Hazards	County & Board of Education	X				Short Term	1	5	1	KYTC, State, & County	3
Replace small and inefficient tiles, drains, and culverts with larger more efficient ones throughout the County to resolve drainage issues.	Flood	State & County	X				Short Term	1	5	1	State, County, PDM, FMA, & HMGP	3
Clean out ditches throughout the County to resolve drainage issues.	Flood	State & County		X			Short Term	1	4	1	County	2
Complete engineer study at Clover Bottom near Phoenix Building to resolve flooding issues.	Flood	State & County		X			Long Term	1	5	1	State, County, PDM, FMA, & HMGP	4
Welchburg/KY-3443 road needs to be elevated to resolve drainage issues.	Flood	State	X				Long Term	1	5	1	State, County, PDM, FMA, & HMGP	4
Elevation of War Fork Rd.	Flood	County	X				Short Term	1	1	5	State	4
Build a bridge at Lower Adkinstown Road.	Flood	County	X				Short Term	1	5	1	County, PDM, FMA, & HMGP	
Restore Indian Creek to natural capacity.	Flood	County		X			Long Term	1	2	1	County, State, & Federal	1
Engineer Study at US-421 to resolve Karst problems.	Karst	Federal, State, & County	X				Long Term & Continuous	1	1	1	Federal	1

Purchase equipment for County Road Department to better maintain roads during natural hazards.	All Hazards	County		X			Continuous	1	5	1	County & Various Grants	2
Purchase generators for Fire Departments within Jackson County.	All Hazards	County & City	X				Short Term	1	5	1	County, City, & Various Grants	1
Purchase generators for Water Plants within County.	All Hazards	City & Water Associations	X				Short Term	1	1	1	City & Water Associations	1
Purchase generators for Waste Water Plants within County.	All Hazards	City	X				Short Term	1	1	1	City & Water Associations	1
Cyber protection for 911 Center.	Cyber Terrorism	County		X			Continuous	1	5	1	County & Grants	3
Purchase surveillance systems for critical infrastructure such as electrical stations and water & waste water plants.	Terrorism	County, City, and Private Companies		X			Short Term	1	5	1	Grants & Private Companies	3
Dunagan Road needs to be elevated as the road is currently lower than the creek. When flooding occurs, community becomes inaccessible.	Flood	County	X				Short Term	1	1	5	County, PDM, FMA, & HMGP	3
Evaluate bridge tonnage throughout County. Fix bridges that do not meet tonnage requirement.	All Hazards	State & County	X				Continuous	1	3	5	State, County, PDM, FMA, & HMGP	Depends on the Bridge
Complete engineer study on KY-89 South due to flooding issues.	Flood	Multiple Agencies	X				Continues	1	1	1	Multiple Agencies	1
Purchase better equipment for County Road Department to clean and maintain roads during winter weather.	Winter Weather	County		X			Continuous	1	5	1	County & Various Grants	2
Purchase and implement a mobile satellite dispatch with radios to use as back up if anything was to	All Hazards	County		X			Short Term	1	5	1	County & Various Grants	2

happen to current communication system.												
Purchase better search and rescue equipment and vehicles.	All Hazards	Multiple Agencies		X			Continuous	1	5	1	Various Grants	2
Purchase and install emergency shutters on windows at Sand Gap & Tyner School.	Tornado & Severe Storms	County & Board of Education	X				Short Term	1	5	1	BOE & Grants	1
Repair slip at High Street.	Landslide	City	X				Short Term	4	5	5	City	5
Repair slip at McCammon Ridge Road.	Landslide	County	X				Short Term	1	1	1	County, State, & Grants	2
Complete engineer study at Mae Gumm to resolve flooding issues.	Flood	County		X			Long Term	1	1	1	County	3

Knox County, KY:
Hazard Mitigation Overview

IX. KNOX COUNTY OVERVIEW

Knox County is in the southern part of the Eastern Kentucky coal field. The area is generally mountainous with elevations ranging from 890 to 2322 feet. The county has two cities; Barbourville, which is the County seat, and Corbin which is shared with Whitley County. The City of Barbourville is home to Union College as well as EKU and LMU extension campuses.

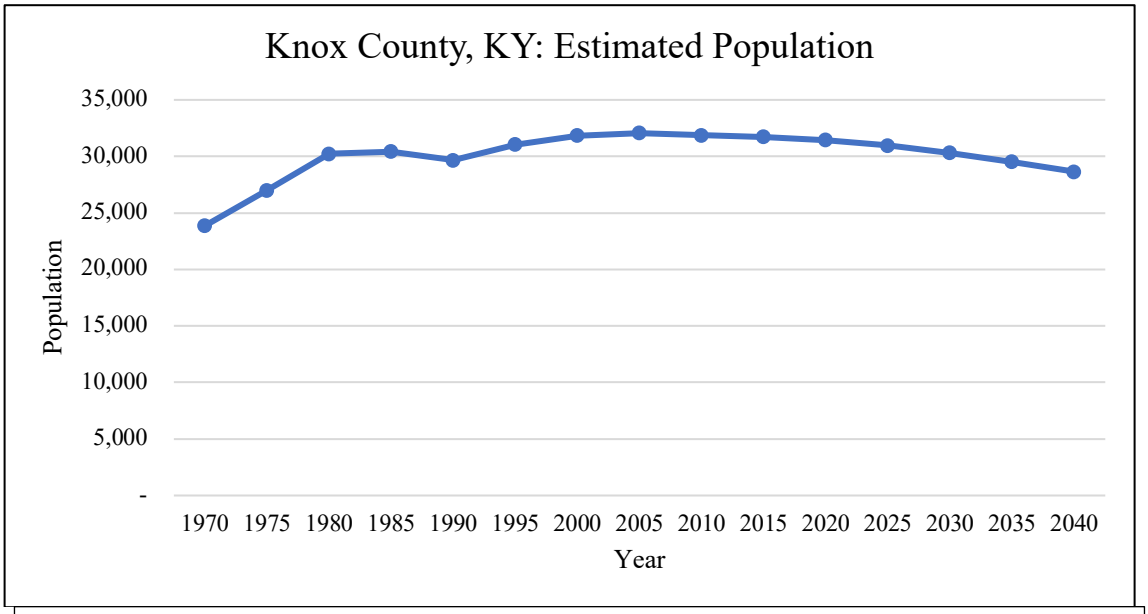
Knox County, KY: Quick Facts	
Total Population, July 1, 2019	31,145
Population per Square Miles, 2010	82.5
Land Area in Square Miles, 2010	386.30
Housing Units, July 1, 2016	14,460
Persons in Poverty, percent	39.2%
Median Value of Owner-Occupied Housing Units, 2011-2015	$78,400
Median Household Income, 2012-2016	$77,000
Total Employment, 2015	8,039
Total Employer Establishments, 2015	447
Source: U.S. Census Bureau	

KNOX COUNTY POPULATION:

In 2019 Knox County's estimated total population was 31,145.[96] Knox County's population decreased by 2.3% between 2010 and 2019, and the population is predicted to continue to decline. Please note that the City of Corbin straddles the boundaries of Knox, Whitley, and Laurel Counties, with the majority of the population residing in Whitley County. The population counts below reflect the city as a whole, across the three counties.

Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Knox County	31,741	31,668	31,365	1.2% fewer	
City of Barbourville	3,178	3,169	3,072	3.3% fewer	
City of Corbin	7,710	6,923	7,325	5% fewer	
Source: U.S. Census Bureau					

[96] United States Census. QuickFacts: Knox County, Kentucky. Retrieved on 6/22/2020 from https://www.census.gov/quickfacts/knoxcountykentucky.



Source: U.S. Census Bureau & KY State Data Center

COMMUNITY CAPABILITIES

Knox County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Knox County Fiscal Court is comprised of a Judge Executive and 5 Magistrates. The City of Barbourville is a Home Rule class city lead by a Mayor-Council government. The City of Corbin is a Home Rule class city and has a Manager form of government. Both the Fiscal Court, City Council, and Board of Commissioners have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation. The following chart displays various plans and programs that the County and Cities participate in.

Knox County Plans & Programs									
	Emergency Operation Plan	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Knox County	✓		✓	✓	✓	✓	✓	N/A	
City of Barbourville	✓	✓	✓	✓	✓	✓	✓	N/A	
City of Corbin	✓	✓	✓	✓	✓	✓	✓	N/A	

EMERGENCY MANAGEMENT

To prepare for future natural hazards Knox County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Knox County THIRA.

THIRA Hazard Ranking	
1	Flood
2	Snow Storms
3	Wildfire

The Knox County Emergency Management is currently working on developing and implementing a Local Emergency Planning Committee (LEPC). This committee, once established, will meet quarterly and will promote emergency planning and preparedness. The LEPC will include members from various professions and will be open to the public. For more information about Knox County's THIRA and LEPC meetings contact the Emergency Management Director.

KNOX COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events.

The following chart summarizes the natural hazards that have had a negative impact on the people and places of Knox County. These hazards were discussed and reviewed during the community meetings.

Rank	Natural Hazards
1	Flood
2	Severe Winter Weather
3	Severe Storms/Tornados
4	Drought
5	Wildfire

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

FLOOD

The Cumberland River flows through Knox County bringing with it the potential for severe flooding. The major areas of flat land are in the valleys of the Cumberland River, Lynn Camp Creek, and in the lower reaches of some of their tributaries. The valley flats along the Cumberland River range from 940 to 1,000 ft. The elevation of the City of Barbourville, at the courthouse, is 986 ft.

To protect the vulnerable low-lying areas from flooding a flood wall was built in the mid-1950's. The city's floodwall was raised approximately 10 feet following the devastating 1977 flood. During this flood the City of Barbourville was evacuated as a precaution. Sandbag-reinforced levees protecting the town held back the water. Knox was still declared a disaster area. To further protect the county's vulnerable assets from the Cumberland River a diversion channel was built in 1986. There are 6 flood gates throughout the county. Even with these flood mitigation projects Knox County still has flooding problems.

In order to address systematically the number of previous flooding occurrences, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from flooding for Knox County, Kentucky, and for its incorporated city, Barbourville. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Knox County and for its unincorporated and incorporated cities.

The only incorporated city in Knox County is the City of Barbourville. In order to capture "Flood" and "Flash Flood" events specific to the incorporated city, the below tables include all "Flood" and "Flash Flood" events having searched the entire date range of available data within the NCEI "Storm Events Database," i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of "probability"), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Knox County and its incorporated cities, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines "probability" in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the "Flood" and "Flash Flood" events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for Knox County as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 5-1: Knox County Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:											
1	ARTEMUS	KNOX CO.	KY	11/30/1996	18:00	EST	Flash Flood		0	0	10.00K	0.00K
2	KNOX (ZONE)	KNOX (ZONE)	KY	12/1/1996	0:01	EST	Flood		0	0	2.00K	0.00K
3	KNOX (ZONE)	KNOX (ZONE)	KY	3/3/1997	7:00	EST	Flood		0	0	5.00K	0.00K
4	COUNTY-WIDE	KNOX CO.	KY	4/16/1998	19:00	EST	Flash Flood		0	0	50.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	4/17/1998	6:45	EST	Flood		0	0	0.00K	0.00K
	COUNTY-WIDE	KNOX CO.	KY	4/18/1998	22:00	EST	Flash Flood		0	0	50.00K	0.00K
5	CENTRAL PORTION	KNOX CO.	KY	1/9/1999	7:00	EST	Flash Flood		0	0	0.00K	0.00K
6	COUNTY-WIDE	KNOX CO.	KY	7/4/2001	14:30	EST	Flash Flood		0	0	0.00K	0.00K
7	DEWITT	KNOX CO.	KY	1/24/2002	7:50	EST	Flash Flood		0	0	0.00K	0.00K
8	KNOX (ZONE)	KNOX (ZONE)	KY	3/18/2002	3:12	EST	Flood		0	0	0.00K	0.00K
9	FLAT LICK	KNOX CO.	KY	2/15/2003	11:00	EST	Flash Flood		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/16/2003	6:29	EST	Flood		0	0	2.270M	0.00K
10	COUNTY-WIDE	KNOX CO.	KY	4/9/2003	8:30	EST	Flash Flood		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	4/9/2003	13:36	EST	Flood		0	0	0.00K	0.00K
11	GIRDLER	KNOX CO.	KY	1/2/2004	9:25	EST	Flash Flood		0	0	0.00K	0.00K
12	KNOX (ZONE)	KNOX (ZONE)	KY	2/6/2004	18:51	EST	Flood		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/6/2004	21:39	EST	Flood		0	0	0.00K	0.00K
13	KNOX (ZONE)	KNOX (ZONE)	KY	3/6/2004	18:19	EST	Flood		0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
14	KNOX (ZONE)	KNOX (ZONE)	KY	9/17/2004	6:19	EST	Flood		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	9/17/2004	6:19	EST	Flood		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	9/17/2004	6:19	EST	Flood		1	0	103.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	9/17/2004	6:19	EST	Flood		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	9/17/2004	6:19	EST	Flood		0	0	0.00K	0.00K
15	BERTHA	KNOX CO.	KY	12/9/2004	14:40	EST	Flash Flood		0	0	0.00K	0.00K
16	GIRDLER	KNOX CO.	KY	3/2/2007	19:00	EST -5	Flood		0	0	0.00K	0.00K
17	WILTON	KNOX CO.	KY	7/28/2008	16:00	EST -5	Flash Flood		0	0	0.00K	0.00K
18	HEIDRICK	KNOX CO.	KY	1/7/2009	4:30	EST -5	Flood		0	0	0.00K	0.00K
	HEIDRICK	KNOX CO.	KY	1/7/2009	5:40	EST -5	Flood		0	0	0.00K	0.00K
19	DISNMAN SPGS	KNOX CO.	KY	5/4/2009	2:50	EST -5	Flood		0	0	0.00K	0.00K
	GRAY	KNOX CO.	KY	5/4/2009	1:25	EST -5	Flash Flood		0	0	0.00K	0.00K
	BAILEYS SWITCH	KNOX CO.	KY	5/4/2009	3:15	EST -5	Flash Flood		0	0	0.00K	0.00K
20	GRAY	KNOX CO.	KY	6/11/2009	14:56	EST -5	Flash Flood		0	0	0.00K	0.00K
21	BAILEYS SWITCH	KNOX CO.	KY	7/26/2009	4:20	EST -5	Flash Flood		0	0	0.00K	0.00K
22	BIMBLE	KNOX CO.	KY	8/4/2009	14:00	EST -5	Flash Flood		0	0	0.00K	0.00K
	BIMBLE	KNOX CO.	KY	8/4/2009	15:45	EST -5	Flash Flood		0	0	0.00K	0.00K
23	KNOXFORK	KNOX CO.	KY	1/24/2010	13:00	EST -5	Flood		0	0	0.00K	0.00K
	PROVI-DENCE	KNOX CO.	KY	1/24/2010	17:00	EST -5	Flash Flood		0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
24	MOORE HILL	KNOX CO.	KY	11/30/2010	17:25	EST-5	Flash Flood		0	0	1.00K	1.00K
25	WARREN	KNOX CO.	KY	6/20/2011	3:30	EST-5	Flash Flood		0	0	75.00K	0.00K
	ANCHOR	KNOX CO.	KY	6/20/2011	3:30	EST-5	Flash Flood		0	0	3.000M	0.00K
	HUBBS	KNOX CO.	KY	6/20/2011	3:30	EST-5	Flash Flood		0	0	50.00K	0.00K
	KAYJAY	KNOX CO.	KY	6/20/2011	3:30	EST-5	Flash Flood		0	0	10.00K	0.00K
	ANCHOR	KNOX CO.	KY	6/20/2011	3:30	EST-5	Flash Flood		1	0	25.00K	0.00K
	ANCHOR	KNOX CO.	KY	6/20/2011	8:00	EST-5	Flood		0	0	25.00K	0.00K
26	TROSPER	KNOX CO.	KY	7/30/2011	16:20	EST-5	Flash Flood		0	0	0.00K	0.00K
27	BAILEYS SWITCH	KNOX CO.	KY	11/28/2011	12:00	EST-5	Flood		0	0	0.00K	0.00K
28	FOUNT	KNOX CO.	KY	4/17/2013	9:00	EST-5	Flash Flood		0	0	1.00K	0.00K
	MILLS	KNOX CO.	KY	4/17/2013	9:00	EST-5	Flash Flood		0	0	760.00K	0.00K
29	FLAT LICK	KNOX CO.	KY	2/22/2015	0:30	EST-5	Flood		0	0	1.00K	0.00K
	BOONE HGTS	KNOX CO.	KY	2/22/2015	0:30	EST-5	Flood		0	0	1.00K	0.00K
30	CAMP GROUNDS	KNOX CO.	KY	4/7/2015	8:45	EST-5	Flash Flood		0	0	1.00K	0.00K
	BOONE HGTS	KNOX CO.	KY	4/7/2015	10:28	EST-5	Flash Flood		0	0	1.00K	0.00K
31	JARVIS	KNOX CO.	KY	7/14/2015	8:20	EST-5	Flash Flood		0	0	0.00K	0.00K
	SPRULE	KNOX CO.	KY	7/14/2015	9:00	EST-5	Flash Flood		0	0	1.00K	0.00K
32	FLAT LICK	KNOX CO.	KY	12/25/2015	13:18	EST-5	Flash Flood		0	0	1.00K	0.00K
33	HIMYAR	KNOX CO.	KY	5/27/2017	21:40	EST-5	Flash Flood		0	0	1.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
34	WILTON	KNOX CO.	KY	8/8/2018	14:12	EST-5	Flash Flood		0	0	0.00K	0.00K
35	CAMP GROUNDS	KNOX CO.	KY	8/18/2018	18:10	EST-5	Flash Flood		0	0	0.00K	0.00K
36	SWAN LAKE	KNOX CO.	KY	2/20/2019	13:00	EST-5	Flood		0	0	0.00K	0.00K
	BOONE HGTS	KNOX CO.	KY	2/20/2019	13:15	EST-5	Flood		0	0	0.00K	0.00K
37	HEIDRICK	KNOX CO.	KY	2/23/2019	20:30	EST-5	Flood		0	0	0.00K	0.00K
38	WARREN	KNOX CO.	KY	7/7/2019	14:46	EST-5	Flash Flood		0	0	6.00K	0.00K
39	KAYJAY	KNOX CO.	KY	7/18/2019	4:04	EST-5	Flash Flood		0	0	3.00K	0.00K
40	JARVIS	KNOX CO.	KY	2/5/2020	23:30	EST-5	Flood		0	0	50.00K	0.00K
	HEIDRICK	KNOX CO.	KY	2/6/2020	13:00	EST-5	Flood		0	0	2.500M	0.00K
41	MOORE HILL	KNOX CO.	KY	5/5/2020	8:38	EST-5	Flash Flood		0	0	0.20K	0.00K
	Totals: 41								2	0	3,549.47K	1K

Knox County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise, in actuality, one event for the purpose of defining a denominator for illustrating frequency. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

That Knox County, unincorporated (and its unincorporated cities) independently experienced 41 flooding events over 25 years yields that Knox County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every seven months (i.e., 41/25). Specifically, Knox County, unincorporated and its unincorporated cities experienced an average of 1.68 flooding events each year. Or, using December 31, 2020 as an endpoint, 41/300 months is 0.14 events per month. $1/0.14 = 7.1429 \approx 1$ flooding event an average of every seven (7) months.

Table 5-2: City of Barbourville Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:											
1	BARBOUR-VILLE	KNOX CO.	KY	1/24/2002	7:50	EST	Flash Flood		0	0	0.00K	0.00K
	BARBOUR-VILLE	KNOX CO.	KY	1/24/2002	19:03	EST	Flash Flood		0	0	0.00K	0.00K
2	BARBOUR-VILLE	KNOX CO.	KY	3/17/2002	20:00	EST	Flash Flood		0	0	50.00K	0.00K
3	BARBOUR-VILLE	KNOX CO.	KY	2/15/2003	13:15	EST	Flash Flood		0	0	0.00K	0.00K
4	BARBOUR-VILLE	KNOX CO.	KY	6/16/2003	14:53	EST	Flash Flood		0	0	0.00K	0.00K
5	BARBOUR-VILLE	KNOX CO.	KY	12/1/2004	0:15	EST	Flash Flood		0	0	0.00K	0.00K
6	BARBOUR-VILLE	KNOX CO.	KY	8/10/2006	18:48	EST	Flash Flood		0	0	0.00K	0.00K
7	BARBOUR-VILLE	KNOX CO.	KY	7/28/2008	14:15	EST-5	Flash Flood		0	0	0.00K	0.00K
8	BARBOUR-VILLE	KNOX CO.	KY	4/27/2011	19:00	EST-5	Flash Flood		0	0	1.00K	1.00K
9	BARBOUR-VILLE	KNOX CO.	KY	8/10/2013	5:18	EST-5	Flood		0	0	1.00K	1.00K
	BARBOUR-VILLE	KNOX CO.	KY	8/11/2013	5:30	EST-5	Flash Flood		0	0	0.00K	1.00K
10	BARBOUR-VILLE	KNOX CO.	KY	4/7/2015	9:10	EST-5	Flash Flood		0	0	1.00K	0.00K
11	BARBOUR-VILLE	KNOX CO.	KY	7/14/2015	8:20	EST-5	Flash Flood		0	0	1.00K	0.00K
12	BARBOUR-VILLE	KNOX CO.	KY	4/11/2017	19:30	EST-5	Flash Flood		0	0	0.00K	0.00K

13	BARBOUR-VILLE	KNOX CO.	KY	2/10/2018	17:09	EST-5	Flood		0	0	1.00K	0.00K
14	BARBOUR-VILLE	KNOX CO.	KY	8/18/2018	18:25	EST-5	Flash Flood		0	0	0.00K	0.00K
	Totals:										55K	3K

City of Barbourville - Probability as Frequency of Event Occurrence

This assessment assumes that the two discrete events occurring in Barbourville on January 24, 2002, are actually one (1) event, and the two discrete events occurring in Barbourville on August 10 and 11, 2013, are also one (1) event.

That the City of Barbourville independently experienced fourteen (14) flooding events over 25 years yields that the City of Barbourville experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every 13 months (i.e., 14/25).

PAST FLOOD EVENTS

In June 2011, the Kayjay area in southern Knox County received 4 to 6 inches of rain. One death was attributed to the flooding when a trailer was swept off its foundation. Roads were inundated with flood waters and several water rescues were performed. In February 2018, the Cumberland River crested at 37.5 feet due to heavy rains creating flood problems throughout the county. The rescue squad responded to nearly 25 calls involving flooding and a trapped car. Several water rescues had to be performed as well. The flood washed out several roads throughout the county. The Red Cross prepared the First Baptist Church as a shelter. The Red Cross discovered seven homes that were impacted by the flood waters. Knox County declared an emergency.

During flood events several communities become isolated due to roads being inundated with flood waters. Due to the amount of rainfall and mountainous terrain landslide have occurred in conjunction with flooding. Landslides can cover roads making them impassible as well. Shelters are set up for those stranded from home or have been impacted by flood waters.

CUMBERLAND RIVER HISTORICAL CRESTS

Due to the high probability of flooding, emergency managers watch the Cumberland River closely. NOAA has a flood gauge located at the City of Barbourville to assist with the prediction and preparation of flood events. The following is a list of the historic crests of the Cumberland River at Barbourville.

Historic Crests		
1	45.91 ft	4/6/1977
2	42.80 ft	1/1/1946
3	42.65 ft	11/29/1973
4	42.30 ft	1/1/1970
5	42.15 ft	1/30/1957
6	41.60 ft	3/14/1975
7	41.43 ft	3/13/1963
8	40.83 ft	5/8/1984
9	40.25 ft	2/2/1951
10	39.31 ft	3/17/1973

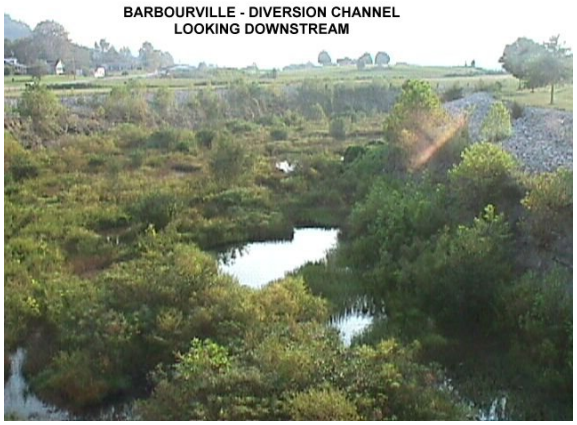
Flood Categories	
Major Flood Stage	38
Moderate Flood Stage	33
Flood Stage	27
Action Stage	21.5

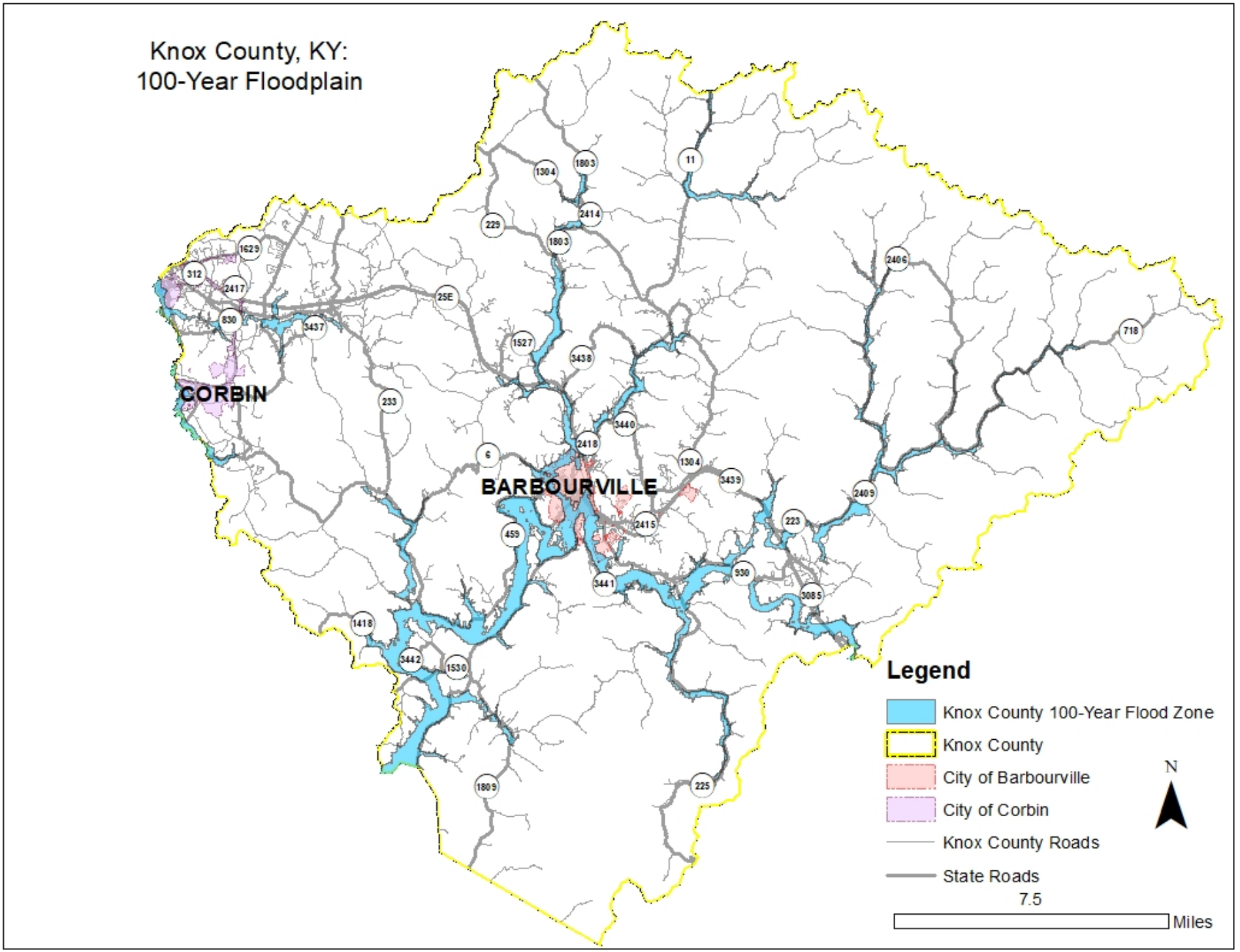
A small change in water level can drastically alter the outcome of a flood event. The following chart explains the possible flood impacts at various crest levels.

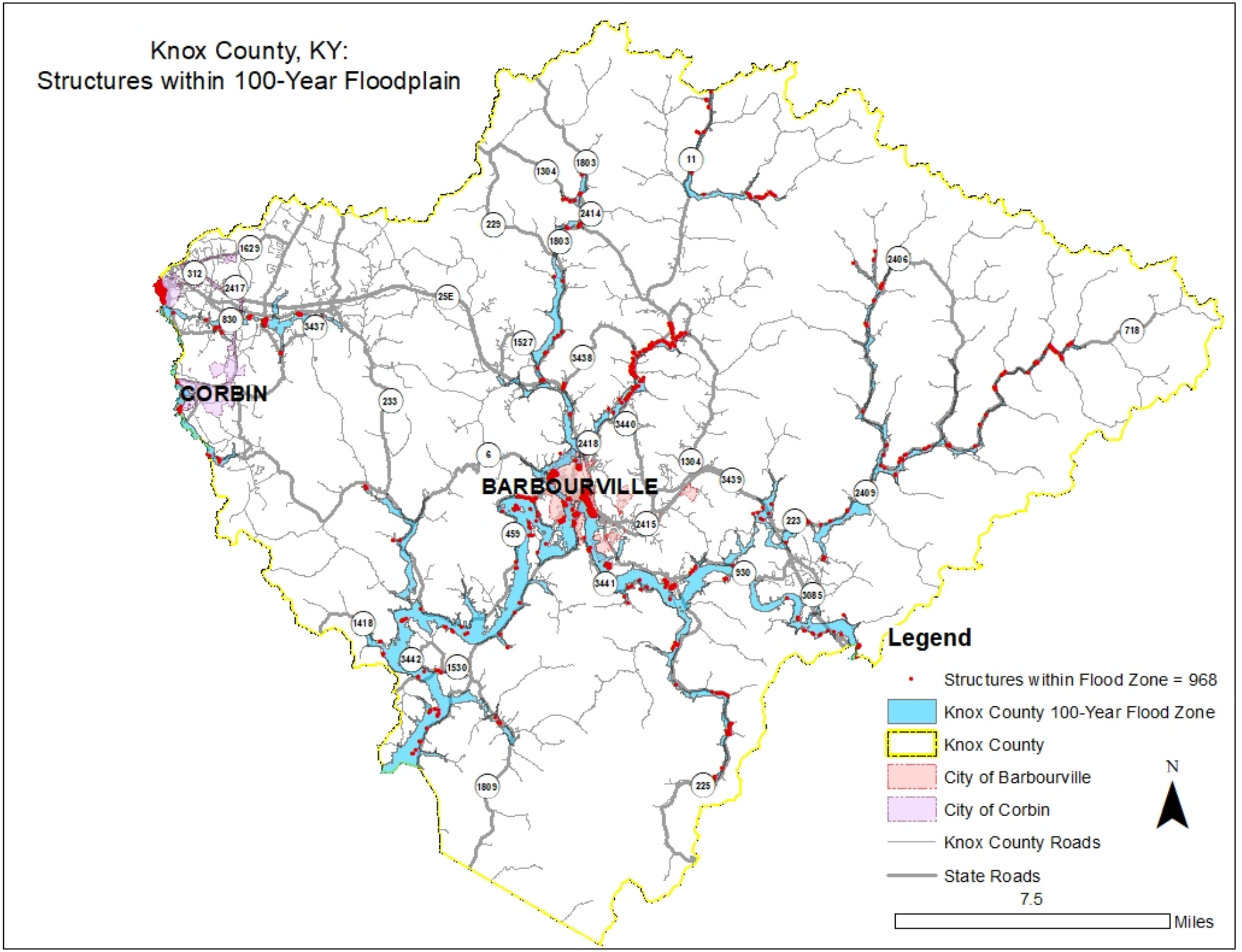
Flood Impacts	
50	Overtopping or failure of floodwall is expected. Full evacuation of Barbourville is necessary.
45.91	Flooding will exceed the highest flood on record. Homes and businesses must be evacuated.
40.29	Closing of flood gates begins.
40	Major flood threatens the protected area of Barbourville. US 25 E floods on both sides of the city.
39.6	KY 11 floods.
39.4	Homes on Miller Road and Boone Heights begin flooding.
38.5	Homes begin flooding in Apple Grove, Sharp Gap and Smokey.
36.6	Roads begin flooding I Heidrick. Homes begin flooding on South Main.
34	Flooding threatens homes and businesses in unprotected area.

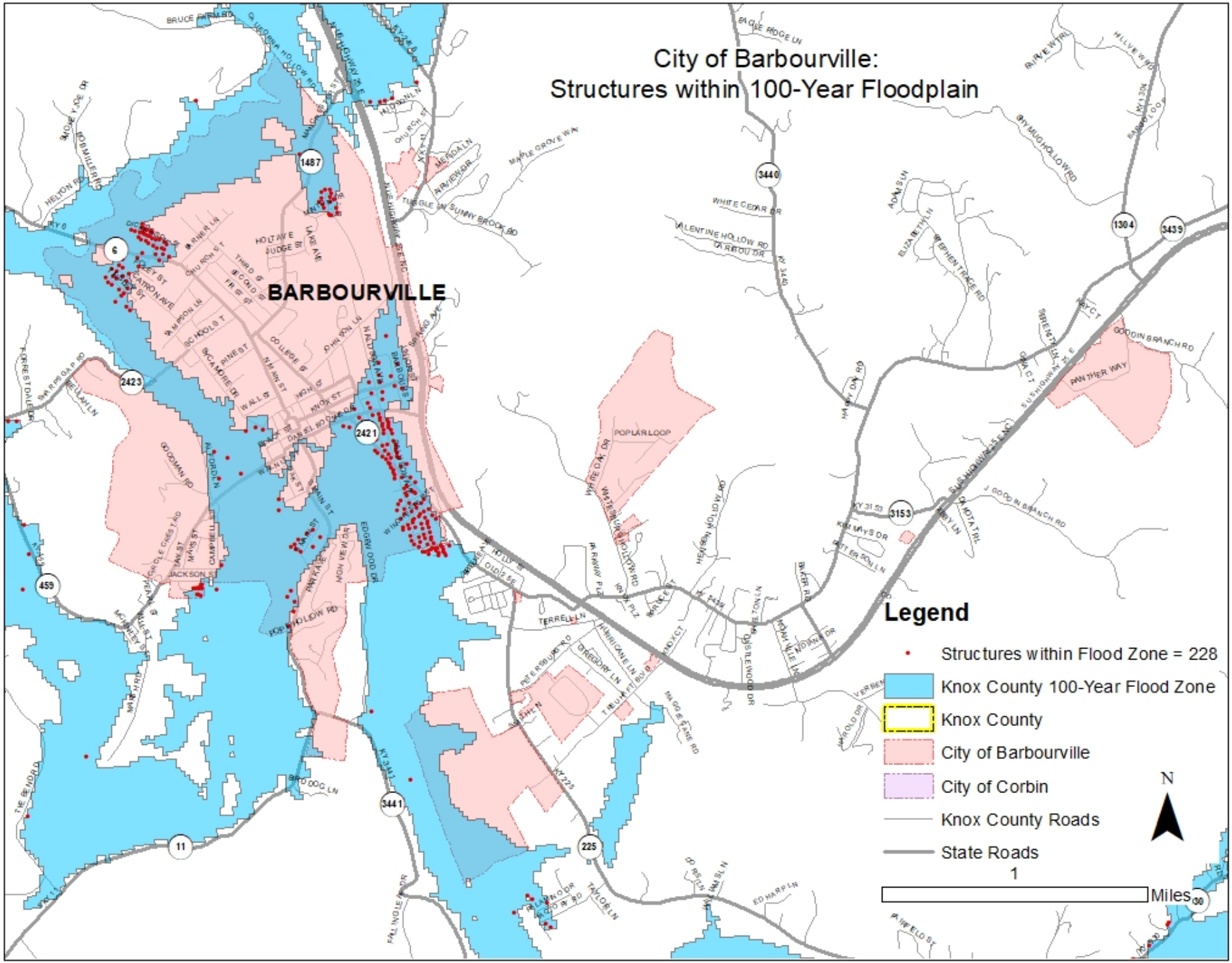
30	Manchester Street and Miller Road east of US 25 E flood.
27	Low lying roads flood. Manchester Street floods.

Barbourville's flood wall became nationally certified to protect the town from a flood in 2017. If the flood wall failed inspection, residents and business owners could have seen a hike in insurance cost across the city.

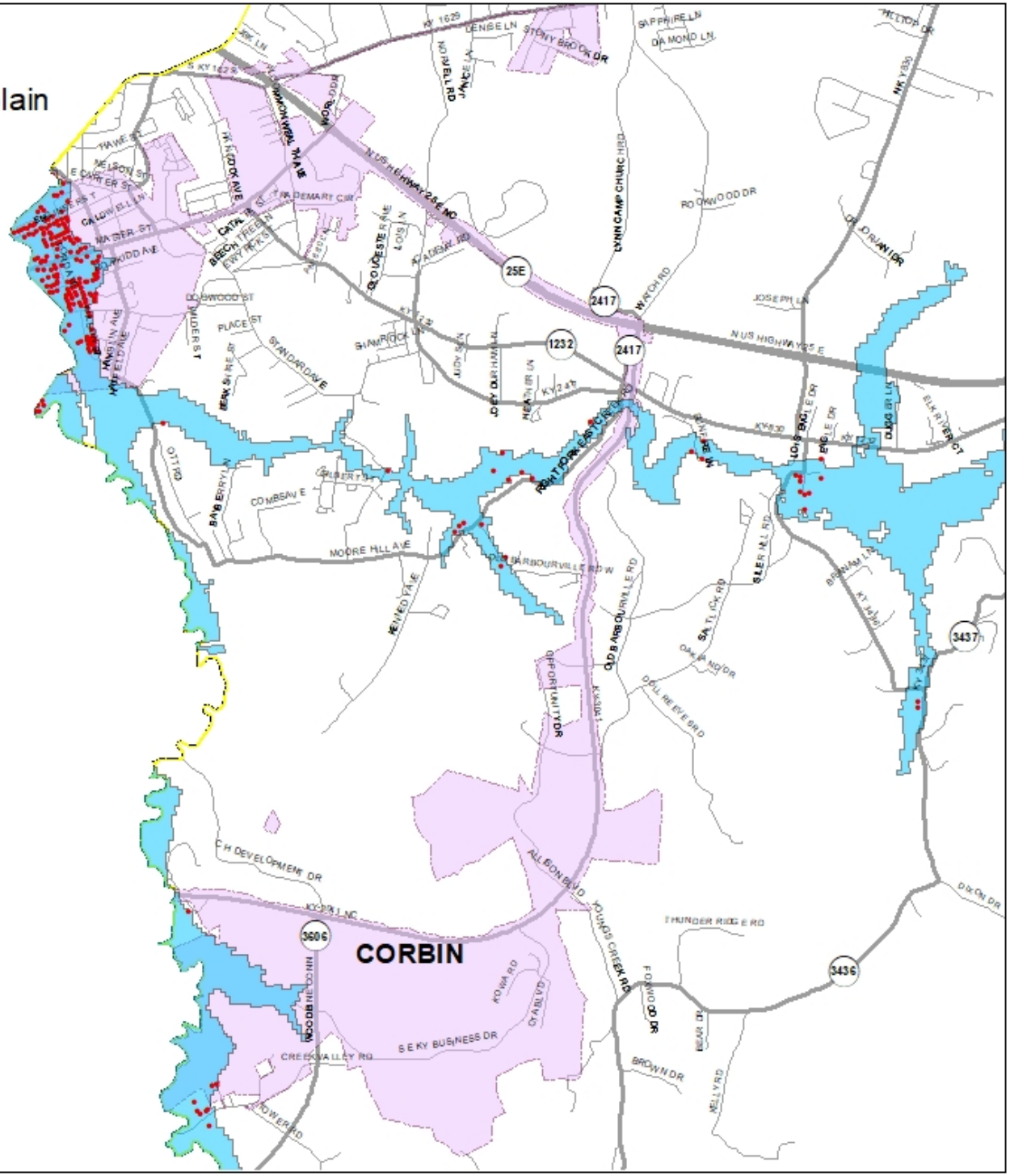



Knox County, KY:
100-Year Floodplain
CORBIN
BARBOURVILLE
1629
312
2417
830
3437
25E
1304
1803
2414
229
1803
11
2406
718
1527
3438
233
3440
2418
6
1304
3439
2409
459
2415
223
930
3441
3085
1418
3442
1530
1809
225
Legend
Knox County 100-Year Flood Zone
Knox County
City of Barbourville
City of Corbin
Knox County Roads
State Roads
N
7.5
Miles


Knox County, KY:
Structures within 100-Year Floodplain
CORBIN
BARBOURVILLE
1629
312
2417
830
3437
25E
229
1304
1803
2414
1803
11
1527
3438
233
6
3440
2418
1304
3439
2409
2406
718
223
459
2415
930
3441
3085
1418
3442
1530
1809
225
Legend
Structures within Flood Zone = 968
Knox County 100-Year Flood Zone
Knox County
City of Barbourville
City of Corbin
Knox County Roads
State Roads
N
7.5
Miles


City of Barbourville:
Structures within 100-Year Floodplain
BARBOURVILLE
Legend
Structures within Flood Zone = 228
Knox County 100-Year Flood Zone
Knox County
City of Barbourville
City of Corbin
Knox County Roads
State Roads
1
Miles
N

City of Corbin
Structures within 100-Year Floodplain



ASSESSING VULNERABILITY: IDENTIFYING ASSESTS

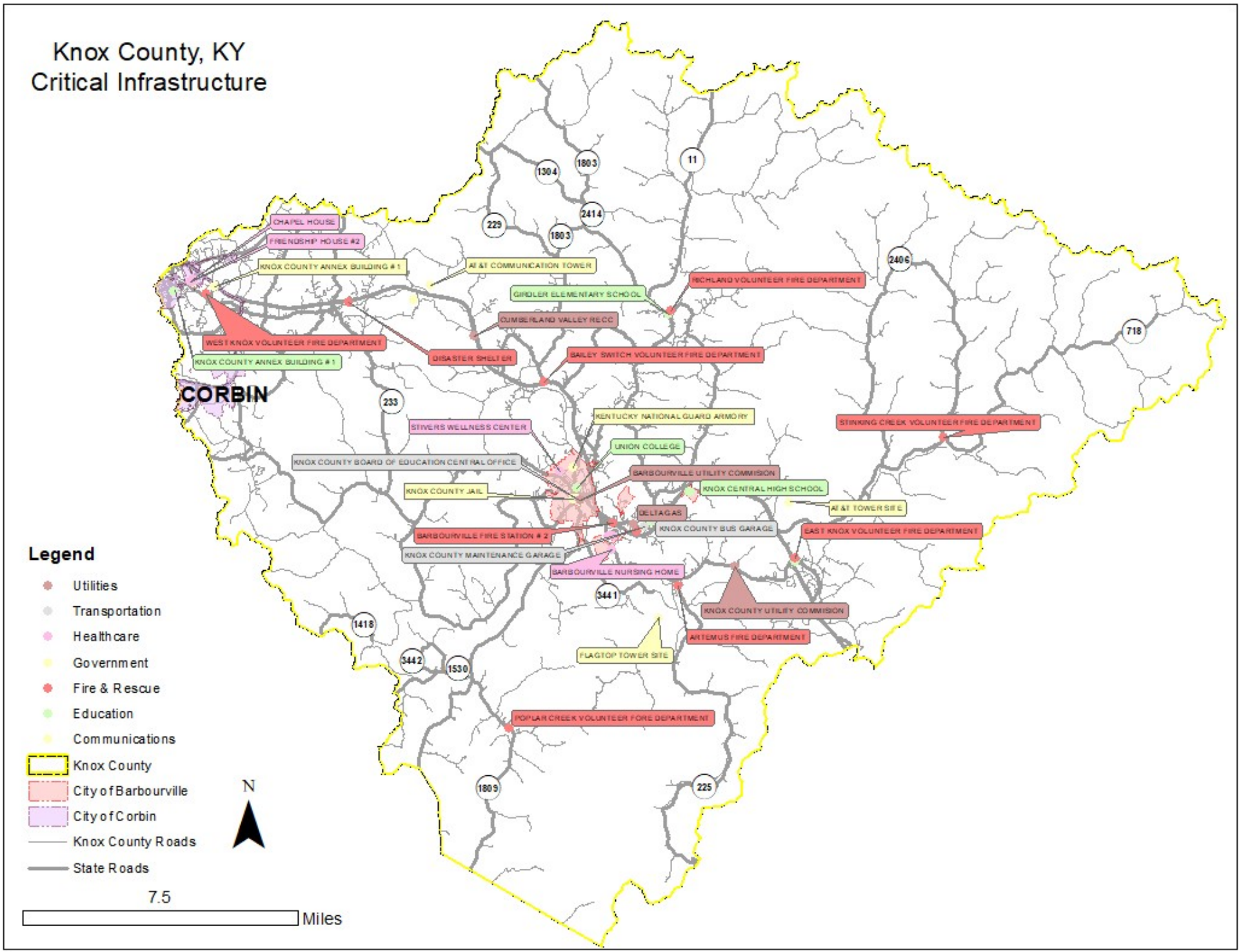
Using best available data CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the County. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

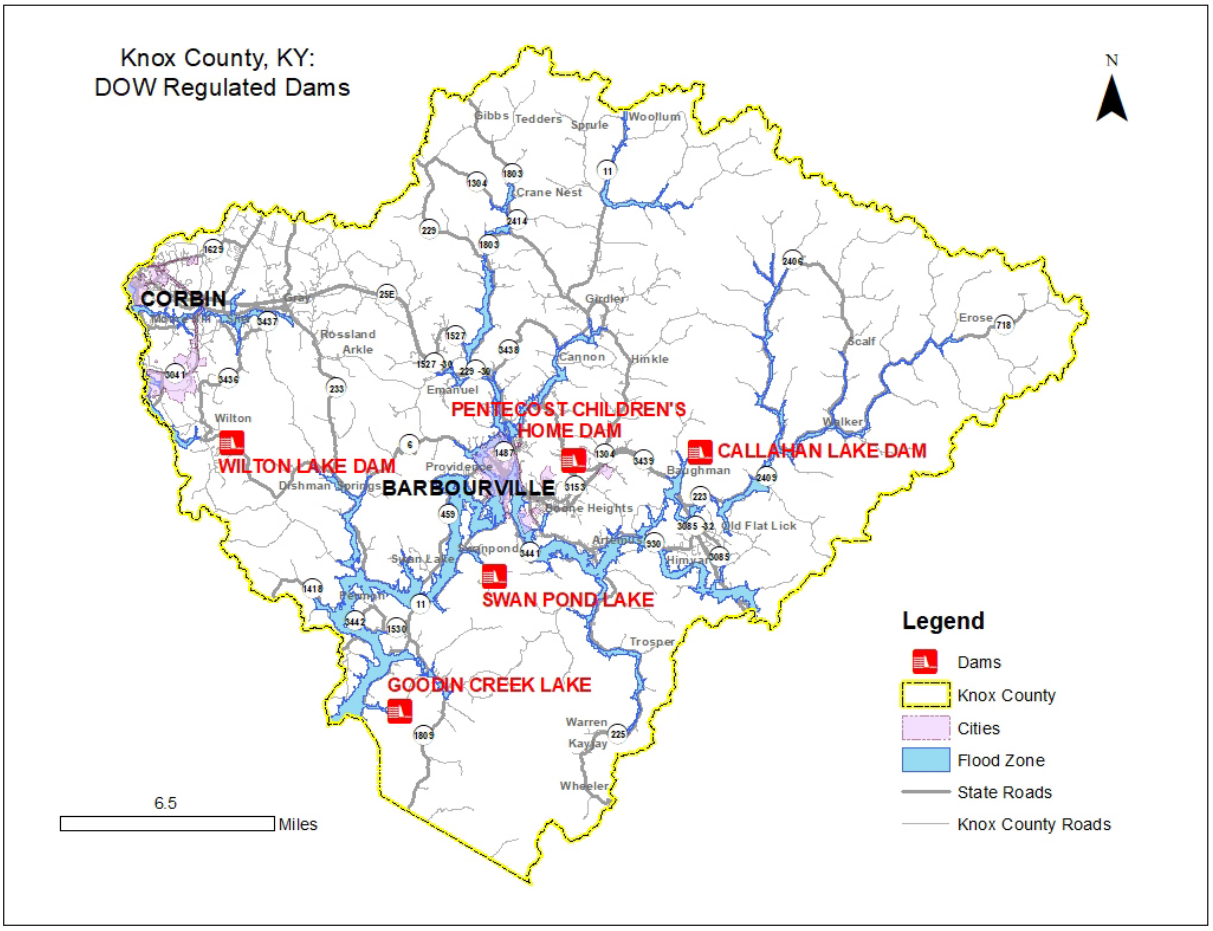
Digitized structural points were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined only 1 critical facility being located within the 100-year-floodplain, however, the data was limited due to structures within the county not being digitally mapped. This is an area that could be expanded upon in future updates. The following chart list the critical facilities located in Knox County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Critical Infrastructure Knox County		***Structures Located in Floodplain**	
Name	**Address**	**Property Replacement Value**	**Coordinates**
Knox County			
City Municipal Building	196 Daniel Boone Drive, Barbourville, KY 40906	$4,800,000	36.865531 -83.887316
Barbourville Police Department	196 Daniel Boone Drive Barbourville, KY 40906	$778,000	36.865531 -83.887316
Barbourville City Hall	196 Daniel Boone Dr #200 Barbourville, KY 40906	TBD	36.865531 -83.887316
Barbourville Street Department	219 Ballard Street Barbourville, KY 40906	$1,000,000	
Knox County Health Department	261 Hospital Drive Barbourville, KY 40906	$3,800,000	36.851728 -83.872085
Knox County Health Department Storage	261 Hospital Drive Barbourville, KY 40906	$340,000	
Bluegrass Care Navigators		TBD	
Knox County Annex Building #1	14173 US-25 Corbin, KY 40701	$826,000	
Knox County Annex Building #2	235 Court Square Barbourville, KY 40906	$850,000	
Knox County Court House	401 Court Square Barbourville, KY 40906	$5,333,000	36.866443 -83.888584
Knox County Jail	Jail St. Barbourville, KY 40906	TBD	36.866564 -83.890031
Barbourville Health & Rehabilitation Center	65 Minton Hickory Farm Road Barbourville, KY 40906	TBD	36.845814 -83.871807
Knox County Detention Center	103 Jail St. Barbourville, KY 40906	TBD	
KY State Maintenance Garage	US 25E Barbourville, KY 40906	TBD	
Knox County Ambulance Service	1701 Cumberland Gap Pkwy. Barbourville, KY 40906	$1,300,000	36.853359 -83.858507

Knox County Maintenance Garage	840 KY 3439 Barbourville, KY 40906	$130,000	
Knox County Hospital	80 Hospital Dr. Barbourville, KY 40906	$22,000,000	36.851396 -83.870382
Chapel House	1375 Master St. Corbin, KY 40701	$2,221,614	
Friendship House of Corbin	1365 Master St. Corbin, KY 40701	$2,366,056	
Christian Health Center - Corbin	1380 Master St. Corbin, KY 40701	$3,943,800	
Village at Corbin		$929,733	
Water & Waste Water Treatment			
Water Treatment Facility	202 Daniel Boone Drive Barbourville, KY 40906	$6,000,000	
Knox County Utility Commission	1905 KY 930 Barbourville, KY 40906	$8,000,000	
Waste Water Treatment Facility	202 Daniel Boone Drive Barbourville, KY 40906	$5,000,000	
Electrical & Gas Infrastructure			
KY Utilities		TBD	
Barbourville Utilities		TBD	
Cumberland Valley RECC		$40,600,000	
G&M Oil Company		TBD	
Delta Gas		$16,825,000	
Schools			
Knox Central High School	100 Panther Way Barbourville, KY 40906	$30,386,500	36.868613 -83.832653
Lynn Camp High School	100 N. KY 830 Corbin, KY 40701	$25,659,150	36.946776 -84.037421
Barbourville High School	140 School Street Barbourville, KY 40906	TBD	36.870912 -83.894542
Appalachian Children's Home	909 KY-3439 Barbourville, KY 40906	TBD	
Knox County Middle School	311 N. Main Street, Barbourville, KY	$20,091,995	36.868422 -83.89085
Knox County Learning Academy	135 Wall St, Barbourville, KY 40906	$2,189,142	36.867723 -83.89143
Lynn Camp Elementary School	366 N. KY 830, Corbin, KY 40701	$13,240,046	36.95046 -84.036
Jesse D Lay Elementary School	220 N Allison Ave, Barbourville, KY 40906	$9,917,996	36.871228 -83.882012
Dewitt Elementary School	138 Ky 718, Flat Lick, KY 40935	$6,702,680	36.875467 -83.735384
Flat Lick Elementary School	State Hwy 3085, Flat Lick, KY 40935	$8,741,234	36.839673 -83.781542
Girdler Elementary School	KY-11, Barbourville, KY 40906	$11,009,085	36.938502 -83.840828
Knox Central Elementary School	1000 KY-3439, Barbourville, KY 40906	TBD	36.856319 -83.850707
G.R. Hampton Elementary School	60 KY-3441, Barbourville, KY 40906	$8,174,043	36.849408 -83.886684

Corbin Middle School	706 S Kentucky Ave, Corbin, KY 40701	TBD	36.942555 -84.09637
Corbin Preschool	614 Master St, Corbin, KY 40701	TBD	36.953137 -84.087069
Barbourville Elementary School	140 School St, Barbourville, KY 40906	TBD	36.870865 -83.89461
Universities			
LMU Nursing School	6965 Cumberland Gap Pkwy, Harrogate, TN 37752	TBD	36.579655 -83.66072
Union College	310 College Street, Barbourville, KY	TBD	36.869886 -83.887955
Fire Departments			
Barbourville Fire Department Station #1	196 Daniel Boone Drive, Barbourville, KY	TBD	36.865518 -83.887337
Barbourville Fire Department Station #2	590 Old 25 E, Barbourville, KY 40906	TBD	36.856531 -83.870397
West Knox Fire Department	90 Gloucester Ave, Corbin, KY 40701	TBD	36.950457 -84.068741
Richland Fire Department	6046 KY 1304 Girdler, KY 40943	TBD	
Artemus Fire Department	Church St. Artemus, KY 40903	TBD	36.831425 -83.839084
Little Poplar Creek Fire Department	1794 KY 1809 Bryants Store, KY 40921	TBD	36.776178 -83.923779
Stinking Creek Fire Department	2085 Ky 718, Walker, KY 40997	TBD	36.887563 -83.707047
East Knox Fire Department	Old Flatlick Rd, Flat Lick, KY 40935	TBD	36.841159 -83.781188
Bailey Switch Fire Department	1 Cumberland Gap Pkwy, Barbourville, KY 40906	TBD	36.913159 -83.902842
Knox County Media			
Barbourville Mountain Advocate	214 Knox St, Barbourville, KY 40906	TBD	36.866796 -83.887149
WKKQ FM Radio	222 Daniel Boone Dr, Barbourville, KY 40906	TBD	36.866102 -83.886276
Eastern Cable	701 S Main St, Corbin, KY 40701	TBD	36.943059 -84.094777


Knox County, KY
Critical Infrastructure
CHAPEL HOUSE
FRIENDSHIP HOUSE #2
KNOX COUNTY ANNEX BUILDING #1
AT&T COMMUNICATION TOWER
GIRDLER ELEMENTARY SCHOOL
CUMBERLAND VALLEY RECC
RICHLAND VOLUNTEER FIRE DEPARTMENT
WEST KNOX VOLUNTEER FIRE DEPARTMENT
DISASTER SHELTER
BAILEY SWITCH VOLUNTEER FIRE DEPARTMENT
KNOX COUNTY ANNEX BUILDING #1
CORBIN
STIVERS WELLNESS CENTER
KENTUCKY NATIONAL GUARD ARMORY
STINKING CREEK VOLUNTEER FIRE DEPARTMENT
UNION COLLEGE
KNOX COUNTY BOARD OF EDUCATION CENTRAL OFFICE
BARBOURVILLE UTILITY COMMISION
KNOX COUNTY JAIL
KNOX CENTRAL HIGH SCHOOL
AT&T TOWER SITE
DELTA GAS
KNOX COUNTY BUS GARAGE
EAST KNOX VOLUNTEER FIRE DEPARTMENT
BARBOURVILLE FIRE STATION # 2
KNOX COUNTY MAINTENANCE GARAGE
BARBOURVILLE NURSING HOME
KNOX COUNTY UTILITY COMMISION
ARTEMUS FIRE DEPARTMENT
FLAGTOP TOWER SITE
POPLAR CREEK VOLUNTEER FORE DEPARTMENT
1304
1803
11
2414
229
1803
2406
718
233
3441
1418
3442
1530
1809
225
Legend
Utilities
Transportation
Healthcare
Government
Fire & Rescue
Education
Communications
Knox County
City of Barbourville
City of Corbin
Knox County Roads
State Roads
N
7.5
Miles



ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to the structures that were digitized by the CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Knox County	968	$77,000.00	$74,536,000.00
City of Barbourville	228		$17,556,000.00
City of Corbin	163		$12,551,000.00

KNOX COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Knox County, Unincorporated possesses one (1) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and

there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The one (1) property in Knox County, Unincorporated is disaggregated as follows:

Knox County, Uninc., RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Knox County	Single-Family Occupancy	1	1	0	1	1
Knox County	2-4 Family Occupancy	0	0	0	0	0
Knox County	Other Non-Residential	0	0	0	0	0
TOTAL		***1***	***1***	***0***	***1***	***1***

The City of Barbourville possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation. The following are the floodplain coordinators for Knox County.

Floodplain Coordinators				
Community Name	**Name**	**Job Title**	**Address**	**Phone Number**
Barbourville	Cory Moren	Code Enforcement Officer	P.O. Box 1300 Barbourville, KY 40906	606-546-6197
Corbin	Willard McBurney	Mayor	805 South Main St. Corbin, KY 40701	606-523-6520

Knox Co.	Bill Oxendine	County PVA	401 Court Square/Suite 101 Barbourville, KY 40906	606-546--4113

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov. Below is an overview of the county's participation with the National Flood Insurance Program.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210132B	Barbourville	Knox	03/15/74	12/01/77	03/16/15	12/01/77	No
210227C	Corbin	Knox & Whitley	06/1474	12/18/86	03/16/15	12/18/86	No
210131B	Knox Co.	Knox	12/13/74	05/17/89	03/16/15	05/17/89	No

NFIP FINANCIAL CLAIMS

Since 1978 a total of 112 structures have sustained damage due to flooding causing direct and private insurances to payout a total of $640,432640432/ in claims. To put it in perspective that is an average of $5,718.14 per claim or $16,010.80 per year spent on repairing flood damages. There are only 123 flood insurance policies in effect as of March 2018 and 968 identified structures located within the 100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			Coverage in Thousands			Flood Losses			Dollars Paid Historical		
Barbourville	19037	4	25	29	645	5,080	5,725	24	8	32	124,967	11,326	136,293
Corbin	38583	15	25	40	1,558	3,035	4,593	1	15	16	541	235,695	236,236
Knox Co.	36686	17	37	54	2,260	4,597	6,857	26	38	64	105,888	162,015	267,903
Total	94306	36	87	123	4,463	12,712	17,175	51	61	112	231,396	409,036	640,432
Nfipservices.floodsmart.gov													

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

SEVERE WINTER WEATHER

Knox County is mountainous with elevations ranging from 890 to 2322 feet. The highest elevation is 2,322 ft, on a mountain peak near the Knox-Bell County line. The difference in elevation between the top of this mountain and the valley of Brush Creek, one mile east, is more than 1,100 ft. This hilly terrain can make traveling during winter weather nearly impossible. People who live in rural areas can become trapped at home; unable to travel due to the hazardous road conditions. For people with health emergencies this can be disastrous. Emergency management arranges for roads to be cleared for EMS and dialysis patients. Severe winter weather also threatens utilities, critical facilities, and vulnerable populations. The First Baptist Church has been used as a warming shelter in the past; assisting those without power. By analyzing past winter weather events emergency management can become better prepared for future events.

In order to address systematically the number of previous severe winter weather events, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies on the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below is a table relaying previous occurrences, locations, and impacts from severe winter weather for Knox County. The tables include what the National Weather Service (NWS) labels "Heavy Snow", "Ice Storm", "Winter Storm", and "Winter Weather" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the severe winter weather event. Still, it is the best available data for a systematic illustration of severe winter weather events for Knox County.

Finally, it should also be noted that a portion of the severe winter weather events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for all counties as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 5-3: Knox County Severe Winter Storm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								1	1	0.00K	0.00K
1	KNOX (ZONE)	KNOX (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	KNOX (ZONE)	KNOX (ZONE)	KY	1/11/1996	20:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	KNOX (ZONE)	KNOX (ZONE)	KY	2/1/1996	16:00	EST	Heavy Snow		0	0	0.00K	0.00K
4	KNOX (ZONE)	KNOX (ZONE)	KY	3/20/1996	4:00	EST	Heavy Snow		0	0	0.00K	0.00K
5	KNOX (ZONE)	KNOX (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	KNOX (ZONE)	KNOX (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
7	KNOX (ZONE)	KNOX (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
8	KNOX (ZONE)	KNOX (ZONE)	KY	1/6/2002	6:00	EST	Heavy Snow		0	0	0.00K	0.00K
9	KNOX (ZONE)	KNOX (ZONE)	KY	1/19/2002	6:00	EST	Winter Storm		0	0	0.00K	0.00K
10	KNOX (ZONE)	KNOX (ZONE)	KY	12/4/2002	14:00	EST	Heavy Snow		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	12/4/2002	14:00	EST	Heavy Snow		0	0	0.00K	0.00K
11	KNOX (ZONE)	KNOX (ZONE)	KY	1/16/2003	19:55	EST	Heavy Snow		0	0	0.00K	0.00K
12	KNOX (ZONE)	KNOX (ZONE)	KY	1/25/2004	8:00	EST	Ice Storm		0	0	0.00K	0.00K
13	KNOX (ZONE)	KNOX (ZONE)	KY	3/7/2008	23:30	EST -5	Ice Storm		0	0	0.00K	0.00K
14	KNOX (ZONE)	KNOX (ZONE)	KY	2/3/2009	15:55	EST -5	Winter Weather		0	0	0.00K	0.00K
15	KNOX (ZONE)	KNOX (ZONE)	KY	3/12/2009	16:35	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	3/12/2009	16:35	EST -5	Winter Weather		0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	KNOX (ZONE)	KNOX (ZONE)	KY	3/12/2009	16:45	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	3/12/2009	16:45	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	3/12/2009	18:10	EST -5	Heavy Snow		0	0	0.00K	0.00K
16	KNOX (ZONE)	KNOX (ZONE)	KY	12/18/2009	14:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
17	KNOX (ZONE)	KNOX (ZONE)	KY	1/29/2010	18:08	EST -5	Heavy Snow		0	0	0.00K	0.00K
18	KNOX (ZONE)	KNOX (ZONE)	KY	2/9/2010	21:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
19	KNOX (ZONE)	KNOX (ZONE)	KY	2/15/2010	6:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/15/2010	6:00	EST -5	Winter Weather		0	0	0.00K	0.00K
20	KNOX (ZONE)	KNOX (ZONE)	KY	12/15/2010	21:00	EST -5	Ice Storm		0	0	0.00K	0.00K
21	KNOX (ZONE)	KNOX (ZONE)	KY	2/9/2011	14:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/9/2011	20:00	EST -5	Winter Storm		0	0	0.00K	0.00K
22	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	11:30	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	11:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	11:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	11:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	11:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	11:30	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	12:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	2/19/2012	12:23	EST -5	Winter Weather		0	0	0.00K	0.00K
23	KNOX (ZONE)	KNOX (ZONE)	KY	1/25/2013	6:30	EST -5	Ice Storm		0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
24	KNOX (ZONE)	KNOX (ZONE)	KY	1/2/2014	5:30	EST -5	Winter Weather		1	1	0.00K	0.00K
	KNOX (ZONE)	KNOX (ZONE)	KY	1/2/2014	7:00	EST -5	Winter Weather		0	1	0.00K	0.00K
25	KNOX (ZONE)	KNOX (ZONE)	KY	2/12/2014	16:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
26	KNOX (ZONE)	KNOX (ZONE)	KY	3/3/2014	5:00	EST -5	Winter Storm		0	0	0.00K	0.00K
27	KNOX (ZONE)	KNOX (ZONE)	KY	2/16/2015	7:00	EST -5	Winter Storm		0	0	0.00K	0.00K
28	KNOX (ZONE)	KNOX (ZONE)	KY	2/20/2015	23:00	EST -5	Winter Storm		0	0	0.00K	0.00K
29	KNOX (ZONE)	KNOX (ZONE)	KY	3/5/2015	3:00	EST -5	Winter Storm		0	0	0.00K	0.00K
30	KNOX (ZONE)	KNOX (ZONE)	KY	1/20/2016	6:00	EST -5	Winter Weather		0	0	0.00K	0.00K
31	KNOX (ZONE)	KNOX (ZONE)	KY	1/22/2016	1:30	EST -5	Winter Storm		0	0	0.00K	0.00K
32	KNOX (ZONE)	KNOX (ZONE)	KY	2/14/2016	15:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
33	KNOX (ZONE)	KNOX (ZONE)	KY	1/16/2018	7:15	EST -5	Winter Weather		0	0	0.00K	0.00K
34	KNOX (ZONE)	KNOX (ZONE)	KY	12/9/2018	0:30	EST -5	Heavy Snow		0	0	0.00K	0.00K
35	KNOX (ZONE)	KNOX (ZONE)	KY	12/24/2020	14:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
	Totals:	35							1	1	0.00K	0.00K

Knox County Severe Winter Weather - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Knox County experienced 35 severe winter weather events over 25 years yields that Knox County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every 8 1/2 months (i.e., 35/300). Specifically, Knox County

experienced an average of 1.4 severe winter weather events each year. Or, using December 31, 2020 as an endpoint, this is 0.1167 events per month. 1/0.1167 = 8.57 ≈ 1 severe winter storm event an average of every 8 1/2 months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through November. This indicates that the winter months for Knox County are December through March, a total of 4 months. When the frequency is calculated using the four winter months only (35/100), it reveals that Knox County experienced an average of 1.4 events per winter period, or 0.35 events per winter month. 1/0.35 = 2.86 or about 1 severe winter storm events an average of every 2 winter months.

Knox County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Knox county experienced periods of rain, sleet, freezing rain, and snow early on January 22nd. As of 630 am, 0.25 inches of freezing rain had accumulated on exposed objects and surfaces across the county. The precipitation changed over to snow during the late morning hours on the 22nd, with 3 to 5 inches of snow reported across the county by storms end."[97]

Knox County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	KNOX (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	KNOX (ZONE)	1/11/1996	1/12/1996	Heavy Snow	
3	KNOX (ZONE)	2/1/1996	2/3/1996	Heavy Snow	
4	KNOX (ZONE)	3/20/1996	3/20/1996	Heavy Snow	
5	KNOX (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
6	KNOX (ZONE)	12/23/1998	12/24/1998	Winter Storm	
7	KNOX (ZONE)	1/22/2000	1/22/2000	Winter Storm	
	KNOX (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
8	KNOX (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
9	KNOX (ZONE)	1/19/2002	1/19/2002	Winter Storm	
10	KNOX (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported.

[97] "Storm Events Database Event Details – Knox County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
	KNOX (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported.
11	KNOX (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 4 inches of snow were reported.
12	KNOX (ZONE)	1/25/2004	1/25/2004	Ice Storm	
13	KNOX (ZONE)	3/7/2008	3/8/2008	Ice Storm	One quarter of an inch of ice and two inches of snow accumulated in North Corbin.
14	KNOX (ZONE)	2/3/2009	2/4/2009	Winter Weather	Law enforcement estimated that 3 to 4 inches of snow had fallen since yesterday afternoon in Barbourville.
15	KNOX (ZONE)	3/12/2009	3/12/2009	Winter Weather	An inch of snow fell in North Corbin.
	KNOX (ZONE)	3/12/2009	3/12/2009	Winter Weather	One inch of snow fell 6 miles west of Barbourville.
	KNOX (ZONE)	3/12/2009	3/12/2009	Winter Weather	Two inches of snow fell 3 miles southeast of Barbourville.
	KNOX (ZONE)	3/12/2009	3/12/2009	Winter Weather	Two inches of snow fell 1 mile northeast of Rossland.
	KNOX (ZONE)	3/12/2009	3/13/2009	Heavy Snow	Three and one half inches of snow fell in North Corbin.
16	KNOX (ZONE)	12/18/2009	12/19/2009	Heavy Snow	Seven inches of snow had fallen in southern Knox county.
17	KNOX (ZONE)	1/29/2010	1/30/2010	Heavy Snow	County dispatch reports field units are estimating 5 inches of snowfall across the county.
18	KNOX (ZONE)	2/9/2010	2/10/2010	Heavy Snow	Four inches of snow fell in Bimble.
19	KNOX (ZONE)	2/15/2010	2/15/2010	Winter Weather	The county emergency manager reported that 1.5 to 2 inches of snow had fallen since around 6 am in Barbourville. The main roads were clear with secondary roads covered with snow.
	KNOX (ZONE)	2/15/2010	2/16/2010	Winter Weather	The storm total snowfall in Barbourville since early Monday morning was 2.8 inches. The snowfall total from the previous 24 hours was 1.7 inches.
20	KNOX (ZONE)	12/15/2010	12/16/2010	Ice Storm	Half an inch of ice accumulated in Barbourville.
21	KNOX (ZONE)	2/9/2011	2/9/2011	Winter Weather	Three inches of new snow fell in Bimble between 2 and 525 pm.
	KNOX (ZONE)	2/9/2011	2/10/2011	Winter Storm	The snow accumulated 4.8 inches.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
22	KNOX (ZONE)	2/19/2012	2/19/2012	Winter Weather	Two and a half inches of snow had fallen in Heidrick.
	KNOX (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Four inches of snow fell in Barbourville.
	KNOX (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Three and a half inches of snow fell in Cranes Nest.
	KNOX (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Four inches of snow 1 mile east of Barbourville.
	KNOX (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Three and six tenths of an inch of snow fell at Cranes Nest.
	KNOX (ZONE)	2/19/2012	2/19/2012	Winter Weather	Eight tenths of an inch of snow fell in Barbourville in a one hour period, making for a storm total snowfall of 2.5 inches.
	KNOX (ZONE)	2/19/2012	2/19/2012	Winter Weather	Two and a half inches of snow had fallen in the last two and a half hours in Barbourville and it was still snowing.
	KNOX (ZONE)	2/19/2012	2/19/2012	Winter Weather	An inch and a half of snow fell in Barbourville during a one hour period, with a total of 1.7 inches on the ground.
23	KNOX (ZONE)	1/25/2013	1/25/2013	Ice Storm	A quarter inch of ice accumulation was reported in Barbourville.
24	KNOX (ZONE)	1/2/2014	1/2/2014	Winter Weather	A car accident occurred on Highway 11 south of Barbourville early this morning due to slick roads caused by freezing rain. One fatality and one injury occurred as a result of this accident.
	KNOX (ZONE)	1/2/2014	1/2/2014	Winter Weather	A car accident that resulted in an injury occurred around 7 am on Highway 1304 in Girdler. The accident was by roads that were made slick due to freezing rain.
25	KNOX (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Snowfall amounts of up to four inches were observed from Barbourville eastward. Lesser amounts of snow were observed over the western half of the county.
26	KNOX (ZONE)	3/3/2014	3/3/2014	Winter Storm	The state highway garage reported up to half an inch of ice accumulation in the northwestern portions of Knox county, especially towards the Corbin area. Snowfall amounts were generally an inch or less.
27	KNOX (ZONE)	2/16/2015	2/16/2015	Winter Storm	The Dept. of Highways reported that 2.5 inches of snow had fallen in Barbourville as of 1052 am. Up to 6 inches of snow had fallen across most of the county by the time the storm wound down the night of the 16th.
28	KNOX (ZONE)	2/20/2015	2/21/2015	Winter Storm	Freezing rain was the issue in Knox county during this event. A quarter of an inch of ice had accumulated in Barbourville by 8 am on the 21st.
29	KNOX (ZONE)	3/5/2015	3/5/2015	Winter Storm	Three to four inches of snow fell in Barbourville and Dewitt by storms end.
30	KNOX (ZONE)	1/20/2016	1/20/2016	Winter Weather	Around three inches of snow fell across the county, with some sleet mixed in.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
31	KNOX (ZONE)	1/22/2016	1/23/2016	Winter Storm	Knox county experienced periods of rain, sleet, freezing rain, and snow early on January 22nd. As of 630 am, 0.25 inches of freezing rain had accumulated on exposed objects and surfaces across the county. The precipitation changed over to snow during the late morning hours on the 22nd, with 3 to 5 inches of snow reported across the county by storms end.
32	KNOX (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 4 to 5 inches across the county. Some freezing rain and sleet also mixed in but amounts were inconsequential.
33	KNOX (ZONE)	1/16/2018	1/16/2018	Winter Weather	
34	KNOX (ZONE)	12/9/2018	12/9/2018	Heavy Snow	
35	KNOX (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Snowfall of 8.5 inches was reported 1 south of the community of Trosper at 11:50 pm EST on 12/24.
36	KNOX (ZONE)	2/14/2021	2/16/2021	Ice Storm	One quarter of an inch of ice accumulation due to freezing rain occurred near North Corbin.
37	KNOX (ZONE)	2/17/2021	2/18/2021	Winter Weather	Almost 2 inches of snow was measured in Gray.
	KNOX (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated snowfall amount of 2.5 inches was reported in Hinkle.
	KNOX (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Four inches of snow was reported in Barbourville.

SEVERE THUNDERSTORMS/TORNADOS

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures.

Thunderstorms can produce tornados, floods, lightning and damaging winds. They may occur individually, in clusters or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios. Through studying past severe thunderstorm events, the county and cities, can become better prepared for future disasters.

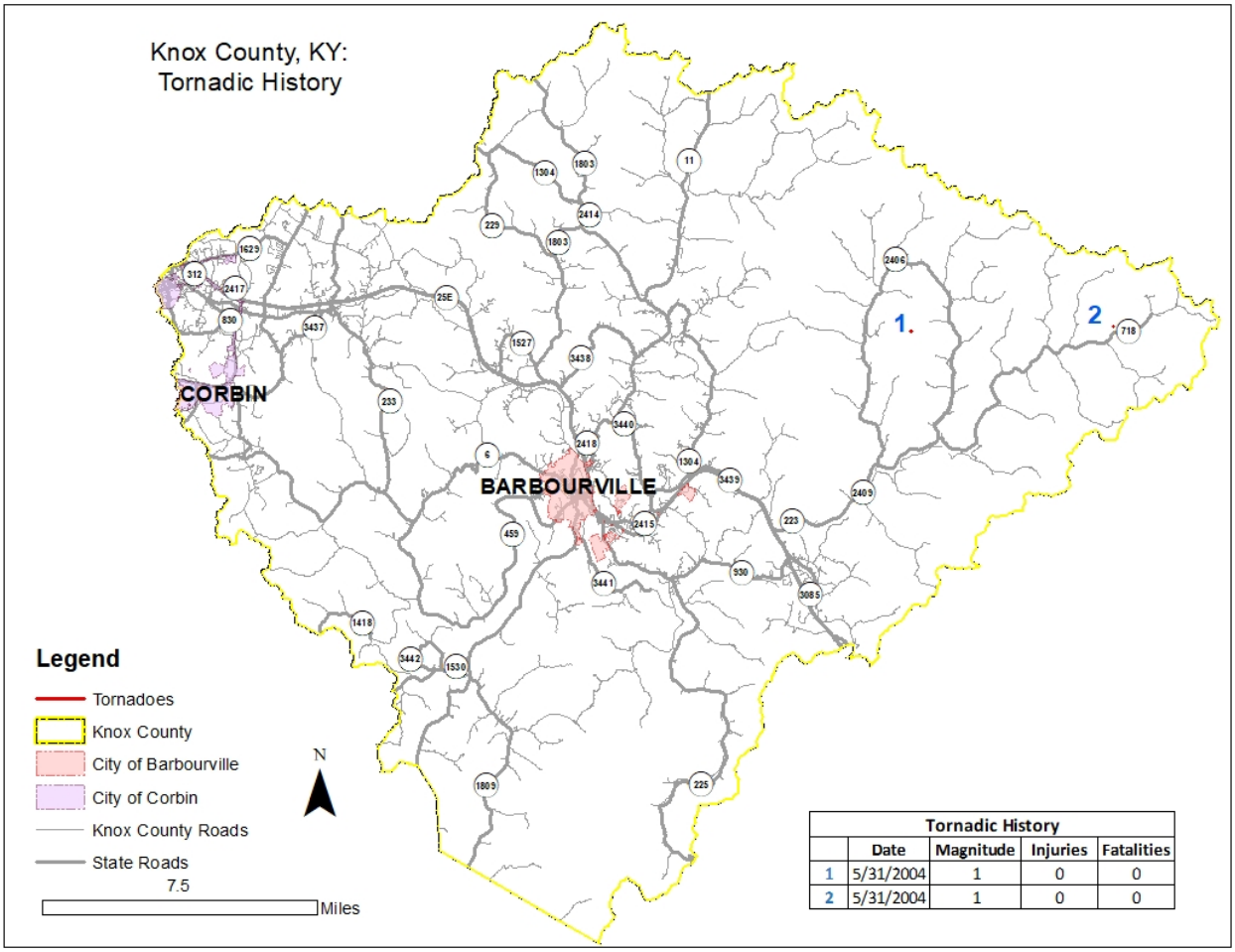


Table 5-4: Knox County Thunderstorm/Wind Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	446.50K	0.10K
1	BARBOUR - VILLE	KNOX CO.	KY	4/20/2000	21:00	EST	Thunderstorm Wind	60 kts. E	0	0	0.00K	0.00K
2	MOORE HILL	KNOX CO.	KY	5/15/2003	16:05	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	BARBOUR - VILLE	KNOX CO.	KY	5/15/2003	16:05	EST	Thunder-storm Wind	60 kts. EG	0	0	0.00K	0.00K
3	BARBOUR - VILLE	KNOX CO.	KY	5/17/2003	17:15	EST	Thunder-storm Wind	70 kts. EG	0	0	5.00K	0.00K
4	KNOX (ZONE)	KNOX (ZONE)	KY	11/24/2003	8:55	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
5	BARBOUR - VILLE	KNOX CO.	KY	5/26/2004	15:30	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	HEIDRICK	KNOX CO.	KY	5/26/2004	15:50	EST	Thunder-storm Wind	50 kts. EG	0	0	5.00K	0.00K
	BARBOUR - VILLE	KNOX CO.	KY	5/27/2004	2:00	EST	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
6	BARBOUR - VILLE	KNOX CO.	KY	5/30/2004	16:00	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	COUNTYWIDE	KNOX CO.	KY	5/31/2004	1:00	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	BARBOUR - VILLE	KNOX CO.	KY	5/31/2004	1:30	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
7	BARBOUR - VILLE	KNOX CO.	KY	7/13/2004	22:58	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
8	WOOLLUM	KNOX CO.	KY	10/19/2004	0:05	EST	Thunderstorm Wind	58 kts. EG	0	0	0.00K	0.00K
	BARBOUR - VILLE	KNOX CO.	KY	10/19/2004	0:15	EST	Thunderstorm Wind	58 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
9	BARBOUR - VILLE	KNOX CO.	KY	4/22/2005	21:00	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
10	BARBOUR - VILLE	KNOX CO.	KY	5/19/2005	23:00	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
11	HAMMOND	KNOX CO.	KY	1/2/2006	19:00	EST	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00 K
12	BARBOUR - VILLE	KNOX CO.	KY	4/2/2006	19:33	EST	Thunderstorm Wind	53 kts. EG	0	0	3.00K	0.00 K
	BARBOUR - VILLE	KNOX CO.	KY	4/2/2006	19:33	EST	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00 K
13	BARBOUR - VILLE	KNOX CO.	KY	4/19/2006	3:43	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
14	GIRDLER	KNOX CO.	KY	6/22/2006	22:19	EST	Thunderstorm Wind	55 kts. EG	0	0	4.00K	0.00 K
	BARBOUR - VILLE	KNOX CO.	KY	6/22/2006	22:53	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
15	SWANPOND	KNOX CO.	KY	7/4/2006	18:13	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
16	BARBOUR - VILLE	KNOX CO.	KY	7/20/2006	14:03	EST	Thunderstorm Wind	60 kts. EG	0	0	3.00K	0.00 K
	BARBOUR - VILLE	KNOX CO.	KY	7/20/2006	14:38	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
	INDIAN CREEK	KNOX CO.	KY	7/20/2006	18:18	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00 K
	GRAY	KNOX CO.	KY	7/21/2006	18:03	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
	GRAY	KNOX CO.	KY	7/21/2006	18:08	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00 K
	BARBOUR - VILLE	KNOX CO.	KY	7/21/2006	18:13	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
17	BARBOUR - VILLE	KNOX CO.	KY	8/3/2006	13:58	EST	Thunderstorm Wind	55 kts. EG	0	0	5.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
18	BARBOUR - VILLE	KNOX CO.	KY	8/10/2006	17:43	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00 K
19	BARBOUR - VILLE	KNOX CO.	KY	4/3/2007	20:59	EST -5	Thunderstorm Wind	58 kts. EG	0	0	100.00 K	0.00 K
20	EROSE	KNOX CO.	KY	6/24/2007	16:08	EST -5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00 K
21	BARBOUR - VILLE	KNOX CO.	KY	1/29/2008	22:47	EST -5	Thunderstorm Wind	58 kts. EG	0	0	30.00K	0.00 K
22	BARBOUR - VILLE	KNOX CO.	KY	6/10/2008	1:15	EST -5	Thunderstorm Wind	53 kts. EG	0	0	2.00K	0.00 K
23	BARBOUR - VILLE	KNOX CO.	KY	7/22/2008	15:00	EST -5	Thunderstorm Wind	60 kts. EG	0	0	35.00K	0.00 K
24	PROVIDENCE	KNOX CO.	KY	7/28/2008	14:05	EST -5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00 K
	BARBOUR VILLE	KNOX CO.	KY	7/28/2008	14:08	EST -5	Thunderstorm Wind	61 kts. EG	0	0	0.00K	0.00 K
	CANNON	KNOX CO.	KY	7/28/2008	14:08	EST -5	Thunderstorm Wind	54 kts. EG	0	0	10.00K	0.00 K
	BARBOUR - VILLE	KNOX CO.	KY	7/28/2008	14:10	EST -5	Thunderstorm Wind	60 kts. EG	0	0	100.00 K	0.00 K
25	MOORE HILL	KNOX CO.	KY	6/16/2009	16:29	EST -5	Thunderstorm Wind	51 kts. EG	0	0	2.00K	0.00 K
	GRAY	KNOX CO.	KY	6/16/2009	16:34	EST -5	Thunderstorm Wind	55 kts. EG	0	0	25.00K	0.00 K
26	SILER	KNOX CO.	KY	8/4/2009	15:15	EST -5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00 K
27	SILER	KNOX CO.	KY	6/1/2010	20:10	EST -5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00 K
28	BARBOUR - VILLE	KNOX CO.	KY	8/5/2010	14:05	EST -5	Thunderstorm Wind	53 kts. EG	0	0	3.00K	0.00 K
29	BAILEYS SWITCH	KNOX CO.	KY	8/13/2010	14:45	EST -5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
30	TROSPER	KNOX CO.	KY	9/11/2010	16:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
31	SILER	KNOX CO.	KY	2/28/2011	8:25	EST-5	Thunderstorm Wind	60 kts. EG	0	0	10.00K	0.00K
32	CAMP GROUNDS	KNOX CO.	KY	2/28/2011	8:25	EST-5	Thunderstorm Wind	65 kts. EG	0	0	5.00K	0.00K
33	BARBOUR-VILLE	KNOX CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
	GRAY	KNOX CO.	KY	4/4/2011	16:10	EST-5	Thunderstorm Wind	60 kts. EG	0	0	5.00K	0.00K
	BARBOUR-VILLE	KNOX CO.	KY	4/4/2011	16:13	EST-5	Thunderstorm Wind	60 kts. EG	0	0	25.00K	0.00K
	BARBOUR-VILLE	KNOX CO.	KY	4/4/2011	16:23	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
34	DEWITT	KNOX CO.	KY	4/9/2011	14:23	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
35	FOUNT	KNOX CO.	KY	5/22/2011	14:43	EST-5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K
36	BARBOUR-VILLE	KNOX CO.	KY	5/24/2011	7:30	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
	BARBOUR-VILLE	KNOX CO.	KY	5/24/2011	8:10	EST-5	Thunderstorm Wind	55 kts. EG	0	0	3.00K	0.00K
	BARBOUR-VILLE	KNOX CO.	KY	5/24/2011	12:28	EST-5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K
37	RAIN	KNOX CO.	KY	6/20/2011	2:07	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
	HAMMOND	KNOX CO.	KY	6/21/2011	19:06	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
38	MOORE HILL	KNOX CO.	KY	8/8/2011	14:58	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
	HINKLE	KNOX CO.	KY	8/8/2011	15:03	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	ELYS	KNOX CO.	KY	8/8/2011	15:20	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
39	BARBOUR - VILLE	KNOX CO.	KY	2/29/2012	17:00	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
40	JARVIS STORE	KNOX CO.	KY	7/19/2012	18:32	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	GRAY	KNOX CO.	KY	7/19/2012	18:48	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	BOONE HGTS	KNOX CO.	KY	7/19/2012	19:08	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
41	BARBOUR - VILLE	KNOX CO.	KY	1/30/2013	7:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
42	BARBOUR - VILLE	KNOX CO.	KY	6/13/2013	12:26	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
43	BARBOUR - VILLE	KNOX CO.	KY	7/17/2013	15:10	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
44	BARBOUR - VILLE	KNOX CO.	KY	2/21/2014	0:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
45	GRAY	KNOX CO.	KY	5/13/2014	15:40	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
46	GRAY	KNOX CO.	KY	5/21/2014	21:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
47	BARBOUR - VILLE	KNOX CO.	KY	6/10/2014	17:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	PERMON	KNOX CO.	KY	6/10/2014	17:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
48	SCALF	KNOX CO.	KY	8/20/2014	16:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
49	WALKER	KNOX CO.	KY	6/8/2015	14:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
50	BARBOUR - VILLE	KNOX CO.	KY	7/14/2015	19:55	EST-5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
51	GRAY	KNOX CO.	KY	4/27/2016	21:15	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
52	CANNON	KNOX CO.	KY	5/7/2016	18:43	EST-5	Thunderstorm Wind	54 kts. EG	0	0	0.00K	0.00K
53	SCALF	KNOX CO.	KY	6/23/2016	19:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	SCALF	KNOX CO.	KY	6/23/2016	19:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
54	WILTON	KNOX CO.	KY	7/7/2016	17:30	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	PLACE	KNOX CO.	KY	7/8/2016	15:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
55	JARVIS	KNOX CO.	KY	5/27/2017	17:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
56	MOORE HILL	KNOX CO.	KY	7/6/2017	16:58	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	FLAT LICK	KNOX CO.	KY	7/6/2017	17:28	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
57	GRAY	KNOX CO.	KY	4/3/2018	23:32	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
58	SWANPOND	KNOX CO.	KY	5/31/2018	16:47	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
59	MILLS	KNOX CO.	KY	6/28/2019	15:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
60	PERMON	KNOX CO.	KY	3/29/2020	3:52	EST-5	Thunderstorm Wind	48 kts. EG	0	0	2.50K	0.10K
61	JARVIS STORE	KNOX CO.	KY	7/21/2020	22:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
62	BAILEYS SWITCH	KNOX CO.	KY	7/24/2020	16:11	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	FLAT LICK	KNOX CO.	KY	7/24/2020	16:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

Totals:								0	0	446.50 K	0.10 K

Knox County Severe Thunderstorms - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 4/20/2000. The denominator is set at 20 years, keeping the denominator consistent to maintain comparability between counties.

That Knox County experienced 62 severe thunderstorm/wind events over 20 years yields that Knox County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every four months (i.e., 62/240). Specifically, Knox County experienced an average of 3 severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.26 events per month. $1/.26 = 3.8 \approx 1$ severe winter storm event an average of every four months.

Table 5-5: Knox County Hailstorm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	1.00K	0.00K
1	BARBOURVILLE	KNOX CO.	KY	4/28/2002	13:20	EST	Hail	1.75 in.	0	0	0.00K	0.00K
2	BARBOURVILLE	KNOX CO.	KY	4/25/2003	20:33	EST	Hail	1.00 in.	0	0	0.00K	0.00K
3	GIRDLER	KNOX CO.	KY	5/10/2004	14:45	EST	Hail	1.00 in.	0	0	0.00K	0.00K
4	JARVIS STORE	KNOX CO.	KY	4/19/2006	2:47	EST	Hail	1.00 in.	0	0	0.00K	0.00K
5	BARBOURVILLE	KNOX CO.	KY	6/15/2007	15:28	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	BARBOURVILLE	KNOX CO.	KY	6/15/2007	15:33	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	BARBOURVILLE	KNOX CO.	KY	6/15/2007	15:43	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
6	GREEN ROAD	KNOX CO.	KY	5/8/2009	15:45	EST-5	Hail	1.00 in.	0	0	1.00K	0.00K
7	GIBBS	KNOX CO.	KY	6/2/2009	13:54	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
8	WALKER	KNOX CO.	KY	5/14/2010	14:31	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
9	BARBOURVILLE	KNOX CO.	KY	2/29/2012	16:31	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
10	GRAY	KNOX CO.	KY	3/15/2012	4:05	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	GIRDLER	KNOX CO.	KY	3/15/2012	5:08	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
11	BARBOURVILLE	KNOX CO.	KY	4/26/2012	17:09	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
	BARBOURVILLE	KNOX CO.	KY	4/26/2012	17:16	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
12	PERMON	KNOX CO.	KY	6/26/2018	13:53	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	1.00K	0.00K

Knox County Hail Storms - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The pink versus the green highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to

each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 6/4/2001. Although the last date recorded for a hailstorm in Knox County is 6/26/2018, the denominator is set at 20 years to maintain comparability across counties.

That Knox County experienced 12 events with hail 1" or larger over 20 years yields that Knox County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 20 months (i.e., 12/240). Specifically, Knox County experienced an average of 1.2 severe hailstorm events every two years. Or, using December 31, 2020 as an endpoint, this is 0.05 events per month. 1/.05 = 20 ≈ 1 severe hailstorm event an average of every 20 months.

Table 5-6: Knox County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	80.00K	0.00K
1	HAMMOND	KNOX CO.	KY	5/31/2004	1:05	EST	Tornado	F1	0	0	50.00K	0.00K
	EROSE	KNOX CO.	KY	5/31/2004	1:15	EST	Tornado	F1	0	0	30.00K	0.00K
	Totals:								0	0	80.00K	0.00K

Knox County - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate a cluster of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. While the entire timeline of the database, from 1950 through 2020, was searched, the only event in the search was 5/31/2004. Despite this, the denominator is set at 20 years to maintain comparability across counties. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen.

That Knox County experienced 1 tornado event in 20 years yields that Knox County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 20 years (i.e., 1/240). Using December 31, 2020 as an endpoint, this is 0.0042 events per month. 1/.0042 = 238 ≈ 1 tornado event an average of every 20 years.

WILDFIRES

During the Fall 2016 Bailey Switch Fire Department logged 30 plus calls due to fires. This fire department along with others around the county were stretched thin battling fires. A few hundred acres were burned. The National Guard had two Black Hawk helicopters dropping water to help battle the flames. Most fire departments in the CVADD counties are volunteer, which delays response time and limits personnel available for any specific fire. However, there are standing agreements between departments within the county and in nearby communities in adjacent counties to respond to fires out of their jurisdiction if needed and resources are available.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[98]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned

[98] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Knox County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	0	0.0	0.000%
Class B	0.25 to 9 Acres	33	83.6	64.706%
Class C	10 to 99 Acres	18	643.0	35.294%
Class D	100 to 299 Acres	0	0.0	0.000%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

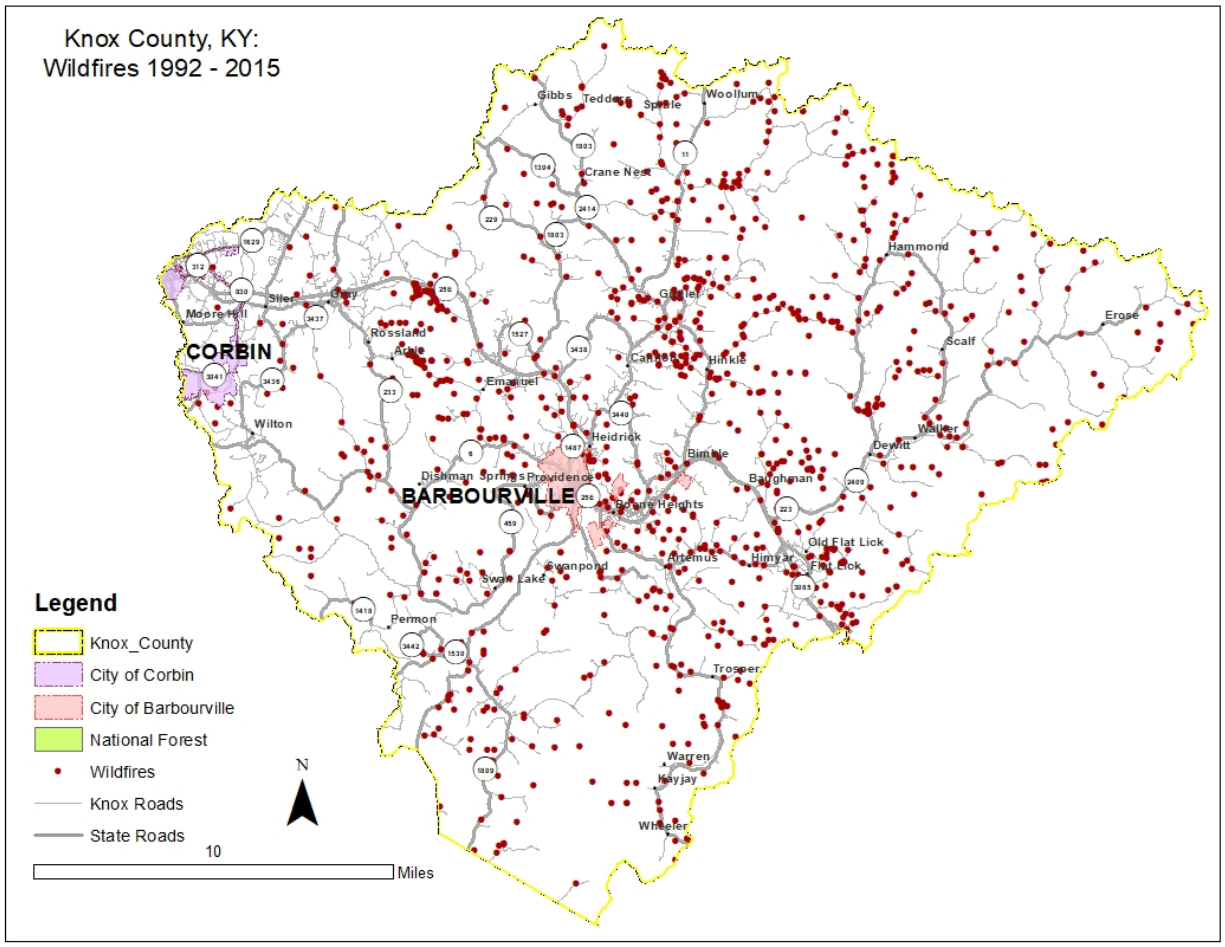
County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Knox	2013	52	1517.0	177,910
	2014	96	2834.8	
	2015	55	1220.5	
	2016	61	4474.1	
	2017	37	2207.0	
	2018	13	225.0	
	2019	22	324.1	
	2020	29	402.5	

Table 1-4 Knox County Summary of Impacts From Wildfires, 2019-2020		
# of Fires		30
Injuries		0
Fatalities		0
Suppression Costs	$	17,351
# Houses Saved		9
Value of Houses Saved	$	900,000
# Houses Lost		0

Value of Houses Lost	$	-
# Structures Saved		9
Value of Structures Saved	$	10,000
# Structures Lost		0
Value of Structures Lost	$	-

In 2019-2020 (the last years for which data is available), Knox County suffered 51 wildfires of all class types. Two years equals 730 days. Thus, there were 51/730 fires per day, or 0.0699 fires per day, or 1 wildfire of all class types every 14.31 days (1/0.0699). Within particular wildfire classes, there were no Class A wildfires between 2019-2020. There were 33 Class B wildfires between 2019-2020. This translates to 33/730 fires where between 0.25 to 9 acres were burned, or 0.0452 Class B fires per day, or one (1) Class B wildfire about every 22.12 days (1/0.0452). There were 18 Class C wildfires between 2019-2020. This translates to 18/730 fires where between 10 to 99 acres were burned, or 0.0247 Class C fires per day, or one (1) Class C wildfire about every 40.48 days (1/0.0247). There were no Class D to Class G wildfires – fires where 100 to 5,000 or more acres were burned – in 2019-2020 in Knox County.

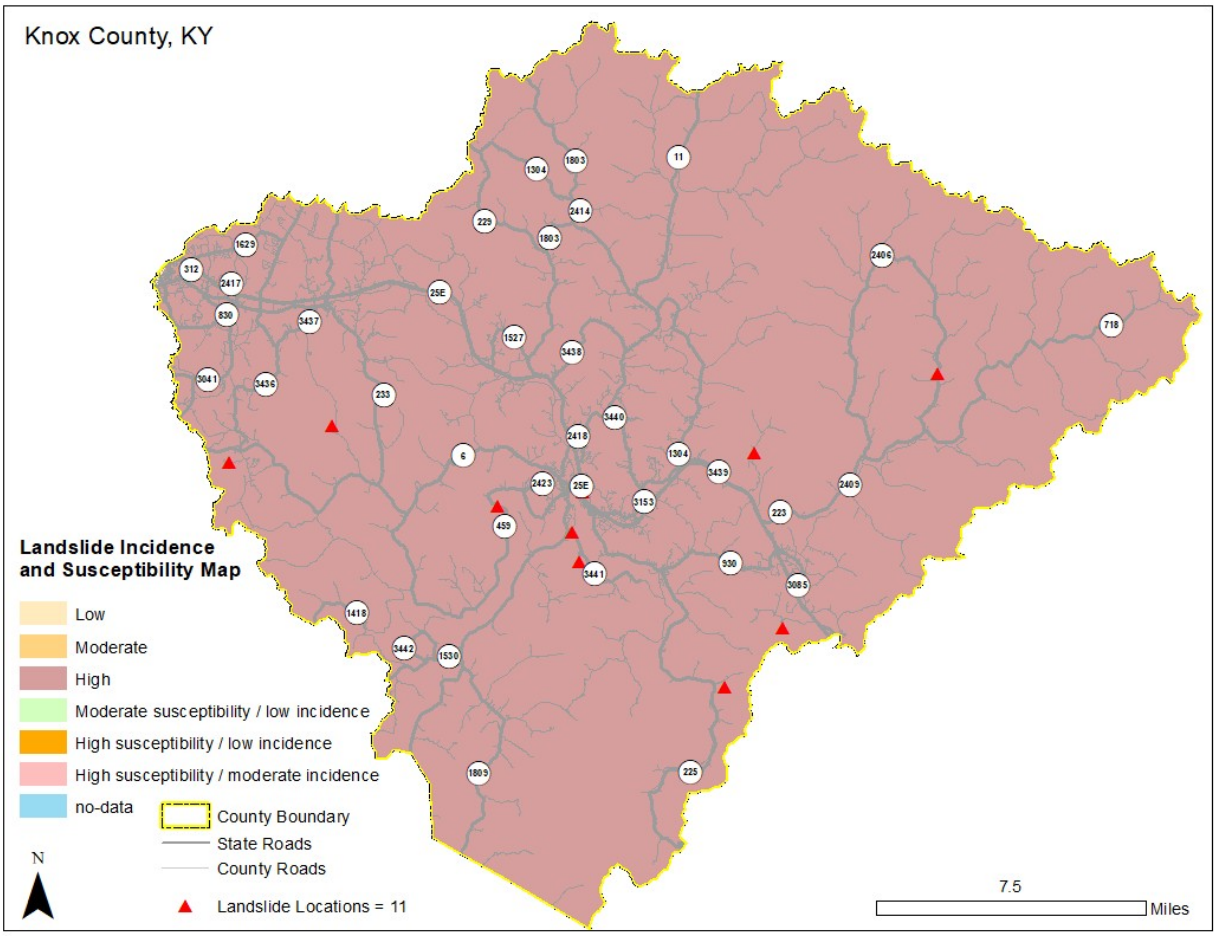
All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current.



LANDSLIDES

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field.

Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils. The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.



Source: Crawford, Matthew. *KGS Landslide Inventory*. Kentucky Geological Survey, www.uky.edu/KGS/.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
1	Knox	Fount	Turkey Creek Rd	Above Road; Stream at Bottom	5/15/2013	Land-slide	Sandstone; Siltstone; Shale; Coal; Limestone							Yes	
2	Knox	Scalf	KY 233		2015	Rock-fall	Shale; Sandstone; Siltstone; Coal; Underclay							Road Closure	
3	Knox	Arte-mus	KY 3441		2020		Siltstone; Shale; Sandstone; Coal							Break in Pavement	
4	Knox	Heid-rick	KY 1527	Below Road	2021		Sandstone; Siltstone; Clay Shale; Coal							Slide Repair	
5	Knox	Arte-mus	(36.809166, -83.780555)												
6	Knox	Arte-mus	(36.785555, -83.81)												
7	Knox/ Whitley	Corbin	(36.894444, -84.004444)												
8	Knox/ Whitley	Corbin	Prewitt Rd			Land-slide	Shale; Siltstone; Sandstone; Coal; Clay								

9	Knox	Pine-ville	US 25	Above Road; Stream at Bottom		Land-slide	Shale; Siltstone; Sandstone; Coal								

Knox County Landslides - Probability as Frequency of Event Occurrence

Knox County, unincorporated (and its unincorporated cities) independently experienced 9 landslide events over 30 years. Thus, Knox County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every three years (i.e., 9/30). Specifically, Knox County, unincorporated and its unincorporated cities experienced an average of 0.5 landslide events each year. Or, using December 31, 2021, as an endpoint, 9/360 months is 0.025 events per month. $1/0.025 = 40 \approx 1$ landslide event an average of every 40 months, or 3.3 years.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narrative	Impact: Cost
1	Knox	Barbourville	Falling Leaf Dr		4/7/2014	Land-slide	Siltstone; Shale; Sandstone; Coal; Limestone							Yes	
2	Knox	Barbourville	KY 3441		12/26/2015	Land-slide	Siltstone; Shale; Sandstone; Coal; Limestone							Road Closure	

3	Knox	Barbourville	KY 459	Below Road; Stream at Bottom		Earth Slide	Shale; Clay Shale; Sandstone; Coal	80 feet							
4	Knox	Barbourville	US 25	Above Road		Rock-fall	Siltstone; Shale; Sandstone; Coal; Limestone								

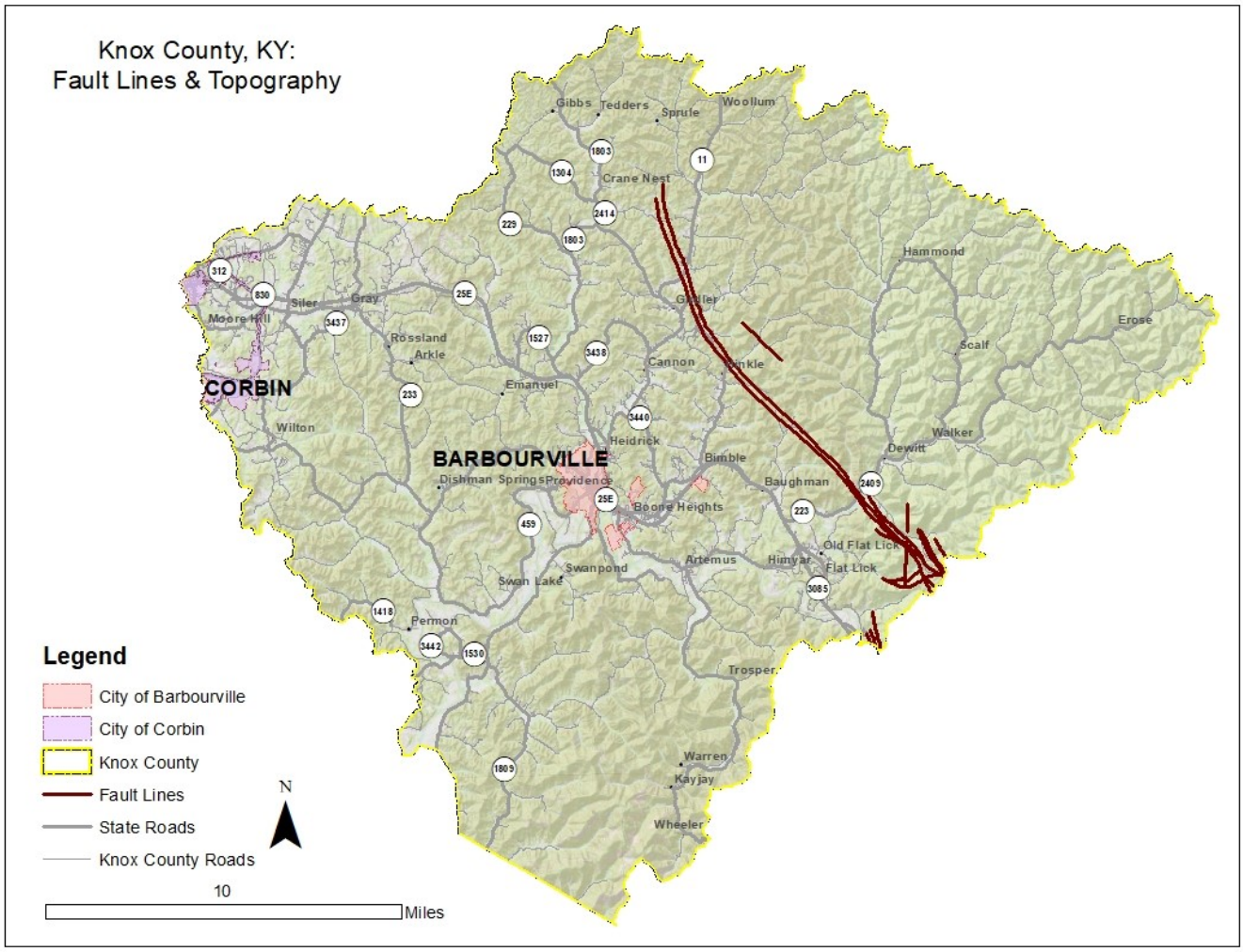
Barbourville Landslides - Probability as Frequency of Event Occurrence

Incorporated Barbourville independently experienced 4 landslide events within its city limits over 30 years. Therefore, Barbourville experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 7.5 years (i.e., 4/30). Specifically, Barbourville experienced an average of 0.13 landslide events each year. Or, using December 31, 2021, as an endpoint, 4/360 months is 0.0111 events per month. $1/0.0111 = 90 \approx 1$ landslide event an average of every 90 months, or one every 7.5 years.

EARTHQUAKES

Earthquakes can happen anytime of the year and without warning. The risk is higher in identified seismic zones such as the New Madrid Fault Zone in western Kentucky. Earthquakes have occurred in Knox County. The following is a list of the recorded earthquakes and a map of any fault lines located in Knox County:

Knox County Historical Earthquakes 1/1/1900 - 1/31/2018				
Location (Lat/Long)	**Magnitude**	**Depth**	**Date**	**Time**
36.87/-83.86	4	1km	1/19/1976	6:20:40
36.868/-83.821	2.6	12km	11/6/1983	0:12:59
36.972/-83.793	2.4	15km	11/6/1986	3:26:46
36.951/-83.642	2.3	2km	12/23/1997	21:07:07
36.971/-83.774	2.5	21km	5/22/1988	15:00:32
36.854/-83.691	3	5km	1/17/1999	38:04.7
36.81/-83.744	2.7	3km	3/30/1999	8:48:01
36.93283/-84.004	3.7	1.29km	9/17/2004	15:21:44
36.93617/-83.8932	2.9	10km	11/30/2004	23:59:34
36.94033/-83.8092	2.2	4.32km	2/7/2006	7:06:24
36.96967/-83.7102	2.3	2.63km	7/17/2007	2:49:21
36.93783/-83.668	2.3	14.58km	5/8/2009	8:05:15
36.7949/-83.9612	2.2	0km	10/5/2014	8:23:22
36.857/-83.734	1.3	25.6km	7/3/2015	5:20:53
36.855/-83.832	2.6	17km	10/30/2017	5:39:37
36.89/-83.686	1.9	27.3km	1/22/2018	12:07:43
36.892/-83.7	1.2	15.2km	10/8/2018	0:07:47



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Knox County was about 82.5 persons in 2010 (the latest data available in Census Quickfacts[19]). This small population size and commensurate low density of structures suggest that the impact of an earthquake would be at the lower end of the range estimated for a given earthquake magnitude. The US Geological Survey states[20]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For

example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake in written history occurred in 1960 off the coast of Chile and had a magnitude of 9.5.
The Michigan Technological University's Earthquake Magnitude Scale[21] puts a number to the potential for damage: The most severe Knox County earthquake, which occurred in 1976, had a magnitude of 4 on the Earthquake Magnitude Scale, which identifies the extent as "often felt, but only causes minor damage". Given that all subsequent earthquakes in the intervening 45 years have been less severe, the occurrence of an earthquake of 5.5 or above in magnitude, where damage to structures typically begins, would be very rare.[22]

Michigan Technological University's Earthquake Magnitude Scale[23] puts a number to the potential for damage:

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

MAN-MADE HAZARDS

During the community meeting residents had several concerns about man-made hazards. The following is a list of these concerns.

Rank	Man-Made Threats
1	Cyber Security
2	Infectious Disease
3	Active Shooter

Cyber security was a major topic of discussion during the meeting for people who work in health care. A ransomware attack at a health care facility would be devastating. An increase in cyber security is needed to better protect the critical healthcare facilities. Another concern for health care employees was the spread of infectious diseases. An infectious disease outbreak would have disastrous consequences for the people and places in Knox County. Preventive measures need to be taken to better protect vulnerable populations from an infectious disease outbreak. Another Man-made hazard was the threat of

an active shooter at schools. Better security measures need to be implemented in the school system to protect the students and teachers from an active shooter.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Knox County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Knox County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Knox County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Knox County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Knox County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Knox County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. For mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

KNOX COUNTY GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

Objective(s):

1. Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive areas.

- Review budgets for mitigation projects, update as needed, and allot funds for such projects.
- Prevent future flood losses by stronger enforcement of NFIP ordinances.
- Designate someone other than Judge Executive/Mayor for the floodplain coordinator position.
- Regulate tree maintenance by ensuring proper trimming especially before winter storm season

Goal #2 *Protect Knox County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

Objective(s):

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Knox County's most vulnerable populations and structures.

2.2 Decrease the number of FEMA-identified "repetitive loss properties."

- Implement projects to correct and prevent landslides.
- Projects for warning citizens during severe weather events such as the installation of sirens and use of a ring down system.
- Projects to mitigate flooding include creating/widening channels so waters have a more direct outlet into streams from cities and communities.
- Other flooding projects include acquisition/relocation of designated repetitive loss properties and other flood prone properties.

Goal #3 *Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

Objective(s):

3.1 Increase the level of knowledge and awareness for Knox County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

- Provide education materials on landslides when citizens apply for building permits.
- Provide community education on new warning systems and routinely afterwards.
- Provide information on the need for flood insurance along with supporting statistics and benefits of NFIP participation.

Goals Correlation to Hazards			
Hazards	**Goal #1**	**Goal #2**	**Goal#3**
Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

2012 Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Master Street Storm Water Project.				✓	
Install warning sirens.				✓	Barbourville only has two sirens. Continue to seek funding for more sirens.
Build tornado safe rooms in eastern Knox.				✓	Has not been built. Continue to seek funding for project.
Build tornado safe rooms in western Knox.				✓	Has not been built. Continue to seek funding for project.
Purchase generator for Cumberland Valley RECC.	✓				Cumberland Valley RECC purchased generator with their own funds.
Purchase generator for Knox EMS.				✓	Currently in process of building new EMS building. Continue to seek funding for generator.
Complete hazard mitigation studies for flood prone areas.				✓	Has not been implemented. Continue to seek funding for project.
Implement a ring down warning systems for Fire Departments.				✓	Has not been implemented. Continue to seek funding for project.
Build a tornado safe room in northern Barbourville.				✓	Has not been built. Continue to seek funding for project.
Build a tornado safe room in southern Barbourville.				✓	Has not been built. Continue to seek funding for project.
Fix Knox County Hospital's lightening grounding problem.	✓				
Fix Knox County Hospital's voltage surge suppressor.	✓				
Purchase an intake generator for city water plant.				✓	Has not been purchased. Continue to seek funding for project.
Purchase generators for Fire Departments.				✓	Barbourville Fire Department has a generator. Continue to seek funding for generators at other facilities.
Purchase generator for flood wall pump station.				✓	Has not been purchased. Continue to seek funding.
Purchase weather radio for storm shelter.				✓	Has not been purchased. Continue to seek funding.
Encourage and implement county-wide buried utilities.				✓	Has not been implemented. Continue to seek funding for project.

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

KNOX COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Purchase and install cameras for schools.	Active Shooter	County, City, & Board of Education		X			Continuous	5	5	1	Various Grants	3
Build vestibules at school entrance to improve security.	Active Shooter	County, City, & Board of Education	X				Continuous	3	5	1	Various Grants	4
Purchase and install metal detectors at schools.	Active Shooter	County, City, & Board of Education	X				Continuous	5	1	5	Various Grants	5
Purchase generators for tower sites.	All Hazards	County & 911	X				Continuous	1	5	1	Various Grants	1
Master Street in Corbin floods impacting several businesses and traffic. Master Street is one of the busiest streets in Corbin; 16,000 – 28,000 vehicles travel it per day. Complete engineering study to resolve flooding issues.	Flood	State, County, & City.	X	X			Continuous	1	1	1	State, City, & Various Grants	1
KY-459 to Bull Run to KY-6 near Swan Pond becomes isolated when flooding occurs. Complete engineering study to resolve flooding issues.	Flood	State	X	X			Short Term	1	5	1	State & Various Grants	2
Warren Loop, Indian Hill, and back parking lot at Cumberland Valley Electric floods jeopardizing equipment	Flood	County, U.S. Army Corps of Engineers, Cumberland Valley Electric	X	X			Long Term	1	1	1	State & Various Grants	3

which could impact the response time of electric company. Flooding occurs 8 or 9 times a year. Complete an engineer study to resolve flooding issues.												
Close the tunnel at Manchester Street, under the railroad, as it regularly floods. Create an over pass or alternate railroad crossing.	Flood	State & County	X				Long Term	1	1	1	Various Grants	3
Purchase repeaters for Flat Top or go to digital emergency radio transmission.	All Hazards	911 & County		X			Short Term	1	5	1	Various Grants	1
Purchase amphibious vehicle for search and rescues.	Flood	Knox County		X			Short Term	1	5	1	Various Grants	2
Purchase generators for Fire Departments within the County.	Winter Storms, Severe Storms & Tornados	County & City	X				Short Term	1	5	1	Various Grants	2
Purchase air purifying equipment for healthcare facilities.	Wildfire	Healthcare Facilities	X				Short Term	1	5	1	Various Grants	2
Review areas for predetermined helicopter landing zones. Build landing pad at Bailey Switch Fire Department to prevent closing US-25E during emergencies.	All Hazards	County, City, & Fire Departments	X	X			Short Term	1	5	1	County & City	1
Build storm shelters in heavily concentrated mobile home areas such as the Gregory Lane Community.	Severe Storms & Tornado	County & City	X				Long Term	3	5	1	Various Grants	5
Remove Knox Utilities water lines from creeks and streams throughout the county. Boil water advisories occur	Flood	Knox Utilities	X				Long Term	1	1	1	Knox Utilities & Various Grants	1

frequently due to location of current water lines.												
Purchase and implement a ring down system for emergency alerts.	All Hazards	County		X			Short Term	1	5	1	County & Various Grants	1
Purchase and install emergency sirens at designated areas.	Severe Storms & Tornados	County		X			Short Term	1	5	1	County & Various Grants	1
Emergency Management to implement the usage of social media.	All Hazards	County				X	Short Term	1	5	1	County	1
Complete engineering study to resolve flooding issue at Bailey Hollow. Restore stream back to natural capacity.	Flood	County & U.S. Army Corps of Engineers	X				Long Term	1	1	1	County & Various Grants	3
Elevate road near Emanuel Hollow bridge.	Flood	County	X				Short Term	1	5	1	County & Various Grants	3
Purchase generators for new Ambulance Service building.	Winter Storms, Severe Storms & Tornados	911	X				Short Term	1	5	1	Various Grants	2
Purchase and implement cyber security for critical facilities.	Cyber Security	County, City, & Critical Facilities		X			Continuous	1	3	1	County, City, Critical Facilities & Grants	1

Laurel County, KY:
Hazard Mitigation Overview

X. LAUREL COUNTY OVERVIEW:

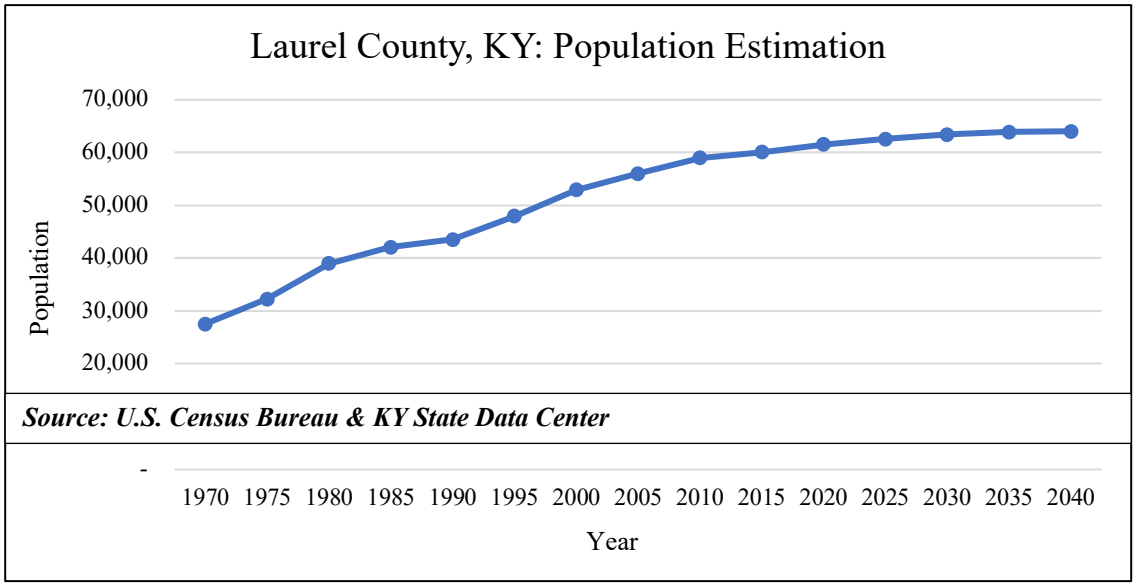
Laurel County is located in the coal field area of southeastern Kentucky. The Daniel Boone National Forest runs through eastern part of the county. The City of London is the county seat and is known as the Cycling Capital of Kentucky.

Laurel County, KY: Quick Facts	
Total Population, July 1, 2019	60,813
Population per Square Miles, 2010	135.6
Land Area in Square Miles, 2010	433.95
Housing Units, July 1, 2016	25,453
Persons in Poverty, percent	23.2%
Median Value of Owner-Occupied Housing Units, 2012-2016	$99,900
Median Household Income, 2012-2016	$36,139
Total Employment, 2015	23,433
Total Employer Establishments, 2015	1,149
Source: U.S. Census Bureau	

LAUREL COUNTY POPULATION:

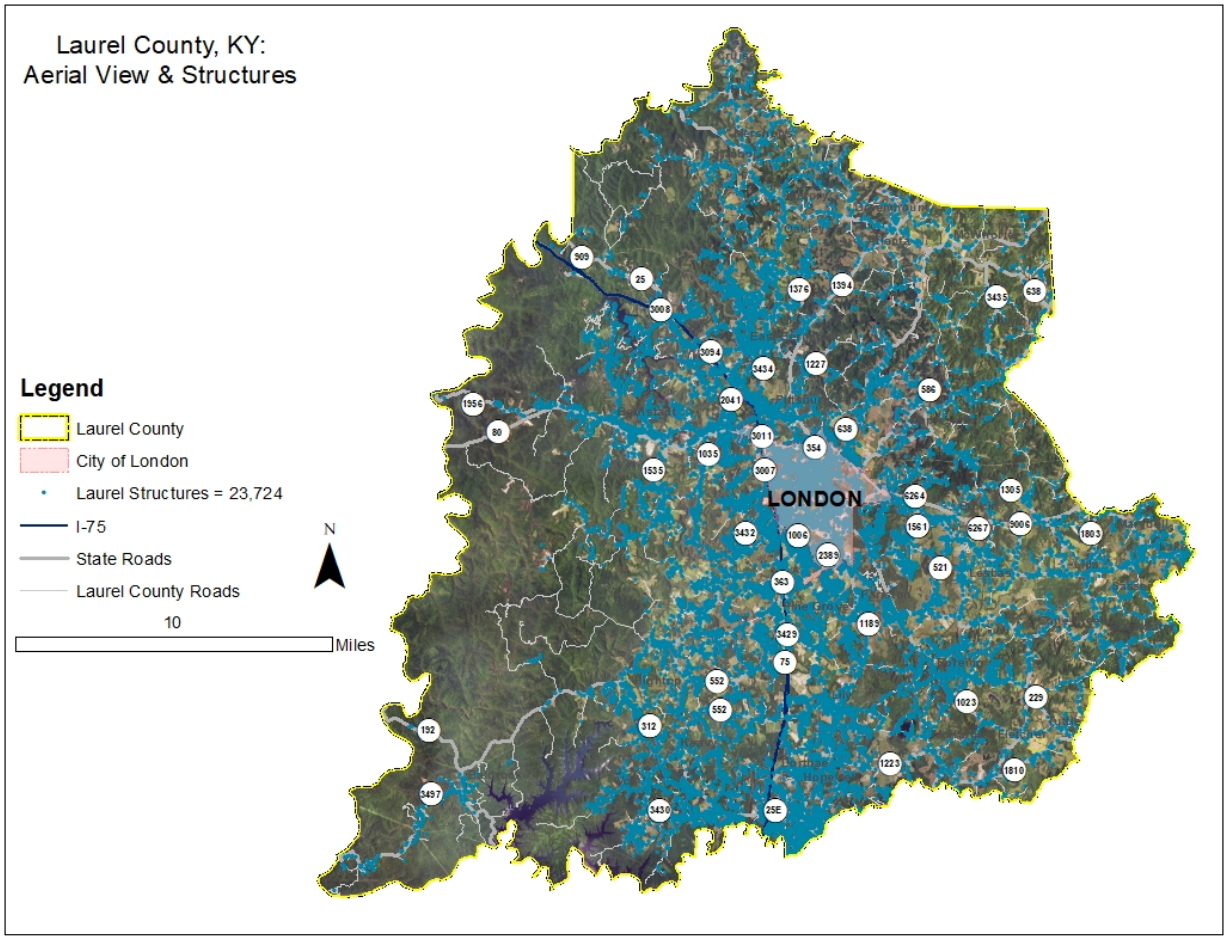
Laurel County is the most populated county within the Cumberland Valley Region with an estimated total population of 60,813 in 2019. Laurel County had a population growth of 3.3% between 2010 and 2019, and the population is expected to continue growing.

Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Laurel County	59,603	60,101	60,357	12.7% increase	
City of London	8,074	8,126	8,059	0.2% decrease	
Source: U.S. Census Bureau					



Source: U.S. Census Bureau & KY State Data Center

According to the United States Census there were 26,007 housing units located in Laurel County in 2019. The following map illustrates where the residential & commercial structures are located based on CVADD ArcGIS database.



COMMUNITY CAPABILITIES

Laurel County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Laurel County Fiscal Court is comprised of a Judge Executive and 6 Magistrates. The City of London is a Home Rule class city lead by a Mayor-Council government. Both the Fiscal Court and City Council have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation.

Laurel County Plans & Programs									
	Emergency Operation Plan	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Laurel County	✓		✓	✓	✓	✓	✓	✓	
City of London		✓	✓	✓	✓	✓	✓	✓	
Bald Rock Fire Department									✓

EMERGENCY MANAGEMENT

To prepare for future natural hazards Laurel County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Laurel County THIRA.

THIRA Hazard Ranking	
1	Tornado
2	Winter Storm
3	HazMat

The Laurel County Emergency Management also has a Local Emergency Planning Committee (LEPC) that meets quarterly and promotes emergency planning and preparedness. The LEPC includes members from various professions and is open to the public. For more information about Laurel County's THIRA and LEPC meetings contact the Emergency Management Director.

LAUREL COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. The following chart summarizes the natural hazards that have had a negative impact on the people and places of Laurel County.

Rank	Natural Hazards
1	Severe Thunderstorms & Tornado
2	Severe Winter Storm
3	Flash Floods
4	Wildfires
5	Drought

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

SEVERE THUNDERSTORMS

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures.

Severe Thunderstorms have at least one of the following:

- Wind gusts of at least 58 mph or higher, i.e. 50 knots;
- Tornado;
- Hail that is one inch or larger, i.e. at minimum the size of a quarter.

This analysis will focus on the wind profiles for each county; later sections will assess hail and tornados.[99]

Thunderstorms can be categorized by their physical characteristics, i.e., the presence or absence of rotation, the number or location of updrafts and downdrafts present. There is a continuous spectrum of storms in the sky and a storm may move from one category along this spectrum to another. The five (5) types are:

- **Ordinary or Single-Cell Storm:** Single cell storms are short-lived and usually not severe.
    - Short life, generally 30-45 minutes
    - Downdraft that forms within 15-20 minutes after cell initiation
    - Updraft that weakens in 25-30 minutes; outflow stabilizes
    - Gusty winds, usually not severe
- **Pulse Storm:** A Pulse Storm is a single-cell thunderstorm that is usually not strong; when it is of substantial intensity, it produces severe weather for short periods of time. Such a storm weakens and then generates another short burst or pulse.
    - Short life, generally 30-45 minutes
    - Usually not severe, but given the right environmental conditions, these storms can create:
        - Downburst winds, usually less than 70 mph
        - A weak tornado
    - Damage is isolated.

[99] The TYPES section is adapted from the National Weather Service. (2011). "Weather Spotter's Field Guide." Department of Commerce. As presented in the Kentucky Hazard Mitigation Plan published by the University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP). (2018)

- **Multicellular Cluster:** This type is the most common storm, consisting of a group of ordinary cells at various stages of the thunderstorm life cycle.
    - Most common type of thunderstorm
    - May last for several hours
    - Consists of a group of cells moving as a single unit
    - Contains cells in different stage of the thunderstorm life cycle
    - Occasionally may contain supercells
    - Given the right conditions, the cells can become severe within the multicellular cluster producing:
        - Downburst winds;
        - Weak tornadoes; and
        - Heavy rainfall in a short time.
- **Multicellular Line:** This category is a long line of storms with a continuous, well developed gust front along the leading edge.
    - Frequently called squall line
    - A long line of storms with individual storm outflows merging to produce a continuous, well-developed gust front marking the leading edge of rain-cooled air
    - Line of storms often oriented north-south or northeast-southwest and usually move toward the northeast, east, or southeast
    - May be embedded along the line
    - Given the right environmental conditions, multicell line storms can produce:
        - Strong downburst winds;
        - Heavy rainfall; and
        - Occasional tornadoes
- **Supercell:** A supercell is a highly organized thunderstorm with an extremely strong updraft. They exhibit persistent storm-scale rotation of the updraft-downdraft couplet or mesocyclone.
    - Classifying supercellular storms is subjective. Still, the following is generally acknowledged about supercells:
        - Highly organized storm with rotation inside
        - Updrafts can attain speeds more than 100 mph
        - Can produce strong, violent tornadoes
        - Rear-flank downdraft can produce damaging outflow winds in excess of 100 mph.
    - Supercells can produce the following elements:
        - Potentially torrential rainfall immediately adjacent to the storm updraft
        - Lighter rainfall at greater distances from the updraft
        - Rear-Flank Downdrafts (RFDs) producing strong, sometimes damaging outflows
        - Tornadoes

Damaging Winds: National Weather Service issues warnings when the winds from a thunderstorm are expected to be 58 mph (50 knots) or higher.

Downburst: This term refers to an area of strong, often damaging winds produced by air rapidly descending in a thunderstorm. Downbursts are sometimes described as a microburst when it covers an area of less than 2.5 square miles and lasts three to seven minutes. Downbursts can be referred to as microburst when they cover larger areas or last for more than seven (7) minutes. On rare occasions, downbursts can have wind speeds in excess of 150 mph.

Bow Echo: A bow-shaped line of convective cells – best seen on radar – is often associated with swaths of damaging straight-line winds and small tornadoes.

Derecho: A derecho is a widespread and usually fast-moving convectively-induced episode of damaging winds. Derechos can result from bow echoes, supercells, multicell clusters or lines, or a blend of any of these. They can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across. Due to the large area extent, an episode is usually not classified as a derecho until it is complete.

Note: When reviewing the types and impacts of thunderstorms and winds, it is important to realize that while tornadoes are typically more destructive when they occur, straightline winds can also be highly destructive and occur much more frequently. In the final analysis, straightline winds cause more damage in both injuries/deaths and property damage in the United States than do tornadoes.

Table 6-1: Laurel County Thunderstorm/Wind Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	6	816.91K	2.01K
1	LONDON	LAUREL CO.	KY	5/25/1998	11:25	EST	Thunderstorm Wind	52 kts.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	5/25/1998	11:35	EST	Thunderstorm Wind	58 kts.	0	0	0.00K	0.00K
2	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/3/2000	21:45	EST	High Wind	58 kts. E	0	0	0.00K	0.00K
3	KEAVY	LAUREL CO.	KY	10/24/2001	21:47	EST	Thunderstorm Wind	60 kts. E	0	0	0.00K	0.00K
4	TUTTLE	LAUREL CO.	KY	5/1/2003	19:20	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
5	LONDON	LAUREL CO.	KY	5/5/2003	16:55	EST	Thunderstorm Wind	65 kts. EG	0	0	0.00K	0.00K
6	LONDON	LAUREL CO.	KY	5/11/2003	5:30	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
7	MC WHORTER	LAUREL CO.	KY	7/12/2003	14:35	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
8	LONDON	LAUREL CO.	KY	7/16/2003	4:25	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
9	CRUISE	LAUREL CO.	KY	11/12/2003	18:00	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
10	LAUREL (ZONE)	LAUREL (ZONE)	KY	11/24/2003	4:45	EST	High Wind	55 kts. EG	0	0	0.00K	0.00K

11	PINE GROVE	LAUREL CO.	KY	5/24/2004	21:05	EST	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
	LONDON	LAUREL CO.	KY	5/24/2004	21:17	EST	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
	SUBLIMITY CITY	LAUREL CO.	KY	5/24/2004	21:24	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
12	LILY	LAUREL CO.	KY	5/26/2004	15:10	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	TUTTLE	LAUREL CO.	KY	5/26/2004	15:20	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	5/27/2004	1:25	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
13	LONDON	LAUREL CO.	KY	5/31/2004	0:30	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	BALDROCK	LAUREL CO.	KY	5/31/2004	0:38	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
14	LONDON	LAUREL CO.	KY	6/2/2004	16:55	EST	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
15	KEAVY	LAUREL CO.	KY	7/6/2004	18:00	EST	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
16	LONDON	LAUREL CO.	KY	10/18/2004	23:38	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	10/18/2004	23:44	EST	Thunderstorm Wind	58 kts. MG	0	0	0.00K	0.00K

	LONDON	LAUREL CO.	KY	10/18/2004	23:44	EST	Thunderstorm Wind	60 kts. EG	0	0	2.00 K	0.00 K
17	LONDON	LAUREL CO.	KY	4/22/2005	20:30	EST	Thunderstorm Wind	55 kts. EG	0	0	1.00 K	0.00 K
	LONDON	LAUREL CO.	KY	4/22/2005	20:36	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
18	KEAVY	LAUREL CO.	KY	6/10/2005	16:55	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
19	LONDON	LAUREL CO.	KY	6/14/2005	17:27	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K
	LONDON	LAUREL CO.	KY	6/14/2005	17:28	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
20	LONDON	LAUREL CO.	KY	8/5/2005	14:44	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
21	LONDON	LAUREL CO.	KY	8/13/2005	14:35	EST	Thunderstorm Wind	55 kts. EG	0	0	1.00 K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	HIGHTOP	LAUREL CO.	KY	8/13/2005	14:48	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00 K	0.00 K
22	EAST BERNSTADT	LAUREL CO.	KY	11/15/2005	22:39	EST	Thunderstorm Wind	52 kts. EG	0	0	0.00 K	0.00 K
23	LONDON	LAUREL CO.	KY	1/2/2006	18:00	EST	Thunderstorm Wind	53 kts. EG	0	0	1.00 K	0.00 K
24	LONDON	LAUREL CO.	KY	3/9/2006	20:48	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00 K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
25	VICTORY	LAUREL CO.	KY	4/7/2006	15:29	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	4/7/2006	22:18	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
26	VICTORY	LAUREL CO.	KY	5/26/2006	23:13	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
27	VICTORY	LAUREL CO.	KY	5/31/2006	15:58	EST	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
28	LONDON	LAUREL CO.	KY	6/22/2006	22:32	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
29	LONDON	LAUREL CO.	KY	8/10/2006	17:13	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	8/10/2006	17:18	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	8/10/2006	17:18	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
30	LONDON	LAUREL CO.	KY	9/23/2006	17:26	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
31	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/1/2006	5:38	EST-5	High Wind	55 kts. EG	0	0	0.00K	0.00K
32	LONDON	LAUREL CO.	KY	4/3/2007	20:13	EST-5	Thunderstorm Wind	55 kts. EG	0	0	35.00K	0.00K
	LONDON	LAUREL CO.	KY	4/3/2007	20:23	EST-5	Thunderstorm Wind	53 kts. EG	0	0	3.00K	0.00K

	LONDON	LAUREL CO.	KY	4/3/2007	20:28	EST-5	Thunderstorm Wind	55 kts. EG	0	0	50.00K	0.00K
33	VICTORY	LAUREL CO.	KY	6/24/2007	15:13	EST-5	Thunderstorm Wind	60 kts. EG	0	0	30.00K	0.00K
34	EAST BERNSTADT	LAUREL CO.	KY	1/29/2008	21:35	EST-5	Thunderstorm Wind	60 kts. EG	0	0	20.00K	0.00K
	EAST BERNSTADT	LAUREL CO.	KY	1/29/2008	22:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	20.00K	0.00K
	LONDON	LAUREL CO.	KY	1/29/2008	22:37	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
36	LIDA	LAUREL CO.	KY	6/10/2008	1:08	EST-5	Thunderstorm Wind	55 kts. EG	0	0	12.00K	0.00K
	HIGHTOP	LAUREL CO.	KY	6/10/2008	23:40	EST-5	Thunderstorm Wind	58 kts. EG	0	0	5.00K	0.00K
	LONDON	LAUREL CO.	KY	6/10/2008	23:50	EST-5	Thunderstorm Wind	53 kts. EG	0	0	2.00K	0.00K
37	LONDON	LAUREL CO.	KY	6/20/2008	15:05	EST-5	Thunderstorm Wind	55 kts. EG	0	0	15.00K	0.00K
38	LONDON	LAUREL CO.	KY	7/20/2008	16:40	EST-5	Thunderstorm Wind	60 kts. EG	0	0	50.00K	0.00K
39	LILY	LAUREL CO.	KY	7/22/2008	14:30	EST-5	Thunderstorm Wind	55 kts. EG	0	0	5.00K	0.00K
	LONDON	LAUREL CO.	KY	7/22/2008	14:30	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K

	KEAVY	LAUREL CO.	KY	7/22/2008	14:31	EST-5	Thunderstorm Wind	54 kts. EG	0	0	3.00K	0.00K
	LONDON	LAUREL CO.	KY	7/22/2008	14:36	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
40	LONDON	LAUREL CO.	KY	7/28/2008	13:30	EST-5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
41	KEAVY	LAUREL CO.	KY	2/11/2009	15:43	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.40K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	GREEN-MOUNT	LAUREL CO.	KY	2/11/2009	15:43	EST-5	Thunderstorm Wind	58 kts. EG	0	0	20.00K	0.00K
	LONDON	LAUREL CO.	KY	2/11/2009	15:44	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
42	EAST BERN-STADT	LAUREL CO.	KY	2/27/2009	6:45	EST-5	Thunderstorm Wind	51 kts. EG	0	0	1.00K	0.00K
43	BALD-ROCK	LAUREL CO.	KY	6/16/2009	16:19	EST-5	Thunderstorm Wind	52 kts. EG	0	0	4.00K	0.00K
	TUTTLE	LAUREL CO.	KY	6/16/2009	16:39	EST-5	Thunderstorm Wind	61 kts. EG	0	0	25.00K	0.00K
44	KEAVY	LAUREL CO.	KY	8/4/2009	15:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	15.00K	0.00K
45	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/9/2009	15:15	EST-5	High Wind	52 kts. EG	0	0	0.00K	0.00K
46	KEAVY	LAUREL CO.	KY	4/24/2010	23:30	EST-5	Thunderstorm Wind	60 kts. EG	0	0	10.00K	0.00K

47	LONDON	LAUREL CO.	KY	6/14/2010	23:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
	BERN-STADT	LAUREL CO.	KY	6/15/2010	17:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	4.00K	0.00K
	LONDON	LAUREL CO.	KY	6/15/2010	18:10	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
	LILY	LAUREL CO.	KY	6/15/2010	23:40	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
49	LESBAS	LAUREL CO.	KY	9/11/2010	16:19	EST-5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
50	KEAVY	LAUREL CO.	KY	2/25/2011	0:50	EST-5	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
51	CORBIN LONDON ARPT	LAUREL CO.	KY	2/28/2011	8:15	EST-5	Thunderstorm Wind	55 kts. EG	0	0	25.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
52	EAST BERN-STADT	LAUREL CO.	KY	3/23/2011	17:30	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
53	KEAVY	LAUREL CO.	KY	4/4/2011	15:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	8.00K	0.00K
	HARE	LAUREL CO.	KY	4/4/2011	15:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	20.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	15:57	EST-5	Thunderstorm Wind	52 kts. EG	0	0	15.00K	0.00K

	CORBIN LONDON ARPT	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	EAST BERN-STADT	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	PINE GROVE	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
	NORTH CORBIN	LAUREL CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:02	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
	LILY	LAUREL CO.	KY	4/4/2011	16:03	EST-5	Thunderstorm Wind	52 kts. EG	0	0	20.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:04	EST-5	Thunderstorm Wind	52 kts. EG	0	0	15.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

	CORBIN LONDON ARPT	LAUREL CO.	KY	4/4/2011	16:05	EST-5	Thunderstorm Wind	55 kts. EG	0	0	8.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:04	EST-5	Thunderstorm Wind	52 kts. EG	0	0	30.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:04	EST-5	Thunderstorm Wind	52 kts. EG	0	0	15.00K	0.00K
	CORBIN LONDON ARPT	LAUREL CO.	KY	4/4/2011	16:05	EST-5	Thunderstorm Wind	55 kts. EG	0	0	8.00K	0.00K
	LONDON	LAUREL CO.	KY	4/4/2011	16:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
54	LONDON	LAUREL CO.	KY	4/27/2011	9:10	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
	MAPLES-VILLE	LAUREL CO.	KY	4/27/2011	9:14	EST-5	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
55	GREEN-MOUNT	LAUREL CO.	KY	5/14/2011	12:10	EST-5	Thunderstorm Wind	55 kts. EG	0	0	15.00K	0.00K
56	EAST BERN-STADT	LAUREL CO.	KY	5/23/2011	5:03	EST-5	Thunderstorm Wind	67 kts. MG	0	0	1.00K	0.00K
	EAST BERN-STADT	LAUREL CO.	KY	5/23/2011	5:23	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
	MC WHORTER	LAUREL CO.	KY	5/23/2011	5:28	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
	LONDON	LAUREL CO.	KY	5/26/2011	2:41	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K

57	EAST BERN-STADT	LAUREL CO.	KY	5/26/2011	2:43	EST-5	Thunderstorm Wind	55 kts. EG	0	0	3.00K	0.00K
	KEAVY	LAUREL CO.	KY	5/26/2011	2:47	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
	EAST BERN-STADT	LAUREL CO.	KY	5/26/2011	6:34	EST-5	Thunderstorm Wind	53 kts. MG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
58	EAST BERN-STADT	LAUREL CO.	KY	6/10/2011	11:46	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
59	EAST BERN-STADT	LAUREL CO.	KY	6/20/2011	1:08	EST-5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
	LONDON	LAUREL CO.	KY	6/20/2011	1:13	EST-5	Thunderstorm Wind	55 kts. EG	0	0	3.00K	0.00K
	LONDON	LAUREL CO.	KY	6/21/2011	18:19	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
60	LONDON	LAUREL CO.	KY	6/27/2011	15:48	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
	LILY	LAUREL CO.	KY	6/27/2011	15:50	EST-5	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
61	LONDON	LAUREL CO.	KY	8/8/2011	14:42	EST-5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
	PINE GROVE	LAUREL CO.	KY	8/8/2011	15:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
62	PITTSBURG	LAUREL CO.	KY	3/2/2012	19:05	EST-5	Thunderstorm Wind	60 kts. EG	0	0	10.00K	0.00K

	MC WHORTER	LAUREL CO.	KY	3/2/2012	19:10	EST-5	Thunderstorm Wind	60 kts. EG	0	0	5.00K	0.00K
	EAST BERN-STADT	LAUREL CO.	KY	3/2/2012	19:10	EST-5	Thunderstorm Wind	60 kts. EG	0	0	50.00K	0.00K
64	BALDROCK	LAUREL CO.	KY	4/26/2012	16:40	EST-5	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
65	LONDON	LAUREL CO.	KY	7/3/2012	14:17	EST-5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
66	HARE	LAUREL CO.	KY	7/5/2012	14:30	EST-5	Thunderstorm Wind	55 kts. EG	0	1	0.00K	0.00K
	LONDON	LAUREL CO.	KY	7/5/2012	14:35	EST-5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	7/5/2012	14:35	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	LONDON	LAUREL CO.	KY	7/5/2012	14:35	EST-5	Thunderstorm Wind	60 kts. EG	0	0	40.00K	0.00K
67	LONDON	LAUREL CO.	KY	7/18/2012	13:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
68	EAST BERN-STADT	LAUREL CO.	KY	9/2/2012	14:21	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
69	FARISTON	LAUREL CO.	KY	1/30/2013	7:18	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
70	LONDON	LAUREL CO.	KY	4/11/2013	17:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K

71	KEAVY	LAUREL CO.	KY	5/21/2013	16:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
72	EAST BERN-STADT	LAUREL CO.	KY	6/26/2013	23:40	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	FARISTON	LAUREL CO.	KY	6/26/2013	23:40	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
73	KEAVY	LAUREL CO.	KY	7/1/2013	14:45	EST-5	Thunderstorm Wind	50 kts. EG	0	2	0.00K	0.00K
74	HAZEL PATCH	LAUREL CO.	KY	8/31/2013	17:08	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
75	BUNCH	LAUREL CO.	KY	11/1/2013	1:10	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
76	EAST BERN-STADT	LAUREL CO.	KY	12/22/2013	0:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
77	EAST BERN-STADT	LAUREL CO.	KY	5/21/2014	21:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	PINE GROVE	LAUREL CO.	KY	5/21/2014	21:12	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	5/21/2014	21:12	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LILY	LAUREL CO.	KY	5/21/2014	21:13	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	TUTTLE	LAUREL CO.	KY	5/21/2014	21:20	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

78	VOX	LAUREL CO.	KY	6/10/2014	16:55	EST-5	Thunderstorm Wind	56 kts. MG	0	0	0.00K	0.00K
	VOX	LAUREL CO.	KY	6/10/2014	17:00	EST-5	Thunderstorm Wind	56 kts. MG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	6/10/2014	17:05	EST-5	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	6/10/2014	17:05	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	6/10/2014	17:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	6/10/2014	17:05	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	KEAVY	LAUREL CO.	KY	6/10/2014	17:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
79	LONDON	LAUREL CO.	KY	7/14/2014	13:03	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
80	MARYDELL	LAUREL CO.	KY	8/20/2014	14:20	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	GRIT	LAUREL CO.	KY	8/20/2014	14:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	MC WHORTER	LAUREL CO.	KY	8/20/2014	16:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	CRAW-FORD	LAUREL CO.	KY	8/20/2014	17:00	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K

	CONGO	LAUREL CO.	KY	8/20/2014	17:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
81	PITTSBURG	LAUREL CO.	KY	10/7/2014	15:40	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
82	EAST BERN-STADT	LAUREL CO.	KY	7/13/2015	15:50	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	LONDON	LAUREL CO.	KY	7/14/2015	5:54	EST-5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	EAST BERN-STADT	LAUREL CO.	KY	7/14/2015	19:21	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	BUSH	LAUREL CO.	KY	7/14/2015	19:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	BROCK	LAUREL CO.	KY	7/14/2015	19:39	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
83	(LOZ) MCGEE FLD LONDON	LAUREL CO.	KY	3/1/2016	15:25	EST-5	Thunderstorm Wind	78 kts. EG	0	3	0.00K	0.00K
84	EAST BERN-STADT	LAUREL CO.	KY	5/7/2016	18:16	EST-5	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
85	LONDON	LAUREL CO.	KY	6/4/2016	12:41	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
86	SYMBOL	LAUREL CO.	KY	7/4/2016	15:51	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

	BUNCH	LAUREL CO.	KY	7/4/2016	15:58	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	GREEN-MOUNT	LAUREL CO.	KY	7/4/2016	16:02	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	7/4/2016	16:03	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	ATLANTA	LAUREL CO.	KY	7/4/2016	16:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LIDA	LAUREL CO.	KY	7/4/2016	16:36	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
87	LILY	LAUREL CO.	KY	7/6/2016	17:30	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
88	MC WHORTER	LAUREL CO.	KY	7/8/2016	15:45	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
89	BERN-STADT	LAUREL CO.	KY	7/14/2016	14:25	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
	HIGHTOP	LAUREL CO.	KY	7/14/2016	14:35	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
90	LONDON	LAUREL CO.	KY	8/4/2016	15:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.01K	0.01K
91	LONDON	LAUREL CO.	KY	12/18/2016	2:25	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
92	PINE GROVE	LAUREL CO.	KY	3/1/2017	9:17	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

93	LILY	LAUREL CO.	KY	5/27/2017	19:12	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
94	BALDROCK	LAUREL CO.	KY	7/6/2017	16:45	EST-5	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
	KEAVY	LAUREL CO.	KY	7/6/2017	16:48	EST-5	Thunderstorm Wind	54 kts. EG	0	0	10.00K	0.00K
95	FLETCHER	LAUREL CO.	KY	4/3/2018	23:34	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
96	EAST BERNSTADT	LAUREL CO.	KY	5/15/2018	14:53	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
97	KEAVY	LAUREL CO.	KY	6/25/2018	13:26	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	PINE GROVE	LAUREL CO.	KY	6/26/2018	12:58	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
98	(LOZ)MCGEE FLD LONDO	LAUREL CO.	KY	7/5/2018	20:14	EST-5	Thunderstorm Wind	56 kts. MG	0	0	0.00K	0.00K
	(LOZ)MCGEE FLD LONDO	LAUREL CO.	KY	7/5/2018	20:17	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
99	PINE GROVE	LAUREL CO.	KY	7/20/2018	19:10	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	LILY	LAUREL CO.	KY	7/20/2018	19:13	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
100	(LOZ)MCGEE FLD LONDO	LAUREL CO.	KY	8/16/2018	15:20	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

101	OAKLEY EAST BERNSTADT	LAUREL CO.	KY	6/23/2019	18:36	EST-5	Thunderstorm Wind	50 kts. EG	0	0	80.00K	0.00K
		LAUREL CO.	KY	6/24/2019	15:05	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
102	LILY	LAUREL CO.	KY	6/30/2019	19:15	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
103	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/11/2020	21:51	EST-5	High Wind	50 kts. MG	0	0	0.00K	0.00K
104	BERNSTADT	LAUREL CO.	KY	5/18/2020	15:08	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.50K	1.00K
105	SYMBOL	LAUREL CO.	KY	6/10/2020	17:45	EST-5	Thunderstorm Wind	54 kts. EG	0	0	0.00K	0.60K
106	LONDON	LAUREL CO.	KY	6/21/2020	13:50	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.10K
	MC WHORTER	LAUREL CO.	KY	6/21/2020	14:02	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.20K
107	PINE GROVE	LAUREL CO.	KY	7/23/2020	13:26	EST-5	Thunderstorm Wind	43 kts. EG	0	0	0.00K	0.10K
	Totals:								0	6	816.91K	2.01K

Laurel County Thunderstorm/Wind - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually “next” to each other. While the entire timeline of the database,

from 1950 through 2020, was searched, the earliest event in the search was 5/25/1998. As only two events were prior to 2000, the denominator is set at 20 years, keeping the denominator consistent to maintain comparability between counties.

That Laurel County experienced 107 severe thunderstorm/wind events over 20 years yields that Laurel County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every two and a quarter months (i.e., 107/240). Specifically, Laurel County experienced an average of five (5) severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.44 events per month. $1/.44 = 2.27 \approx 1$ severe winter storm event on average every two and a quarter months.

Table 6-2: Laurel County Hail Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	30.011M	2.000M
1	EAST BERNSTADT	LAUREL CO.	KY	3/28/1997	22:34	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	3/28/1997	22:40	EST	Hail	1.00 in.	0	0	0.00K	0.00K
2	LONDON	LAUREL CO.	KY	5/3/1998	12:15	EST	Hail	1.75 in.	0	0	10.00K	0.00K
3	LONDON	LAUREL CO.	KY	8/19/1999	19:10	EST	Hail	1.00 in.	0	0	0.00K	0.00K
4	LONDON	LAUREL CO.	KY	6/4/2001	16:42	EST	Hail	1.00 in.	0	0	0.00K	0.00K
5	HIGHTOP	LAUREL CO.	KY	4/28/2002	12:28	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	LILY	LAUREL CO.	KY	4/28/2002	12:50	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	LILY	LAUREL CO.	KY	4/28/2002	13:00	EST	Hail	1.75 in.	0	0	0.00K	0.00K
	TUTTLE	LAUREL CO.	KY	4/28/2002	13:03	EST	Hail	1.75 in.	0	0	0.00K	0.00K
	EAST BERNSTADT	LAUREL CO.	KY	4/28/2002	14:49	EST	Hail	1.00 in.	0	0	0.00K	0.00K
6	COUNTYWIDE	LAUREL CO.	KY	5/1/2002	19:28	EST	Hail	4.50 in.	0	0	30.000M	2.000M
	NORTH CORBIN	LAUREL CO.	KY	5/2/2002	13:15	EST	Hail	1.25 in.	0	0	0.00K	0.00K

7	NORTH CORBIN	LAUREL CO.	KY	6/4/2002	17:25	EST	Hail	1.00 in.	0	0	0.00K	0.00K
8	LONDON	LAUREL CO.	KY	5/15/2003	13:45	EST	Hail	1.25 in.	0	0	0.00K	0.00K
	OAKLEY	LAUREL CO.	KY	5/15/2003	14:45	EST	Hail	1.00 in.	0	0	0.00K	0.00K
9	NORTH CORBIN	LAUREL CO.	KY	7/23/2003	15:55	EST	Hail	1.00 in.	0	0	0.00K	0.00K
10	LONDON	LAUREL CO.	KY	5/26/2004	14:55	EST	Hail	1.00 in.	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
11	LONDON	LAUREL CO.	KY	6/2/2004	16:40	EST	Hail	1.00 in.	0	0	0.00K	0.00K
12	KEAVY	LAUREL CO.	KY	7/6/2004	18:00	EST	Hail	2.00 in.	0	0	0.00K	0.00K
13	MERSHONS	LAUREL CO.	KY	6/20/2006	17:32	EST	Hail	1.25 in.	0	0	0.00K	0.00K
	MERSHONS	LAUREL CO.	KY	6/20/2006	17:38	EST	Hail	1.00 in.	0	0	0.00K	0.00K
14	LONDON	LAUREL CO.	KY	5/8/2009	15:46	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
15	CORBIN LONDON ARPT	LAUREL CO.	KY	5/14/2010	13:34	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
16	KEAVY	LAUREL CO.	KY	6/3/2010	19:48	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
17	BERNSTADT	LAUREL CO.	KY	3/23/2011	17:37	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	3/23/2011	17:40	EST-5	Hail	2.00 in.	0	0	0.00K	0.00K

	(LOZ)MCGEE FLD LONDO	LAUREL CO.	KY	3/23/2011	17:40	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	HIGHTOP	LAUREL CO.	KY	3/23/2011	17:40	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	3/23/2011	17:42	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	3/23/2011	17:43	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	3/23/2011	17:45	EST-5	Hail	2.50 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	3/23/2011	18:00	EST-5	Hail	2.50 in.	0	0	0.00K	0.00K
18	LONDON	LAUREL CO.	KY	4/9/2011	13:32	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	LONDON	LAUREL CO.	KY	4/9/2011	13:43	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
19	LONDON	LAUREL CO.	KY	8/8/2011	14:45	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
20	HARE	LAUREL CO.	KY	4/3/2012	15:55	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
21	HIGHTOP	LAUREL CO.	KY	4/26/2012	16:39	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
22	HIGHTOP	LAUREL CO.	KY	5/10/2016	22:31	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	LIDA	LAUREL CO.	KY	5/10/2016	23:08	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
23	BERNSTADT	LAUREL CO.	KY	3/27/2017	17:50	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K

	LONDON	LAUREL CO.	KY	3/27/2017	18:07	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
24	BALDROCK	LAUREL CO.	KY	5/27/2017	17:20	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	BALDROCK	LAUREL CO.	KY	5/27/2017	18:33	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
25	LONDON	LAUREL CO.	KY	7/5/2018	20:14	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	30.011M	2.000M

Laurel County Hail - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The pink versus the green highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 3/28/1997. Although the last date recorded for a hailstorm in Laurel County is 7/5/2018, the denominator is set at 20 years to maintain comparability across counties.

That Laurel County experienced 25 events with hail 1" or larger over 20 years yields that Laurel County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 10 months (i.e., 25/240). Specifically, Laurel County experienced an average of 1.2 severe hailstorm events every year. Or, using December 31, 2020 as an endpoint, this is 0.1 events per month. $1/.1 = 10 \approx 1$ severe hailstorm event an average of every 10 months.

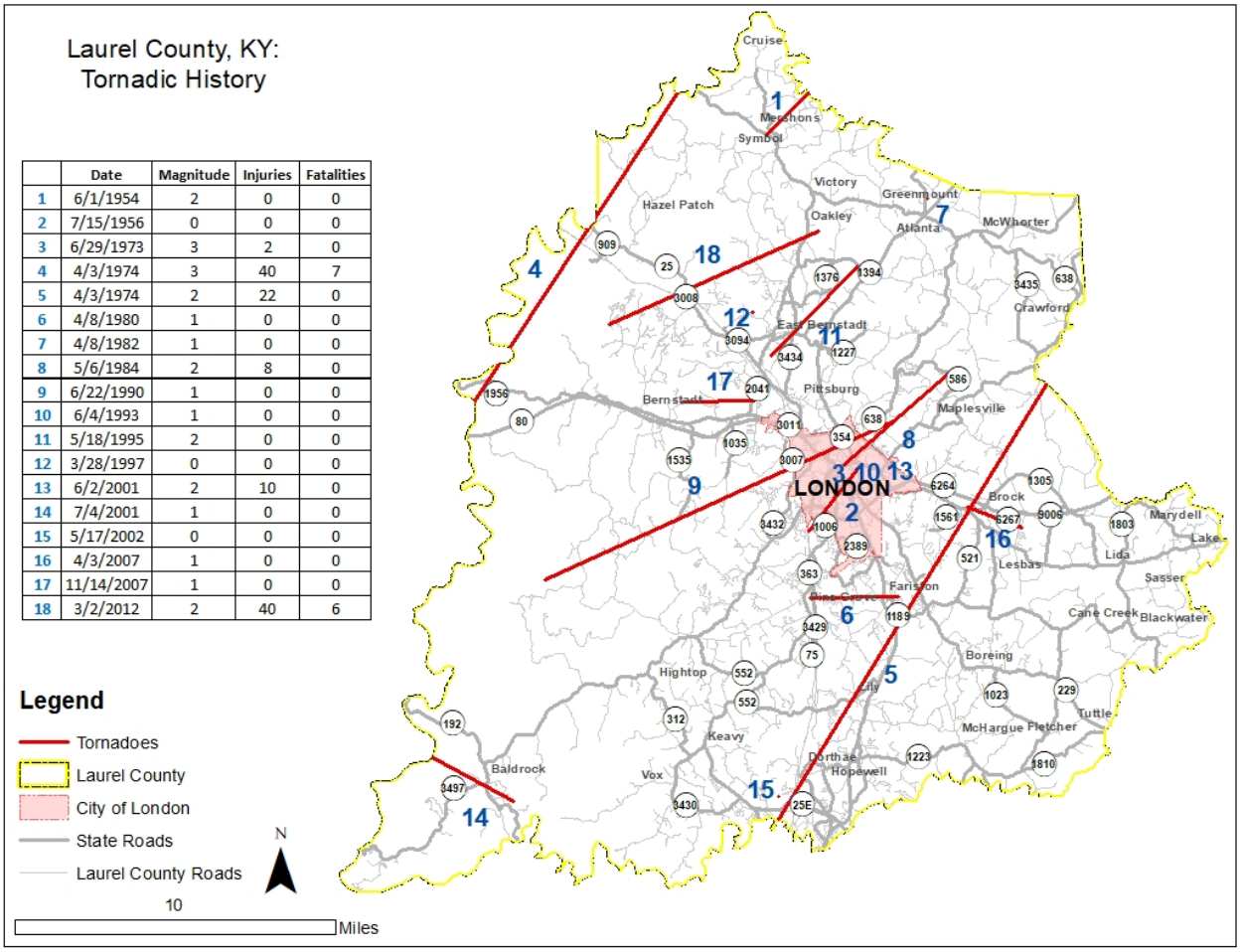
PAST SEVERE THUNDERSTORM & TORNADO EVENTS

In March 2012 an EF-2 tornado struck the East Bernstadt area in Laurel County killing six people and injuring 40. The tornado reached maximum wind speed of 125 miles per hour. The tornado set down at 7:05 p.m. and was on the ground until around 7:12 p.m. It touched down on the west side of Wood Creek Lake and traveled for 6.3 miles to just east of KY 490. The homes that were in the path of the tornado were destroyed. The following is picture shows the destructive force of the EF-2 tornado.

In June of 2014 severe thunderstorms moved through southern Kentucky causing damages to buildings and trees. The Flea Land Flea Market on KY-229 had extensive storm damage. Several buildings were damaged or destroyed. Blown over trees created problems throughout the county. More than 6,000 customers of Kentucky Utilities were without power. The following picture shows the damage caused by the severe storm at Flea Land Flea Market.

Many hazardous weather events are associated with thunderstorms. People who live in mobile homes are vulnerable to severe thunderstorms and tornados. Currently, there are no storm shelters in the Laurel County and the only emergency sirens are in the City of London and at the East Bernstadt Fire Department.

Thunderstorms can produce tornados, floods, lightning, and damaging winds. They may occur individually, in clusters or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios. Through studying past severe thunderstorm events, the county and city, can become better prepared for future disasters.



	Date	Magnitude	Injuries	Fatalities
1	6/1/1954	2	0	0
2	7/15/1956	0	0	0
3	6/29/1973	3	2	0
4	4/3/1974	3	40	7
5	4/3/1974	2	22	0
6	4/8/1980	1	0	0
7	4/8/1982	1	0	0
8	5/6/1984	2	8	0
9	6/22/1990	1	0	0
10	6/4/1993	1	0	0
11	5/18/1995	2	0	0
12	3/28/1997	0	0	0
13	6/2/2001	2	10	0
14	7/4/2001	1	0	0
15	5/17/2002	0	0	0
16	4/3/2007	1	0	0
17	11/14/2007	1	0	0
18	3/2/2012	2	40	6

Table 6-3: Knox County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								6	50	22.420M	0.00K
1	EAST BERNSTADT	LAUREL CO.	KY	3/28/1997	22:30	EST	Tornado	F0	0	0	0.00K	0.00K
2	LONDON	LAUREL CO.	KY	6/2/2001	17:02	EST	Tornado	F2	0	10	17.140M	0.00K
3	LONDON	LAUREL CO.	KY	7/4/2001	14:00	EST	Tornado	F0	0	0	0.00K	0.00K
4	NORTH CORBIN	LAUREL CO.	KY	5/17/2002	16:49	EST	Tornado	F0	0	0	55.00K	0.00K
5	LONDON	LAUREL CO.	KY	4/3/2007	20:28	EST-5	Tornado	EF1	0	0	150.00K	0.00K
6	BERNSTADT	LAUREL CO.	KY	11/14/2007	16:28	EST-5	Tornado	EF1	0	0	75.00K	0.00K
7	HAZEL PATCH	LAUREL CO.	KY	3/2/2012	19:04	EST-5	Tornado	EF2	6	40	5.000M	0.00K
	Totals:								6	50	22.420M	0.00K

Laurel County Tornados - Probability as Frequency of Event Occurrence

While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 3/28/1997. Although the last date recorded for a tornado in Laurel County is 3/2/2012, the denominator is set at 20 years to maintain comparability across counties. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen.

That Laurel County experienced 7 events with tornados over 20 years yields that Laurel County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 34 ½ months (i.e., 7/240). Specifically, Laurel County experienced an average of 1.2 tornado events every two years. Or, using December 31, 2020 as an endpoint, this is 0.029 events per month. 1/.029 = 34.5 ≈ 1 tornado event an average of every 34 ½ months or approximately one every three years.

SEVERE WINTER WEATHER

Severe winter weather threatens utilities, critical facilities, and vulnerable populations. Winter storms can range from a moderate snow over a few hours to a blizzard with blinding, wind-driven snow that lasts for several days. Some winter storms are large enough to affect several states, while others affect only a single community. Many winter storms are accompanied by dangerously low temperatures and sometimes by strong winds, icing, sleet, and freezing rain. These weather conditions can create hazardous road conditions creating major problems throughout the county.

Table 6-4: Laurel County Severe Winter Weather Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								1	0	98.00K	1.00K
1	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
4	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
5	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/19/2002	6:00	EST	Winter Storm		0	0	0.00K	0.00K
7	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/4/2002	13:45	EST	Winter Storm		0	0	4.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/4/2002	13:45	EST	Winter Storm		0	0	4.00K	0.00K
8	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/16/2003	15:45	EST	Heavy Snow		0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
9	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/25/2004	7:30	EST	Ice Storm		0	0	0.00K	0.00K
10	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/11/2006	13:00	EST	Heavy Snow		0	0	0.00K	0.00K
11	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/7/2008	20:30	EST -5	Ice Storm		0	0	0.00K	0.00K
12	LAUREL (ZONE)	LAUREL (ZONE)	KY	11/21/2008	4:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	11/21/2008	5:00	EST -5	Winter Weather		0	0	0.00K	0.00K
13	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/27/2009	2:30	EST -5	Ice Storm		0	0	0.00K	0.00K
14	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/21/2009	19:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/21/2009	21:45	EST -5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/21/2009	22:05	EST -5	Winter Weather		0	0	0.00K	0.00K
15	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/12/2009	17:00	EST -5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/12/2009	17:00	EST -5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/12/2009	17:30	EST -5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/12/2009	18:25	EST -5	Winter Weather		0	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
16	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/5/2009	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
17	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/10/2010	12:08	EST-5	Winter Weather		0	0	0.00K	0.00K
18	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/29/2010	16:20	EST-5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/29/2010	16:20	EST-5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/29/2010	16:20	EST-5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/29/2010	16:20	EST-5	Heavy Snow		0	0	0.00K	0.00K
19	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/9/2010	19:30	EST-5	Winter Weather		0	0	0.00K	0.00K
20	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/15/2010	5:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
21	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/12/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/12/2010	18:00	EST-5	Winter Weather		0	0	0.00K	0.00K
22	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/15/2010	21:00	EST-5	Winter Storm		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/15/2010	21:00	EST-5	Winter Weather		0	0	50.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/15/2010	21:00	EST-5	Winter Storm		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/15/2010	21:30	EST-5	Ice Storm		0	0	0.00K	0.00K
23	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/24/2010	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/24/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
24	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/6/2011	15:15	EST-5	Winter Weather		0	0	0.00K	0.00K
25	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
26	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/26/2011	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
27	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/9/2011	14:00	EST-5	Winter Weather		0	0	0.00K	0.00K
28	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/14/2012	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
29	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/10/2012	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/10/2012	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/10/2012	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/10/2012	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/10/2012	21:00	EST-5	Winter Weather		0	0	0.00K	0.00K
30	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/19/2012	10:35	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/19/2012	11:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/19/2012	11:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
31	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/25/2013	6:00	EST-5	Ice Storm		0	0	0.00K	0.00K
32	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/2/2014	6:50	EST-5	Winter Weather		0	0	0.00K	0.00K
33	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/6/2014	12:30	EST-5	Winter Weather		1	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
34	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/2/2014	22:00	EST-5	Winter Storm		0	0	0.00K	0.00K
35	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/16/2015	5:30	EST-5	Winter Storm		0	0	0.00K	0.00K
36	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/20/2015	22:30	EST-5	Winter Storm		0	0	0.00K	0.00K
37	LAUREL (ZONE)	LAUREL (ZONE)	KY	3/5/2015	1:00	EST-5	Winter Storm		0	0	0.00K	0.00K
38	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/22/2016	2:00	EST-5	Winter Storm		0	0	0.00K	0.00K
39	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/14/2016	15:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
40	LAUREL (ZONE)	LAUREL (ZONE)	KY	1/16/2018	5:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
41	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/8/2018	23:00	EST-5	Winter Weather		0	0	40.00K	1.00K
42	LAUREL (ZONE)	LAUREL (ZONE)	KY	12/24/2020	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	Totals: 42								1	0	98.00K	1.00K

Laurel County Severe Winter Weather - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Laurel County experienced 42 severe winter weather events over 25 years yields that Laurel County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every seven months (i.e., 42/300). Specifically, Laurel County experienced an average of 1.68 severe winter weather events each year. Or, using December 31, 2020, as an endpoint, this is 0.14 events per month. $1/0.14 = 7.14 \approx 1$ severe winter storm event an average of every seven (7) months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through November. This indicates that the winter months for Laurel County are December through March, a total of four months. When the frequency is calculated using the four winter months only (42/100), it reveals that Laurel County experienced an average of 1.68 events per winter period, or 0.42 events per winter month. $1/0.464 = 2.38$ or about 1 severe winter storm events an average of every 2 1/3 winter months.

Laurel County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Storm total snowfall amounts around the county ranged from 6 to 12 inch, with Bunch reporting the highest total of 12 inches. Up to a quarter inch of freezing rain also fell.[100]"

Laurel County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	LAUREL (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	LAUREL (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
3	LAUREL (ZONE)	12/23/1998	12/24/1998	Winter Storm	
4	LAUREL (ZONE)	1/22/2000	1/22/2000	Winter Storm	
5	LAUREL (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
6	LAUREL (ZONE)	1/19/2002	1/19/2002	Winter Storm	
7	LAUREL (ZONE)	12/4/2002	12/5/2002	Winter Storm	4 inches of snow was reported. Power lines were down due to heavy snow and some ice accumulations.
	LAUREL (ZONE)	12/4/2002	12/5/2002	Winter Storm	4 inches of snow was reported. Power lines were down due to heavy snow and some ice accumulations.
8	LAUREL (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 6 inches of snow were reported.
9	LAUREL (ZONE)	1/25/2004	1/25/2004	Ice Storm	
10	LAUREL (ZONE)	2/11/2006	2/11/2006	Heavy Snow	4 inches of snow fell in Victory.
11	LAUREL (ZONE)	3/7/2008	3/8/2008	Ice Storm	One quarter of an inch of ice and two inches of snow accumulated in London.
12	LAUREL (ZONE)	11/21/2008	11/21/2008	Winter Weather	A trained weather observer reported a snowfall of 0.6 inches in Bunch.
	LAUREL (ZONE)	11/21/2008	11/21/2008	Winter Weather	A trained weather observer reported a snowfall amount of 0.4 inches in Victory.

[100] "Storm Events Database Event Details – Laurel County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
13	LAUREL (ZONE)	1/27/2009	1/27/2009	Ice Storm	A weather observer reported one quarter of an inch of ice accumulation from freezing rain near London.
14	LAUREL (ZONE)	2/21/2009	2/22/2009	Winter Weather	One and a half inches of snow fell in London since the evening of February 21.
	LAUREL (ZONE)	2/21/2009	2/21/2009	Winter Weather	One and a half inches of snow fell in an hour and a half in Keavy.
	LAUREL (ZONE)	2/21/2009	2/22/2009	Winter Weather	One and a half inches of snow fell 1 mile southeast of the London airport.
15	LAUREL (ZONE)	3/12/2009	3/13/2009	Heavy Snow	Five and a half inches of snow fell in Tuttle.
	LAUREL (ZONE)	3/12/2009	3/13/2009	Winter Weather	Three inches of snow fell 2 miles northwest of Dorthae.
	LAUREL (ZONE)	3/12/2009	3/13/2009	Winter Weather	Three inches of snow fell in Tuttle.
	LAUREL (ZONE)	3/12/2009	3/13/2009	Winter Weather	Two inches of snow fell in London.
16	LAUREL (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch of snow fell in Keavy.
17	LAUREL (ZONE)	1/10/2010	1/10/2010	Winter Weather	The current snow depth 10 miles west of London was 3 inches.
18	LAUREL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public reported that 6 inches of snow had fallen 10 miles southwest of London.
	LAUREL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept reported that at least 6 inches of snow had fallen across the county.
	LAUREL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A trained spotter measured 5.5 to 6 inches of snow in London.
	LAUREL (ZONE)	1/29/2010	1/30/2010	Heavy Snow	Six inches of snow fell in Keavy.
19	LAUREL (ZONE)	2/9/2010	2/9/2010	Winter Weather	A trained spotter reported white out conditions and snow covered roads in London.

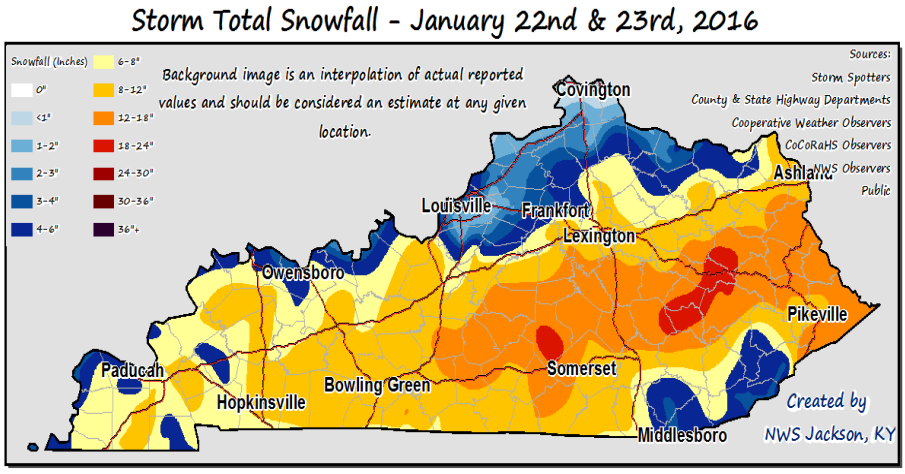
Count	County	Begin Date	End Date	Type	Extent: Event Narrative
20	LAUREL (ZONE)	2/15/2010	2/16/2010	Winter Weather	Three inches of snow fell in Bunch between 8 am Monday and 8 am Tuesday.
	LAUREL (ZONE)	2/15/2010	2/16/2010	Winter Weather	Two and a half inches of snow fell 2 miles northeast of London.
	LAUREL (ZONE)	2/15/2010	2/16/2010	Heavy Snow	A former coop observer reported a snow depth of 4 inches in London as of 905 am.
	LAUREL (ZONE)	2/15/2010	2/16/2010	Winter Weather	The storm total snowfall since early Monday morning was 4.5 inches 2 miles northeast of London.
	LAUREL (ZONE)	2/15/2010	2/16/2010	Winter Weather	One and two tenths of an inch of snow fell in London between 5 am Monday and 8 am Tuesday.
	LAUREL (ZONE)	2/15/2010	2/16/2010	Winter Weather	One and three tenths of an inch of snow fell in Keavy.
21	LAUREL (ZONE)	12/12/2010	12/13/2010	Winter Weather	The snowfall total at Keavy since 6 am Sunday morning was 5 inches. The snow ended around 130 am on Monday.
	LAUREL (ZONE)	12/12/2010	12/13/2010	Winter Weather	Four inches of snow fell in London.
22	LAUREL (ZONE)	12/15/2010	12/16/2010	Winter Storm	Ice accumulated between one eigth and one quarter of an inch on cars, fences, and trees. Side roads and parking lots were covered by an eigth of an inch of ice and main roads were slushy.
	LAUREL (ZONE)	12/15/2010	12/16/2010	Winter Weather	Multiple accidents occurred on I75 in the London area due to icy roads.
	LAUREL (ZONE)	12/15/2010	12/16/2010	Winter Storm	A quarter of an inch of ice accumulated in London.
	LAUREL (ZONE)	12/15/2010	12/16/2010	Ice Storm	A quarter to a half of an inch of ice accumulated on paved roads and tree limbs in Bunch. A snow depth of one inch was also reported.
23	LAUREL (ZONE)	12/24/2010	12/25/2010	Winter Weather	The running snowfall total 1 mile southeast of London was 2.8 inches.
	LAUREL (ZONE)	12/24/2010	12/24/2010	Winter Weather	Two tenths of an inch of snow fell in Keavy.
24	LAUREL (ZONE)	1/6/2011	1/7/2011	Winter Weather	Two and a half to 3 inches of snow fell in the last 24 hours 7 miles east of London.
25	LAUREL (ZONE)	1/20/2011	1/20/2011	Winter Weather	Three quarters to an inch of snow had fallen in London.
26	LAUREL (ZONE)	1/26/2011	1/26/2011	Winter Weather	The snow accumulated 2 inches.
27	LAUREL (ZONE)	2/9/2011	2/9/2011	Winter Weather	Two and a half inches of snow fell in Keavy.
28	LAUREL (ZONE)	1/14/2012	1/15/2012	Winter Weather	Two tenths of an inch of snow fell in Bunch.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
29	LAUREL (ZONE)	2/10/2012	2/11/2012	Winter Weather	One and one tenth of an inch of snow fell in Bunch.
	LAUREL (ZONE)	2/10/2012	2/10/2012	Winter Weather	Nine tenths of an inch of snow fell in London.
	LAUREL (ZONE)	2/10/2012	2/10/2012	Winter Weather	An inch of snow fell in London.
	LAUREL (ZONE)	2/10/2012	2/11/2012	Winter Weather	One and eight tenths of an inch of snow fell in London.
	LAUREL (ZONE)	2/10/2012	2/11/2012	Winter Weather	Four tenths of an inch of snow fell 11 miles southeast of London.
30	LAUREL (ZONE)	2/19/2012	2/19/2012	Winter Weather	Three and two tenths of an inch of snow had fallen over the past 3 hours for a storm total of 3.5 inches.
	LAUREL (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Three and six tenths of an inch of snow had fallen 11 miles southeast of London over a three and a half hour period.
	LAUREL (ZONE)	2/19/2012	2/19/2012	Winter Weather	Three inches of snow fell 5 miles south of London.
	LAUREL (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Five inches of snow fell in London.
	LAUREL (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Four and a half inches of snow fell in Keavy.
31	LAUREL (ZONE)	1/25/2013	1/25/2013	Ice Storm	Ice amounts ranged from 2/10 in London with 1/4 amounts in the northern and southern end of the county.
32	LAUREL (ZONE)	1/2/2014	1/2/2014	Winter Weather	The Hal Rogers Parkway was closed in both directions between London and Manchester due to slick road conditions caused by freezing rain.
33	LAUREL (ZONE)	1/6/2014	1/6/2014	Winter Weather	Interstate 75 was blocked due to an injury accident as a result of a vehicle loosing control on black ice. The injured motorist later died at the hospital.
34	LAUREL (ZONE)	3/2/2014	3/3/2014	Winter Storm	The county Highway Dept. reported that 3 to 4 inches of snow and around an inch of ice had accumulated across the county. The ice total included both freezing rain and sleet.
35	LAUREL (ZONE)	2/16/2015	2/16/2015	Winter Storm	A volunteer weather observer at the Kentucky State Police post in London reported that 4 inches of snow had fallen as of 1003 am. Five inches of snow had fallen in Sublimity City by 1215 pm. London had received 6 inches of snow as of 2 pm. The highest snowfall totals by storms end were reported in Sublimity City, where 8 to 9 inches of snow ended up falling.
36	LAUREL (ZONE)	2/20/2015	2/21/2015	Winter Storm	Quarter inch ice accumulations occurred throughout the county.
37	LAUREL (ZONE)	3/5/2015	3/5/2015	Winter Storm	Up to 4 inches of snow and sleet accumulated across Laurel county.
38	LAUREL (ZONE)	1/22/2016	1/23/2016	Winter Storm	Storm total snowfall amounts around the county ranged from 6 to 12 inches, with Bunch reporting the highest total of 12 inches. Up to a quarter inch of freezing rain also fell.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
39	LAUREL (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 4 to 6 inches across the county. Some freezing rain and sleet also mixed in but amounts were inconsequential.
40	LAUREL (ZONE)	1/16/2018	1/16/2018	Heavy Snow	
41	LAUREL (ZONE)	12/8/2018	12/9/2018	Winter Weather	
42	LAUREL (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Emergency Management reported 4.5 inches of snow in London at 1:50 am EST on 12/25, falling in less than a 12 hour time period.
43	LAUREL (ZONE)	2/1/2021	2/2/2021	Winter Weather	A member of the public reported that 2.5 inches of snow had fallen in London.
44	LAUREL (ZONE)	2/14/2021	2/16/2021	Ice Storm	Three tenths of an inch of ice accumulation due to freezing rain occurred in and around North Corbin.
	LAUREL (ZONE)	2/14/2021	2/16/2021	Ice Storm	The ASOS station at the London-Corbin Airport recorded 0.27 inches of ice accumulation due to freezing rain.
45	LAUREL (ZONE)	2/17/2021	2/18/2021	Heavy Snow	An estimated snowfall amount of 3.5 inches was reported in London.
	LAUREL (ZONE)	2/17/2021	2/18/2021	Heavy Snow	An estimated 3.5 inches of snow fell in East Bernstadt.
	LAUREL (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Four inches of snowfall was measured near Wood Creek Lake.

PAST SEVERE WINTER STORM EVENTS

In January 2016 a major snow storm slammed Kentucky. The National Weather Service in Jackson reported 12 to 15 inches of snow for Laurel County. Tractor trailers were unable to climb the snowy, steep hills of Rockcastle and Laurel Counties blocking the highway. Due to the severity of the snow storm Kentucky State Police closed Interstate 75 in both directions. Several thousand motorists were stranded on I-75. Emergency workers took food and water to people stuck in vehicles. Large trucks were also getting stuck on Highway 80 between London and Somerset. Around 150 people sought refuge at Red Cross shelters opened for stranded motorists along I-75 in Berea, Mt. Vernon, and London. Kentucky State Police checked on motorists unable to leave the highway.



The Laurel County fire departments assist the people living in their districts when winter weather hits. The Campground Fire Department has been used as a warming shelter. The Laurel County Rescue Squad has assisted healthcare workers get to and from work when roads became slick and dangerous. Severe winter storms have caused widespread problems for Laurel County in the past. By reviewing these previous winter storm events emergency personnel can discover vulnerabilities and be better prepared for future storm events.

LAUREL COUNTY FLOODING PROFILE

In order to address systematically the number of previous flooding occurrences, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from flooding for Laurel County, Kentucky and for its incorporated city. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Laurel County and for its unincorporated and incorporated cities.

The only incorporated city for Laurel County is the City of London. In order to capture "Flood" and "Flash Flood" events specific to the incorporated city, the below tables include all "Flood" and "Flash Flood" events having searched the entire date range of available data within the NCEI "Storm Events Database," i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of "probability"), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Laurel County and the City of London, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines "probability" in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the "Flood" and "Flash Flood" events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for Laurel County as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 6-5: Laurel County Flooding Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	163.7K	2K
1	TUTTLE	LAUREL CO.	KY	11/30/1996	23:00	EST	Flash Flood		0	0	5.00K	0.00 K
2	COUNTY WIDE	LAUREL CO.	KY	4/16/1998	19:00	EST	Flash Flood		0	0	30.00K	0.00 K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	4/17/1998	6:45	EST	Flood		0	0	0.00K	0.00 K
	COUNTY WIDE	LAUREL CO.	KY	4/18/1998	22:00	EST	Flash Flood		0	0	10.00K	0.00 K
3	TUTTLE	LAUREL CO.	KY	7/4/2001	14:35	EST	Flash Flood		0	0	3.00K	0.00 K
4	DORTHA	LAUREL CO.	KY	2/14/2003	22:48	EST	Flash Flood		0	0	50.00K	0.00 K
	LILY	LAUREL CO.	KY	2/15/2003	12:30	EST	Flash Flood		0	0	0.00K	0.00 K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/16/2003	9:00	EST	Flood		0	0	0.00K	0.00 K
5	GREEN-MOUNT	LAUREL CO.	KY	6/18/2003	14:15	EST	Flash Flood		0	0	0.00K	0.00 K
6	LAUREL (ZONE)	LAUREL (ZONE)	KY	2/6/2004	19:00	EST	Flood		0	0	0.00K	0.00 K
7	MER-SHONS	LAUREL CO.	KY	5/10/2004	16:15	EST	Flash Flood	0	0	0	0.00K	0.00 K
8	EAST BERN-STADT	LAUREL CO.	KY	6/4/2004	4:15	EST	Flash Flood		0	0	0.00K	0.00 K
9	LAUREL (ZONE)	LAUREL (ZONE)	KY	9/17/2004	4:50	EST	Flood		0	0	0.00K	0.00 K
	VICTORY	LAUREL CO.	KY	9/17/2004	5:30	EST	Flash Flood		0	0	0.00K	0.00 K
	LAUREL (ZONE)	LAUREL (ZONE)	KY	9/18/2004	2:27	EST	Flood		0	0	0.00K	0.00 K
10	PITTS-BURG	LAUREL CO.	KY	5/4/2007	15:28	EST -5	Flash Flood		0	0	0.00K	0.00 K
11	PITTS-BURG	LAUREL CO.	KY	4/11/2008	14:45	EST -5	Flash Flood		0	0	50.00K	0.00 K
12	PINE GROVE	LAUREL CO.	KY	6/11/2009	13:48	EST -5	Flash Flood		0	0	0.00K	0.00 K
14	TUTTLE	LAUREL CO.	KY	11/30/2010	15:00	EST -5	Flash Flood		0	0	1.00K	1.00 K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	LAKE	LAUREL CO.	KY	11/30/2010	15:00	EST-5	Flash Flood		0	0	0.00K	0.00K
15	HIGHTOP	LAUREL CO.	KY	4/27/2011	19:30	EST-5	Flash Flood		0	0	0.00K	0.00K
16	(LOZ)MC GEE FLD LONDON	LAUREL CO.	KY	8/9/2012	14:00	EST-5	Flash Flood		0	0	1.00K	0.00K
	PITTS-BURG	LAUREL CO.	KY	8/9/2012	14:45	EST-5	Flash Flood		0	0	1.00K	0.00K
17	EAST BERN-STADT	LAUREL CO.	KY	4/17/2013	9:00	EST-5	Flood		0	0	0.00K	0.00K
18	BERN-STADT	LAUREL CO.	KY	12/6/2013	15:45	EST-5	Flood		0	0	1.00K	1.00K
19	FARIS-TON	LAUREL CO.	KY	3/4/2015	17:48	EST-5	Flood		0	0	1.00K	0.00K
20	PINE GROVE	LAUREL CO.	KY	7/3/2015	12:04	EST-5	Flash Flood		0	0	1.00K	0.00K
	TUTTLE	LAUREL CO.	KY	7/3/2015	20:49	EST-5	Flash Flood		0	0	5.00K	0.00K
21	EAST BERN-STADT	LAUREL CO.	KY	7/14/2015	7:26	EST-5	Flash Flood		0	0	1.00K	0.00K
22	MAPLES-VILLE	LAUREL CO.	KY	2/20/2019	14:43	EST-5	Flood		0	0	0.00K	0.00K
	LILY	LAUREL CO.	KY	2/20/2019	14:43	EST-5	Flood		0	0	0.00K	0.00K
23	(LOZ)MC GEE FLD LONDON	LAUREL CO.	KY	6/30/2019	22:40	EST-5	Flash Flood		0	0	2.50K	0.00K
24	(LOZ)MC GEE FLD LONDON	LAUREL CO.	KY	7/1/2019	0:00	EST-5	Flood		0	0	1.00K	0.00K
25	MAPLES-VILLE	LAUREL CO.	KY	5/5/2020	8:11	EST-5	Flood		0	0	0.00K	0.00K
	DORTHA	LAUREL CO.	KY	5/5/2020	9:15	EST-5	Flood		0	0	0.00K	0.00K
	TUTTLE	LAUREL CO.	KY	5/5/2020	8:30	EST-5	Flash Flood		0	0	0.20K	0.00K
	Totals: 25								0	0	163.7K	2K

Laurel County Flooding - Probability as Frequency of Event Occurrence
The highlighted rows in the above table are assumed to be clusters of discrete events that comprise, in actuality, one event per cluster for the purpose of defining a denominator for illustrating frequency.

That Laurel County, unincorporated (and its unincorporated cities) independently experienced 25 flooding events over 25 years yields that Laurel County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every year (i.e., 25/25). Specifically, Laurel County, unincorporated and its unincorporated cities experienced an average of 1flooding event each year. Or, using December 31, 2020 as an endpoint, 25/300 months is 0.08 events per month. $1/0.08 = 12.5 \approx 1$ flooding event an average of every twelve months.

(Laurel County and London) Past flooding events

The City of London has been very proactive with flood mitigation. By reviewing past flood events Laurel County emergency personnel can identify vulnerabilities enabling them to become better prepared for future events.

However, some flooding issues remain. As reported on the City of London website on March 1, 2021[101], "Businesses and roadways became flooded and dangerous during Sunday evening and into Monday morning. City-wide emergency personnel from London Police to London Fire, and London-Laurel Rescue worked wrecks, temporarily closed roadways, assisted Carnaby Square with flooding, and rescued individuals trapped within their vehicles due to swift traveling water." The website also posted the following photographs, both taken inside the London city limits during the Feb. 28-March 1, 2021, flooding:

[101] Flooding within city limits. March 1, 2021 City of London, KY, website. Retrieved on 2-7-2022 from Flooding within city limits | City of London, Kentucky (londonky.gov).

Outside the city limits, flooding is still a problem. Rural areas in the county that are often prone to water-covered roadways include Court Road, Hopper Creek, Echo Valley, Hopkins Cemetery Road, Greenmount, and Mt. Zion Road. On March 27, 2021, for example, severe thunderstorms producing hail came through Laurel County. At that time, the county dispatch "reported a road being impassable in the McHargue community"[102], which is about eight miles south of London.

Mitigation efforts in the City of London

To better protect the vulnerable people and property near the Sampson Branch – Whitley Branch area from flooding, the City of London has implemented several flood mitigation projects. This has been a work in progress for several years. Before these flood mitigation projects were completed, there was major flooding on Mill Street. The city completed an engineering study to discover what needed to be done to resolve the flooding Issues. They acquired two homes that were in the floodplain and created retention ponds where the houses were. The drainpipes from the 1920s ranging in size from 24" to 34" were replaced with new 84" pipe. Ditches were replaced with underground pipes to increase drainage capabilities.

Previous Hazard Mitigation Projects		
Title of Project	**Funded By:**	**Amount**
Sampson Branch Project	Loan	$1,000,000
Whitley Branch – N. Mill Street	FEMA	$900,000
Whitley Branch – S. Mill Street	TAP Grant	$750,000
Whitney Branch Nevada St. Bridge	City of London	$200,000
Whitley Branch Wetland Restoration	319	$250,000
	Total:	$3,100,000

[102] "Storm Events Database Event Details – Boreing, KY". NCEI. Retrieved on 4-6-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

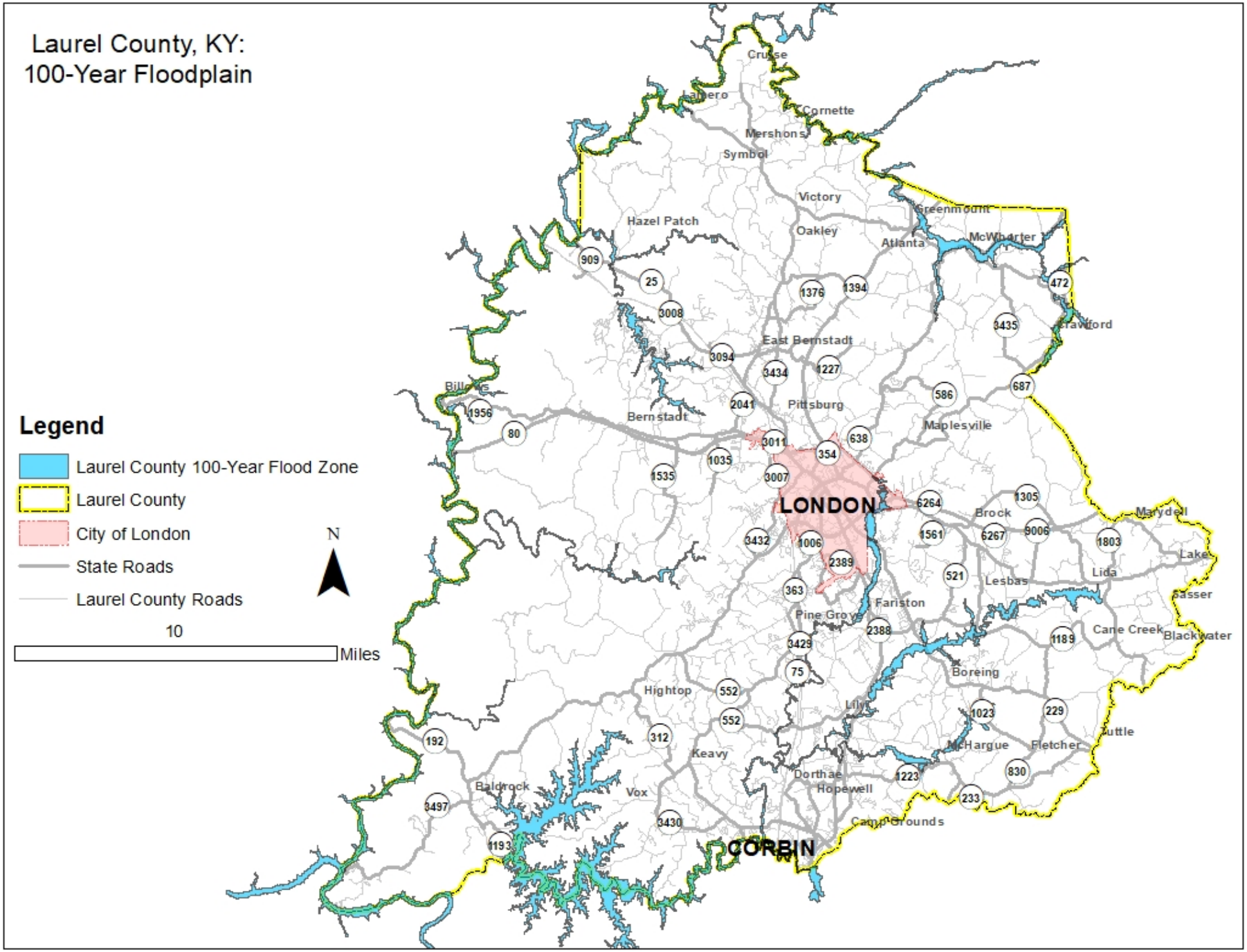
These mitigation projects have resolved most of the flooding issues in the City of London. The City of London was awarded a $400,000 TAPP grant to fix erosion issues at 5th Street and finished that project.

However, some flooding issues remain. As reported on the City of London website on March 1, 2021[103], "Businesses and roadways became flooded and dangerous during Sunday evening and into Monday morning. City-wide emergency personnel from London Police to London Fire, and London-Laurel Rescue worked wrecks, temporarily closed roadways, assisted Carnaby Square with flooding, and rescued individuals trapped within their vehicles due to swift traveling water." The website also posted the following photographs, both taken inside the London city limits during the Feb. 28-March 1, 2021, flooding:

[103] Flooding within city limits. March 1, 2021 City of London, KY, website. Retrieved on 2-7-2022 from Flooding within city limits | City of London, Kentucky (londonky.gov).

Outside the city limits, flooding is still a problem. The rural areas in the county that are often prone to water-covered roadways are: Court Road, Hopper Creek, Echo Valley, Hopkins Cemetery Road, Greenmount, and Mt. Zion Road. Most of these areas have alternate routes that people can take, but at the section of Mt. Zion at the bridge there is nowhere else for people to cross into Laurel County or Jackson County.

The City of London has been very proactive with flood mitigation. By reviewing past flood events Laurel County emergency personnel can identify vulnerabilities enabling them to become better prepared for future events.


Laurel County, KY:
100-Year Floodplain
Legend
Laurel County 100-Year Flood Zone
Laurel County
City of London
State Roads
Laurel County Roads
10
Miles
N
LONDON
CORBIN
Cruise
Cornette
Mershons
Symbol
Victory
Greenmount
Hazel Patch
Oakley
Atlanta
McWhorter
East Bernstadt
Pittsburg
Bernstadt
Maplesville
Brock
Marydell
Lesbas
Lida
Lakes
Sasser
Fariston
Pine Grove
Cane Creek
Blackwater
Boreing
Hightop
Lily
Keavy
Dorthae
Hopewell
McHargue
Fletcher
Tuttle
Baldrock
Vox
Camp Grounds
909
25
1376
1394
472
3008
3435
3094
3434
1227
687
586
1956
80
2041
3011
638
354
1035
1535
3007
1305
6264
1561
6267
9006
1803
3432
1006
2389
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1189
3429
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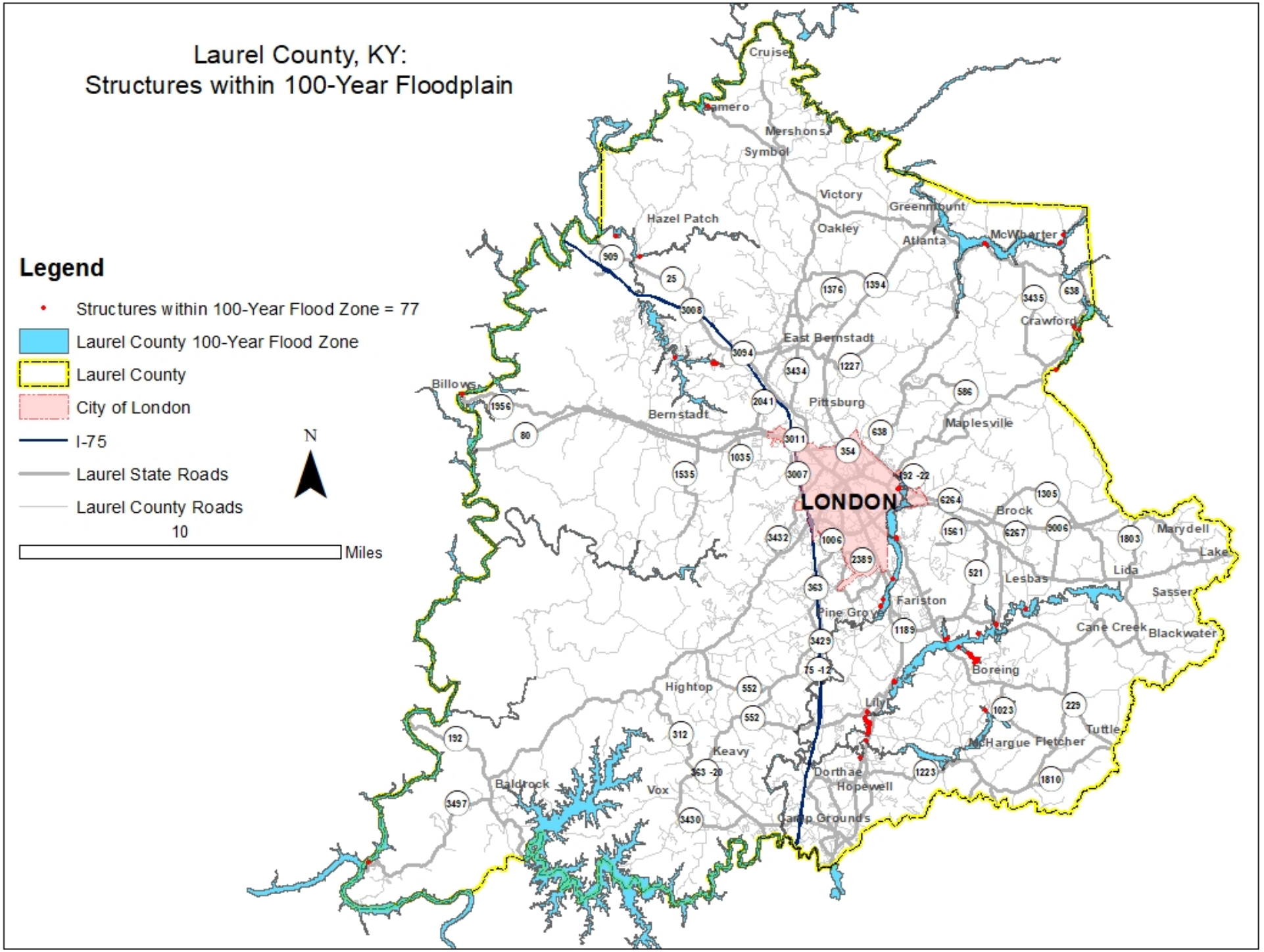
233
3497
3430
1193


Laurel County, KY:
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 77
Laurel County 100-Year Flood Zone
Laurel County
City of London
I-75
Laurel State Roads
Laurel County Roads
10
Miles
N
LONDON
Cruise
Camero
Mershons
Symbol
Victory
Greenmount
Hazel Patch
Oakley
Atlanta
McWharter
Crawford
East Bernstadt
Billows
Bernstadt
Pittsburg
Maplesville
Brock
Marydell
Lake
Lida
Lesbas
Sasser
Fariston
Pine Grove
Cane Creek
Blackwater
Boreing
Hightop
Lily
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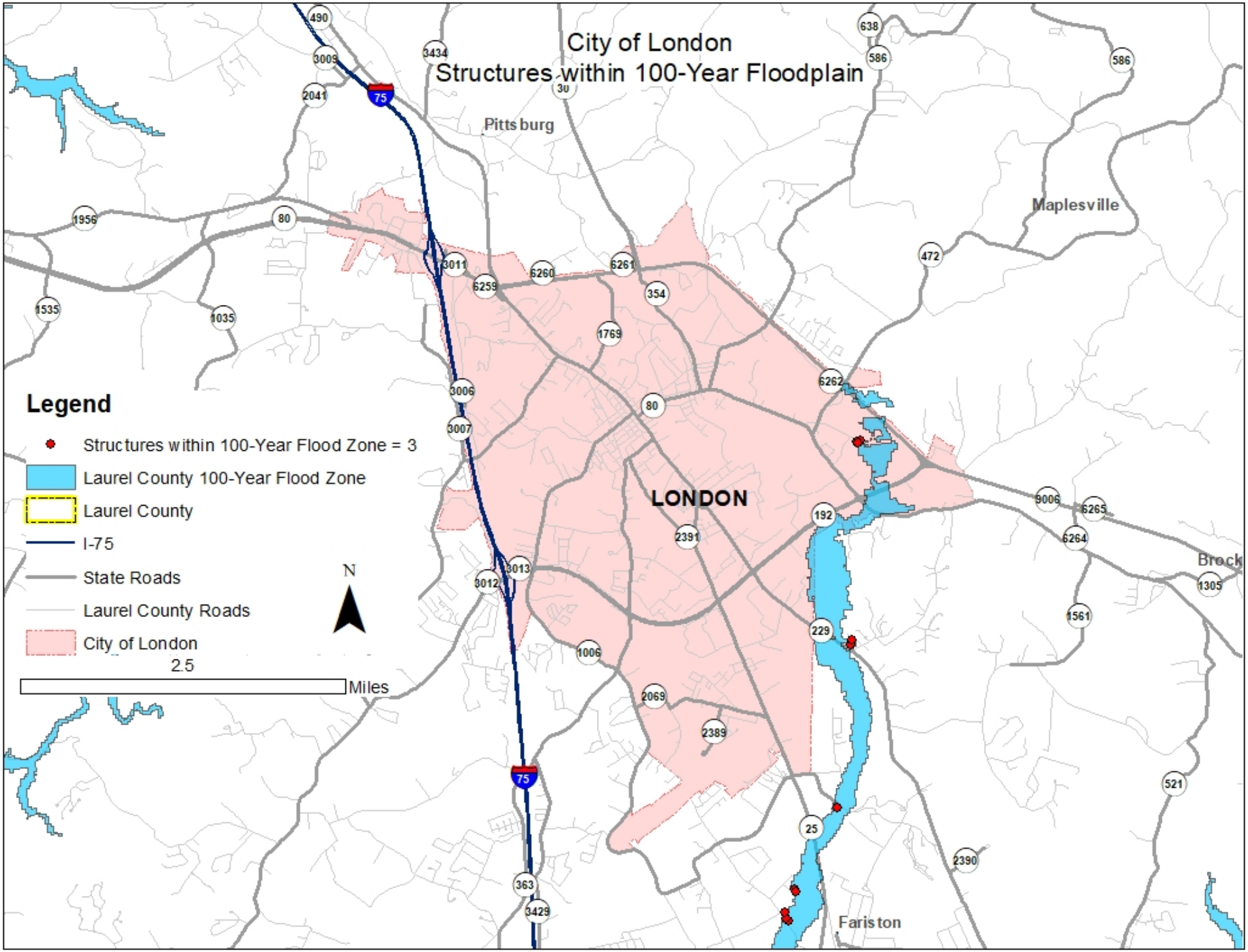
Fletcher
Keavy
Dorthae
Hopewell
Vox
Baldrock
Camp Grounds


City of London
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 3
Laurel County 100-Year Flood Zone
Laurel County
I-75
State Roads
Laurel County Roads
City of London
2.5
Miles
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LONDON
Pittsburg
Maplesville
Brock
Fariston
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3434
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638
586
1956
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1535
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3011
6259
6260
6261
354
1769
472
3006
3007
6262
192
2391
9006
6265
6264
1305
1561
3013
3012
229
1006
2069
2389
521
25
2390
363
3429

ASSESSING VULNERABILITY: IDENTIFYING ASSETS

Using best available data CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the County. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

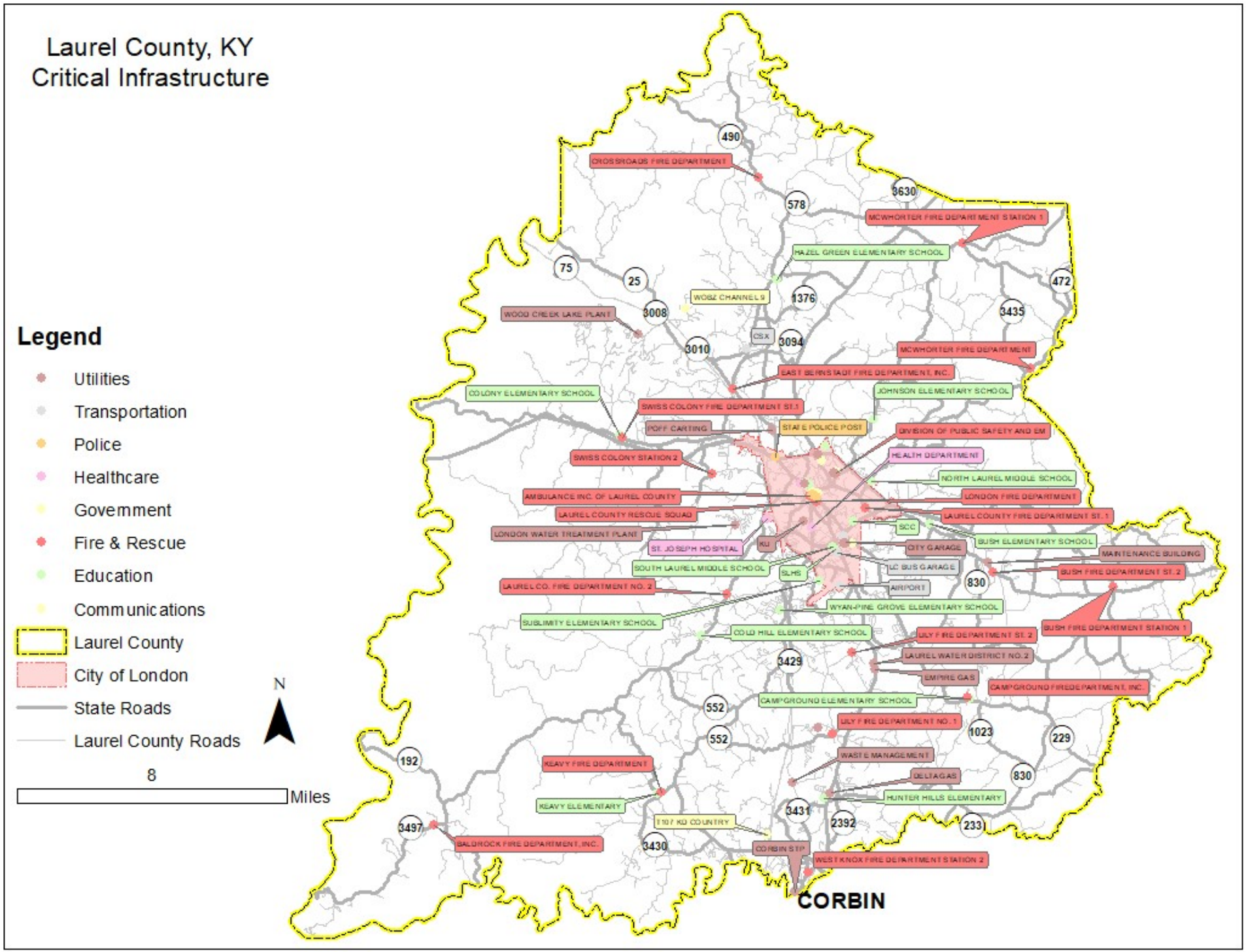
Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 0 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Laurel County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Laurel County Critical Infrastructure		***Structures Located in Floodplain**	
Location	**Address**	**Property Replacement Value**	**Coordinates**
City of London			
London City Police Department/911 Center	503 S. Main Street, London, KY 40741	$1,367,878.00	N37.07.35/W084.04.54
London City Garage	364 Barbourville Rd. London, KY 40741	$572,154.00	N37.06.22/W084.03.47
London Recycling	950 TLC Lane London, KY 40741	$700,000	
Laurel Heights	208 West 12th Street London, KY 40741	8,934,580	
Village Heights & Laurel Village	815 North Mill Street London, KY 40741	$7,941,835	
City Hall	501 S. Main London, KY 40741	$450,000	N37.07.35/W084.04.55
Laurel County			
Emergency Operations Center	168 Substation Street London, KY 40741	854,657	N37.08.11/W084.04.15
CSX	HWY 490 East Bernstadt, KY 40729	$25,000,000	N37.11.28/W084.07.06
Laurel County Senior Citizen Center	426 E. 4th Street London, KY 40741	225,666	
Laurel County Historical Society	310 W. 3rd Street London, KY 40741	$1,591,350	N37.07.35/W084.05.05
Laurel County Fiscal Court & London/Laurel County Judicial Center	101 S. Main Street London, KY 40471	$21,000,000	N37.07.42/W084.05.01
London/Laurel County Detention Center	206 W. 4th Street London, KY 40741	$6,000,000	
Laurel County Work Release Building	206 West 4th Street London, KY 40741	3,394,880	
Laurel County Health Department	525 Whitley St. London, KY 40741	$1,500,000	N37.06.48/W084.05.06
Laurel County Sheriff's Department	203 S. Broad Street London, KY 40741	$530,450	N37.07.38/W084.05.01
Kentucky State Police	11 State Police Road London, KY 40741	$450,000	N37.08.37/W084.05.01
National Guard Armory	213 Armory Street & 20 State Police Road London, KY 40741	$900,000	
Laurel County Road Department	164 Substation Street London, KY 40741	TBD	N37.08.14/W084.04.15

Laurel County Solid Waste Department	163 Substation Street London, KY 40741	TBD	N37.08.11/W084.04.17
London/Corbin Airport	566 Hal Rogers Drive London, KY 40741	$7,310,300	
Water Treatment			
London Water Treatment Plant	1036 Waterworks Rd London, KY 40741	8,000,000	N37.06.38/W084.07.20
London Utility Commission	801 N. Main Street London, KY 40741	$700,000	
Wood Creek Water District	East Bernstadt, KY 40729	$36,157,177	N37.11.53/W084.10.37
East Laurel Water District	1670 Hal Rogers Pkwy, London, KY 40741	$5,566,572	N37.08.40/W084.04.51
West Laurel Water	1670 Hal Rogers Pkwy, London, KY 40741	$5,660,443	
Laurel Water District #2	3910 S Laurel Rd, London, KY 40744	$890,000	N37.03.14/W084.03.09
Corbin Utility Pump Station on Laurel Lake & Corbin Utility Sewer Treatment Plant		$266,000	N36.58.12/W084.07.11
London Wastewater Plant	236 Lagoon Trail London, KY 40744	$15,000,000	
Electrical Infrastructure			
KY Utilities		$1,209,300	
Jackson Energy	Barbourville Rd, London, KY 40744	160,000,000	
East KY Power		$60,000,000	
Gas Infrastructure			
Delta Natural Gas		$375,000	N36.59.53/W084.04.38
Ferrell Gas		TBD	N37.06.16/W084.03.37
Jackson Propane		TBD	
Empire Gas		TBD	N37.03.05/W084.03.09
Schools			
Laurel County Bus Garage	275 S. Laurel Rd, London, KY 40744	$9,900,000	
Laurel County Center for Innovation	110 East 4th St. London, KY 40741	TBD	N37.06.08/W084.04.29
Central Office for Laurel Co. Board of Education	718 North Main Street London, KY 40741	4,800,000	N37.06.06/W084.04.17
Maintenance Building	786 Sublimity School Rd, London, KY 40744	$1,400,000	
Maintenance Building	3962 East Laurel Rd, London, KY 40744	$1,300,000	
Sublimity Elementary School	900 Sublimity School Rd, London, KY 40744	$8,500,000	N.37.05.25/W084.04.52
Bentley School/Day Treatment	65 Marydell Rd, London, KY 40744	$6,700,000	
Bush Elementary School	1832 E Laurel Rd, London, KY 40744	$11,900,000	N37.06.52/W084.01.14
Campground Elementary School	6800 Barbourville Rd London, KY 40744	$7,400,000	N37.02.255/W084.00.060
Cold Hill Elementary School	4012 West Laurel Rd, London, KY 40744	$8,400,000	N37.04.03/W084.08.42
Colony Elementary School	3656 Somerset Rd, London, KY 40744	$9,100,000	N37.09.17/W84.11.15
East Bernstadt Independent School	229 School Street	$5,700,000	N37.11.24/W084.06.50

Hazel Green Elementary School	2515 Hwy 1394 East Bernstadt, KY 40729	$9,500,000	N37.13.14/W084.06.06
Hunter Hills Elementary School	8325 S. US Hwy25 Lily, KY 40701	$13,000,000	N36.59.46/W084.04.51
Keavy Elementary School	598 West Hey 312 Keavy, KY	$8,500,000	N36.59.43/W084.09.42
London Elementary School	600 North Main Street London, KY 40741	$20,800,000	N37.06.37/W084.05.09
London Christian Academy	1505 S Main St. London, KY 40741	TBD	N37.06.37/W084.04.31
Wyann-Pine Grove Elementary School	2330 Keavy Road, Keavy, KY	$22,568,000	N37.06.37/W084.06.10
North Laurel High School	1300 Hal Rogers Parkway London, KY 40741	$30,400,000	N37.08.53/W084.04.37
North Laurel Middle School	101 Johnson Road, London, KY 40741	$20,000,000	N37.07.57/WW084.03.07
South Laurel High School	2015 S. Laurel Road, London, KY 40741	$36,500,000	N37.06.12/W084.04.20
South Laurel Middle School	223 S. Laurel Rd, London, KY 40741	$19,500,000	N37.06.16/W084.03.07
Universities			
Somerset Community College	235 S Laurel Rd, London, KY 40744	TBD	N37.07.06/W084.03.50
Volunteer Fire Departments			
Baldrock Fire Department	101 London Dock Rd, London, KY 40744	$311,464	N37.04.04/W084.08.57
Bush Fire Department Station 1	60 Marydale Rd, London, KY 40744	$491,528	N37.05.05/W083.55.21
Bush Fire Department Station 2	4250 East Laurel Rd, London, KY 40744	$212,914	N37.05.33/W083.59.15
Campground Fire Department, Inc	23 Campground School Rd, London, KY 40744	$285,646	N37.02.18/W084.00.10
Crossroads Fire Department	7274 Highway 490 East Bernstadt, KY 40729	$221,831	N37.15.54/W084.06.37
East Bernstadt Fire Department, Inc	2591 North Laurel Rd East Bernstadt, KY 40729	$418,528	N37.10.25/W084.07.34
Keavy Fire Department	472 West Hwy 312 Keavy, KY 40737	$348,616	N37.00.00/W084.10.06
Laurel County Fire & Rescue	Fire Rescue Drive London, KY 40741	$325,000	N37.07.15/W084.03.23
Lily Fire Department Station 1	1401 Hwy 552 Lily, KY 40740	$435,916	N37.01.26/W084.04.33
Lily Fire Department Station 2	1210 Fariston Rd London, KY 40744	$121,664	N37.03.33/W084.03.48
McWhorter Fire Department Station 1	8620 McWhorter Rd London, KY 40744	$164,349	N37.14.05/W084.03.48
McWhorter Fire Department Station 2	7265 Hwy 472 London, KY 40744	204,033	N37.10.49/W083.57.56
Swiss Colony Fire Department Station 1	3607 Somerset Rd London, KY 40741	$370,000	N37.09.13/W084.08.18
Swiss Colony Fire Department Station 2	2001 Mitchell Creek Rd London, KY 40741	$145,417	N37.08.12/W084.08.18
West Knox Fire Department Station 2	351 US Hwy 25W Corbin, KY 40701	$115,000	N37.57.52/W084.05.25
Fire Alliance Training Facility	1690 Shelter Lane London, KY 40741	298,825	N37.06.39/W084.04.06
Area Solid Waste Removal			
Poff Carting Waste Management	East Pittsburg Church Road	$330,000	
City of London Public Works	364 Barbourville Rd, London, KY 40744	TBD	

Laurel County Media List			
Sentinel Echo Newspaper	123 West Fifth Street, London, KY 40741	TBD	
WWEL/WFTG - Sam Radio 103.9	534 Tobacco Rd London, KY 40741	TBD	
KD Country/T107		TBD	
WKFC 101.9	110 S Main St London, KY 40741	TBD	
WFTG AM 1400	534 Tobacco Rd London, KY 40741	TBD	
WWXL 1450	4260 East Laurel Rd London, KY 40741	TBD	
WWLT 103.1	100 Thomas-Poynter Rd London, KY 40741	TBD	
WEZ 104.3		TBD	
WKDP 99.5 FM		TBD	
WVTN TV & Radio		TBD	
Spectrum/Time Warner		TBD	
Windstream		TBD	
New Wave		TBD	
Communication Towers			
Raccoon Mountain, Laurel Lake, Baldrock, Hwy 25, Hwy 490, East Bernstadt			
Postal Services			
US Postal Service	1760 Hwy 192 W, London, KY 40741	TBD	
FEDEX, FEDEX Freight, & FEDEX Ground	111 Lagoon Trail, London, KY 40741	TBD	
UPS		TBD	
AVERITT Express	20 Lagoon Trail, London, KY 40741	TBD	


Laurel County, KY
Critical Infrastructure
Legend
Utilities
Transportation
Police
Healthcare
Government
Fire & Rescue
Education
Communications
Laurel County
City of London
State Roads
Laurel County Roads
8
Miles
N
CROSSROADS FIRE DEPARTMENT
MCWHORTER FIRE DEPARTMENT STATION 1
HAZEL GREEN ELEMENTARY SCHOOL
WOBZ CHANNEL 9
WOOD CREEK LAKE PLANT
CSX
MCWHORTER FIRE DEPARTMENT
EAST BERNSTADT FIRE DEPARTMENT, INC.
COLONY ELEMENTARY SCHOOL
JOHNSON ELEMENTARY SCHOOL
SWISS COLONY FIRE DEPARTMENT ST.1
POFF CARTING
STATE POLICE POST
DIVISION OF PUBLIC SAFETY AND EM
SWISS COLONY STATION 2
HEALTH DEPARTMENT
NORTH LAUREL MIDDLE SCHOOL
AMBULANCE INC. OF LAUREL COUNTY
LONDON FIRE DEPARTMENT
LAUREL COUNTY RESCUE SQUAD
LAUREL COUNTY FIRE DEPARTMENT ST. 1
SCC
LONDON WATER TREATMENT PLANT
KU
BUSH ELEMENTARY SCHOOL
ST. JOSEPH HOSPITAL
CITY GARAGE
MAINTENANCE BUILDING
SOUTH LAUREL MIDDLE SCHOOL
SLHS
LC BUS GARAGE
BUSH FIRE DEPARTMENT ST. 2
LAUREL CO. FIRE DEPARTMENT NO. 2
AIRPORT
WYAN-PINE GROVE ELEMENTARY SCHOOL
SUBLIMITY ELEMENTARY SCHOOL
BUSH FIRE DEPARTMENT STATION 1
COLD HILL ELEMENTARY SCHOOL
LILY FIRE DEPARTMENT ST. 2
LAUREL WATER DISTRICT NO. 2
EMPIRE GAS
CAMPGROUND FIREDEPARTMENT, INC.
CAMPGROUND ELEMENTARY SCHOOL
LILY FIRE DEPARTMENT NO. 1
WASTE MANAGEMENT
KEAVY FIRE DEPARTMENT
DELTAGAS
HUNTER HILLS ELEMENTARY
KEAVY ELEMENTARY
1107 KD COUNTRY
BALDROCK FIRE DEPARTMENT, INC.
CORBIN STP
WEST KNOX FIRE DEPARTMENT STATION 2
CORBIN
490
578
3630
75
25
3008
1376
472
3435
3010
3094
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552
1023
229
830
192
3497
3431
2392
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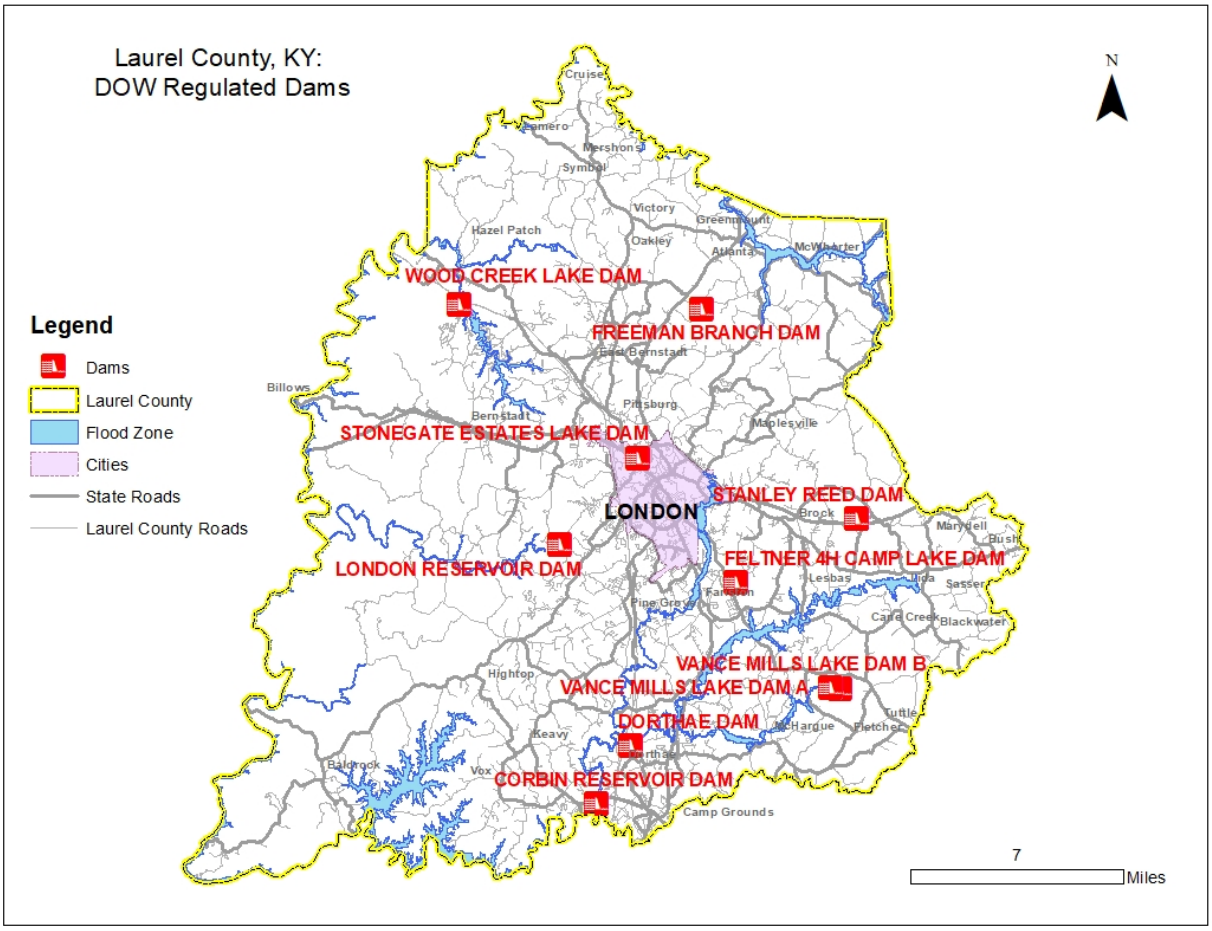
3430
3429
830
CORBIN



ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.		Estimated Total Loss
Laurel	77	$99,900.00		$7,692,300.00
City of London	3			$299,700.00

LAUREL COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Laurel County, Unincorporated and the **City of London** both possess zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the

National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation. The following are the floodplain coordinators for Laurel County.

Floodplain Coordinators				
Community Name	Name	Job Title	Address	Phone Number
Laurel County	David Westerfield	Judge Executive	101 South Main Street London, KY 40741	606-864-4640
City of London	Doug Gilbert	Building Inspector/ Floodplain Coordinator	501 South Main Street London, KY 40741	606-864-8401

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov. Below is an overview of the County's participation with the National Flood Insurance Program.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210134B	Laurel Co.	Laurel	12/27/74	11/02/90	03/16/15	05/17/89	No
210396B	London	Laurel		08/02/06	03/16/15	08/02/06	No

NFIP FINANCIAL CLAIMS

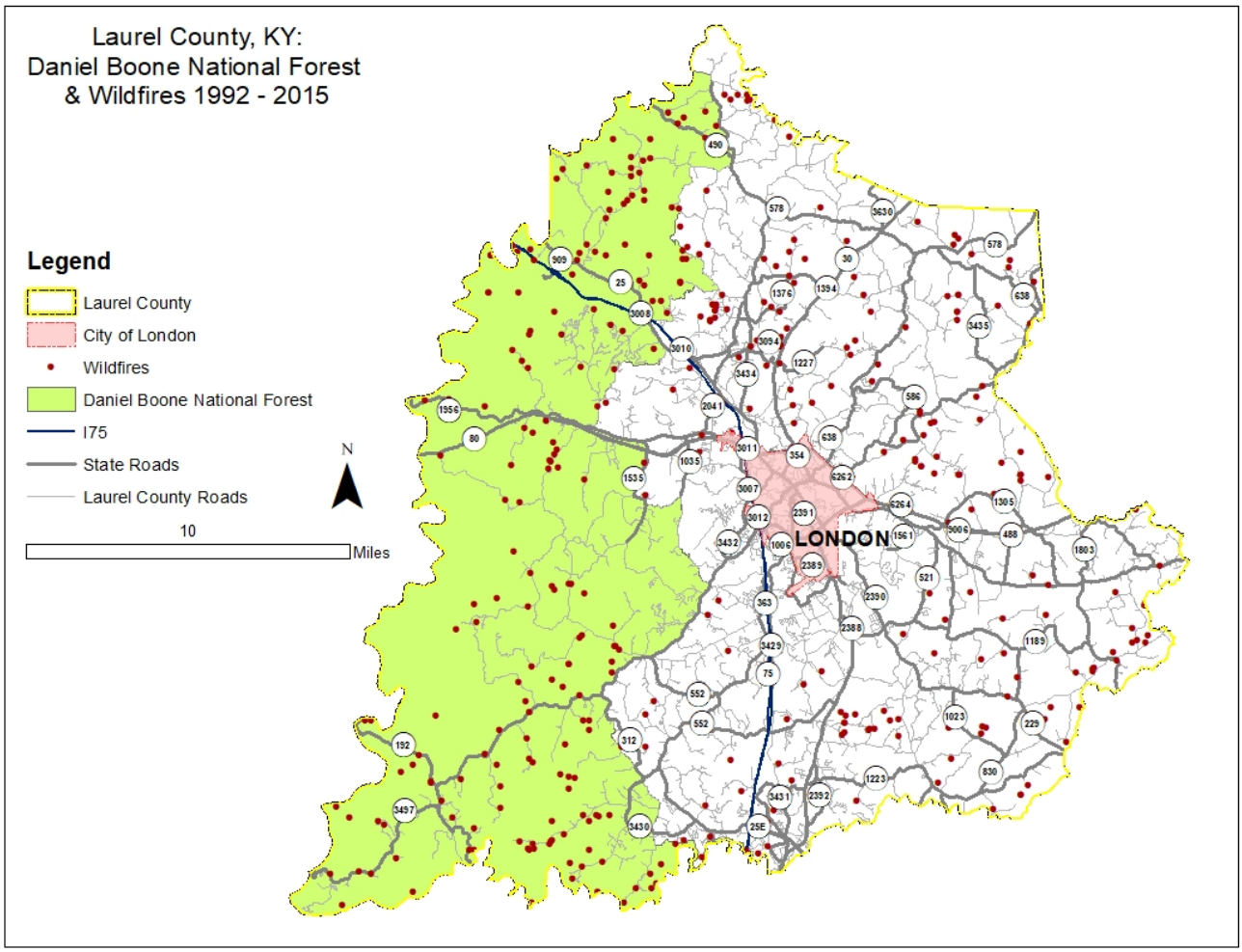
Since 1978 a total of 6 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $35,501 in claims. To put it in perspective that is an average of $5,583.50 per claim or $887.525 per year spent on repairing flood damages. There are only 29 flood insurance policies in effect as of March 2018 and 77 identified structures located within the 100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Laurel Co.	15,207	6	16	22	888	2,887	3,775	0	5	5	0	8,892	8,892
London	17,868	3	4	7	1,055	940	1,995	0	1	1	0	24,609	24,609
Total	33,075	9	20	29	1,943	3,827	5,770	0	6	6	0	33,501	33,501
Nfipservices.floodsmart.gov													

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

WILDFIRES

In November of 2016 the Kentucky Department for Public Health within the Cabinet of Health and Family Services issues a Public Health Alert; smoke inhalation advisory due to wildfires causing poor air quality in southeastern Kentucky. Air quality tests conducted by the Kentucky



Department for Environmental Protection showed some areas of Laurel County had air quality levels that are hazardous, meaning the entire population was expected to be affected by health hazards. In March 2017 more than a dozen wildfires were burning in Eastern Kentucky with Laurel County accounting for two; one burned 14 acres before it was contained and the other burned 5 acres.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires

and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[104]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Laurel County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	0	0.0	0.000%
Class B	0.25 to 9 Acres	7	10.0	70.000%

[104] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

Class C	10 to 99 Acres	3	86.0	30.000%
Class D	100 to 299 Acres	0	0.0	0.000%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Laurel	2013	9	31.5	166,970
	2014	19	183.0	
	2015	5	16.0	
	2016	18	80.0	
	2017	7	49.0	
	2018	3	17.0	
	2019	9	93.0	
	2020	1	3.0	

Table 1-4 Laurel County Summary of Impacts From Wildfires, 2019-2020		
# of Fires		10
Injuries		0
Fatalities		0
Suppression Costs	$	7,747
# Houses Saved		7
Value of Houses Saved	$	560,000
# Houses Lost		0
Value of Houses Lost	$	-
# Structures Saved		1
Value of Structures Saved	$	5,000
# Structures Lost		0
Value of Structures Lost	$	-

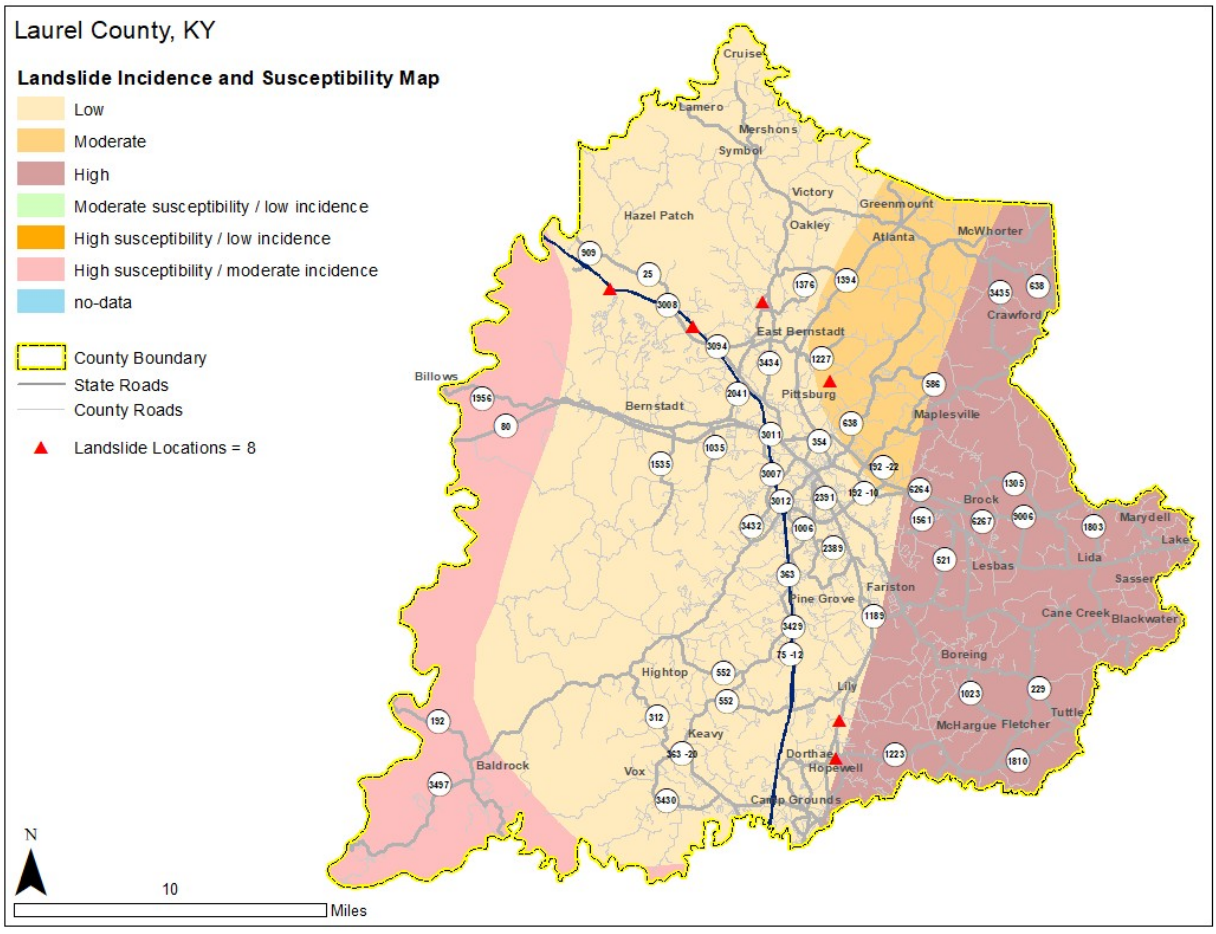
In 2019-2020 (the last years for which data is available), Laurel County suffered 10 wildfires of all class types. Two years equals 730 days. Thus, there were 10/730 fires per day, or 0.0137 fires per day, or 1 wildfire of all class types every 72.99 days (1/0.0137). Within particular wildfire classes, there were no Class A wildfires between 2019-2020. There were 7 Class B wildfires between 2019-2020. This translates to 7/730 fires where between 0.25 to 9 acres were burned, or 0.0096 Class B fires per day, or one (1) Class B wildfire about every 104.17 days (1/0.0096). There were 3 Class C wildfires between 2019-2020. This translates to 3/730 fires where between 10 to 99 acres were burned, or 0.0041 Class C fires per day, or one (1) Class C wildfire about every 243.9 days (1/0.0041). There were no Class D to Class G wildfires – fires where 100 to 5,000 or more acres were burned – in 2019-2020 in Laurel County.

All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current.

LANDSLIDES

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field.

Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils. The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.



All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

Count	County	City	Loca-tion	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	
1	Laurel	Corbin	KY 2392	Above Road	2/5/2014	Rock-fall	Shale; Siltstone; Sandstone; Clay; Coal					
2	Laurel	Bern-stadt	I 75	Above Road	3/31/2014	Land-slide	Sandstone; Shale; Siltstone; Coal					
3	Laurel	Bern-stadt	Herman Kirby Rd		2015	Land-slide	Shale; Siltstone; Sandstone; Coal					
4	Laurel	Lily	US 25	Road Cut	2/6/2017	Rock-slide	Siltstone; Fine-Grained Sandstone					
5	Laurel	Bern-stadt	US 25		5/19/2020	Rock-slide	Sandstone; Shale; Siltstone; Coal					
6	Laurel	Bern-stadt	I 75				Sandstone; Conglomerate; Shale					
7	Laurel	Bern-stadt	I 75				Sandstone					

Laurel County Landslides - Probability as Frequency of Event Occurrence

Laurel County, unincorporated (and its unincorporated cities) independently experienced 7 landslide events over 30 years. Thus, Laurel County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every 4.3 years (i.e., 7/30). Specifically, Laurel County, unincorporated and its unincorporated cities experienced an average of 0.23 landslide events each year. Or, using December 31, 2021, as an endpoint, 7/360 months is 0.0194 events per month. 1/0.0194 = 51.55 ≈ 1 landslide event an average of every 51.5 months, or 4.3 years.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	
1	Laurel	London	KY 638	Above Road	5/19/2020		Shale; Siltstone; Sandstone					

2	Laurel	London	(37.207777, -84.111666)									
3	Laurel	London	(37.170555, -84.073888)									

London Landslides - Probability as Frequency of Event Occurrence

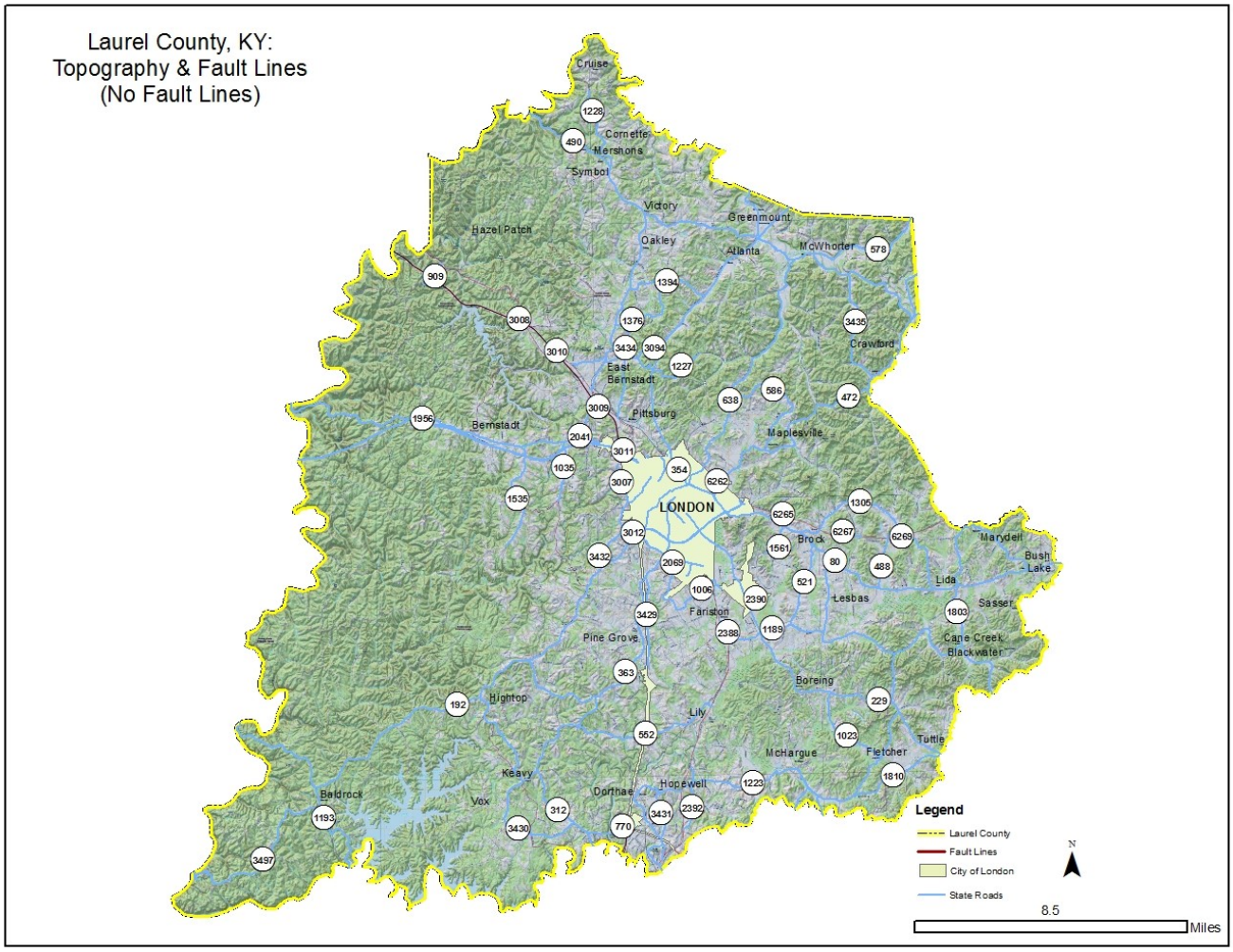
Incorporated London independently experienced 3 landslide events within its city limits over 30 years. Therefore, London experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 10 years (i.e., 3/30). Specifically, London experienced an average of 0.1 landslide events each year. Or, using December 31, 2021, as an endpoint, 3/360 months is 0.0083 events per month. $1/0.0083 = 120 \approx 1$ landslide event an average of every 120 months, or one every 10 years.

EARTHQUAKES

Earthquakes can happen anytime of the year and without warning. The risk in Kentucky is higher in identified seismic zones such as the New Madrid Fault Zone in the western part of the state. Earthquakes have occurred in Laurel County in the past. The following is a list of the recorded earthquakes from the 1900s to January 31, 2021. The map below shows that there are no fault lines in Laurel County.

Laurel County Historical Earthquakes 1/1/1900 – 1/31/2018				
Location	**Magnitude**	**Depth**	**Date**	**Time**
10 km NNW of North Corbin	2.5	3.0 km	5/22/2020	05:58:41 (UTC)
7 km ENE of North Corbin	2.4	2.9 km	12/07/2014	14:49:35 (UTC)
Source: USGS Earthquake Hazard Program				

Laurel County Historical Earthquakes 1/1/1900 – 1/31/2018				
Location	**Magnitude**	**Depth**	**Date**	**Time**
10 km NNW of North Corbin	2.5	3.0 km	5/22/2020	05:58:41 (UTC)
7 km ENE of North Corbin	2.4	2.9 km	12/07/2014	14:49:35 (UTC)
Source: USGS Earthquake Hazard Program				



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Laurel County was about 136 persons in 2010 (the latest data available in Census Quickfacts[24]). This small population size and commensurate low density of structures suggest that the impact of an earthquake would be at the lower end of the range estimated for a given earthquake magnitude. The US Geological Survey states[25]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For

example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake occurred in 1960 off the coast of Chile and had a magnitude of 9.5.
Michigan Technological University's Earthquake Magnitude Scale[26] puts a number to the potential for damage:

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

Laurel County has only had two earthquakes recorded in the USGS Earthquake Hazard Program database. Both earthquakes fell in the 2.5 or less magnitude on the Earthquake Magnitude Scale, which identifies the extent as "usually not felt, but can be recorded by seismograph". Given the history of earthquakes in Laurel County, it is safe to say that the probability of an earthquake of 5.5 or above in magnitude, where damage to structures begins, would be very rare.[27],[28] There have been no recorded events at 5.5 or above on the Earthquake Magnitude Scale and thus there are no recorded past damages and impacts from earthquakes for Laurel County and its incorporated city.

MAN- MADE HAZARDS

Currently, emergency personnel do not have the necessary equipment needed to contain and extinguish a hazardous spill/leak. Resources must be called in from outside of the county to manage a hazardous event. There are several places within the county where a hazardous spill/leak could occur. Tractor trailers hauling hazardous materials on I-75 and/or US-25 have the potential to leak and several factories within the county use dangerous chemicals to manufacture products.
Emergency personnel need equipment and training to be prepared for a hazardous spill.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Laurel County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Laurel County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Laurel County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Laurel County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Laurel County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Laurel County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

LAUREL COUNTY HAZARD MITIGATION GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

Objective(s):

1. Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive areas.
    - Review budgets for mitigation projects and allot funds for such projects.
    - Prevent future flood losses by stronger enforcement of NFIP ordinances.
    - Designate someone other than Judge Executive/Mayor for the floodplain coordinator position.
    - Regulate tree maintenance by ensuring proper trimming especially before winter storm season.

Goal #2 *Protect Laurel County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

Objective(s):

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Laurel County's most vulnerable populations and structures.

2.2 Decrease the number of FEMA-identified "repetitive loss properties."

- Implement projects to correct and prevent landslides.
- Projects for warning citizens during tornados include installation of siren systems and use of Alert Sense.
- Projects to mitigate flooding include creating/widening channels so waters have a more direct outlet into streams from cities and communities.
- Other flooding projects include acquisition/relocation of designated repetitive loss properties and other flood prone properties.

Goal #3 P*rotect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

Objective(s):

3.1 Increase the level of knowledge and awareness for Laurel County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

- Provide community education through Alert Sense and Social Media.
- Provide information on the need for flood insurance and benefits of NFIP participation.

Goals Correlation to Hazards			
Hazards	**Goal #1**	**Goal #2**	**Goal#3**
Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Minor structural flood control - install/upgrade culverts			✓		Ongoing
Construct safe rooms throughout Laurel County in mobile home communities				✓	Has not been built. Continue to seek funding.
Retro-Fit and upgrade Laurel County 911 Center	✓				Software Upgraded - Grant Received
Warning sirens, radios, and ring down system			✓		Alert Sense ringdown system
Generators for critical infrastructure			✓		Keavy VFD, EOC-CSEPP, Judicial Center, and one more VFD all received generators. Continue to seek funding for generators for other critical facilities.
Public Awareness campaigns			✓		Weather Spotter Classes
Hazard Identification/Mapping & related equipment	✓				
GIS software for mitigation	✓				CSEPP Grant Money: Emergency Operation Center & PVA Recipients
Whitley Branch Hazard Mitigation Project (FEMA-DR-1912)	✓				Mill Street
Replace/elevate bridge across Whitley Branch South Mill St & West 2nd St			✓		TAPP Grant received South Mill Street - replaced bridges with culverts
Replace/elevate bridge across Whitley Branch South Mill St & West 3rd St			✓		TAPP Grant
Replace/elevate bridge across Whitley Branch South Mill St & West 4th St			✓		TAPP Grant
Replace Sanitary Sewer Lines from West 5th St to Whitley St down South Mill St	✓				Completed in 2016

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

LAUREL COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Confined space training.	Earthquake	Fire Commission				X	Long Term	1	1	5	Fire Commission	5
Hazardous material training.	Chemical	KYEM & CSEPP				X	Continuous	1	1	1	KYEM & CSEPP	1
Purchase equipment for emergency personnel to protect against hazardous materials.	Chemical	CSEPP		X			Continuous	1	1	1	CSEPP	1
Warning sirens at remote locations within Laurel County: Levi Jackson State Park, Bee Rock Campsite, KOA, Craigs Creek, and Holly Bay.	All Hazards	Grant Applicant	X				Continuous	1	1	5	Various Grants	5
Preventive maintenance in streams and creeks.	Flood	Road Department &/or DOW		X			Continuous	1	1	1	NRCS	1
Engineering study at Court Road to resolve flooding issues.	Flood	Laurel County		X			Long Term	1	1	5	Laurel County	3
Increase culvert size at the end of Industrial Drive under railroad to resolve flooding issues.	Flood	Laurel County	X				Long Term	5	5	5	Laurel County	3
Increase culvert size at 1006 going into Levi Jackson State Park to resolve flooding issues.	Flood	Laurel County	X				Long Term	5	5	5	Laurel County	3
Build safe rooms in areas with high mobile home concentrations.	Severe Thunderstorms & Tornados	Laurel County, City of London	X				Continuous	1	1	1	Grants	1
Purchase generators for Fire Departments.	All Hazards	Fire Departments, County, &/or City		X			Long Term	1	5	1	Grants	1

Purchase portable generators for pump stations.	All Hazards	County, Water Districts		X			Long Term	1	5	1	Grants	1
Bridge Maintenance. Replace wooden bridges throughout County. Bring bridges up to code.	All Hazards	County &/or City	X		X		Long Term	1	1	1	Grants	1
Build concrete wingwalls at culverts at repetitive loss sites.	Flood	County &/or City	X				Long Term	1	1	1	Grants, County, &/or City	1
Move/elevate utilities near the visitor's center (Fiber Optics).	Flood	Corporation	X				Long Term	1	1	1	Corporation	2
Place shut off valves at water towers.	Drought	County	X				Long Term	1	1	1	Grants	1

Rockcastle County, KY:
Hazard Mitigation Overview

XI. ROCKCASTLE COUNTY OVERVIEW

Rockcastle County is in the foothills of the Cumberland Mountains and encompasses 318 square miles. Almost a quarter of the county is Daniel Boone National Forest. There are three cities located within Rockcastle County: the City of Brodhead, the City of Livingston and the City of Mount Vernon.

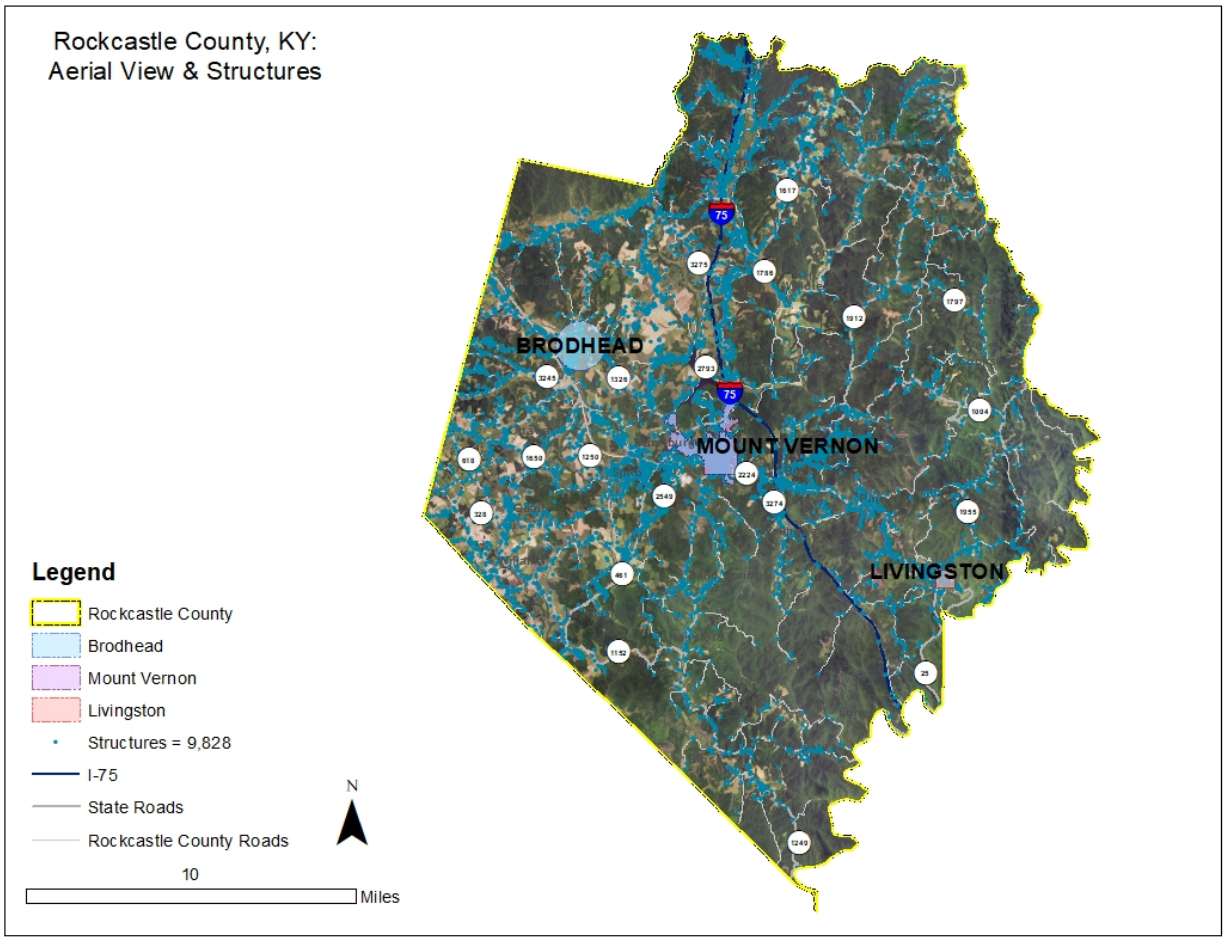
Rockcastle County, KY: Quick Facts	
Total Population, July 1, 2019	16,695
Population per Square Miles, 2010	53.9
Land Area in Square Miles, 2010	316.55
Housing Units, July 1, 2016	7,694
Persons in Poverty, percent	24.2%
Median Value of Owner-Occupied Housing Units, 2012-2016	$75,100
Median Household Income, 2011-2015	$33,500
Total Employment, 2015	2,670
Total Employer Establishments, 2015	200
Source: U.S. Census Bureau	

ROCKCASTLE COUNTY POPULATION

In 2019, Rockcastle County had a total population of 16,695. The City of Mount Vernon, which is the county seat had a population of 2,486. Rockcastle County lost 2.1% of its population between 2010 and 2020, despite an increase in population in Brodhead, and the overall population is projected to continue declining.

Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Rockcastle County	17,084	16,950	16,820	1.5% decrease	
City of Brodhead	1,273	1,324	1,500	18% increase	
City of Livingston	227	225	123	46% decrease	
City of Mt. Vernon	2,848	2,814	2,701	5.4% decrease	
Source: U.S. Census Bureau					

According to the United States Census there were 7,901 housing units located in Rockcastle County in 2019. The following map illustrates where the residential & commercial structures are located based on CVADD ArcGIS database.



COMMUNITY CAPABILITIES

Rockcastle County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Rockcastle County Fiscal Court is comprised of a Judge Executive and 5 Magistrates. The City of Mount Vernon Home Rule class city lead by a Mayor-Council government. The City of Brodhead and the City of Livingston are Home Rule class cities with a Commission form of government. Both the Fiscal Court, City Council, and City Commission have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation.

Rockcastle County Plans & Programs									
	Emergency Operations Plan	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Rockcastle Co.	✓		✓	✓	✓	✓	✓	✓	
City of Brodhead	✓		✓	✓	✓	✓	✓	✓	
City of Livingston	✓		✓	✓	✓	✓	✓	✓	
City of Mt. Vernon	✓		✓	✓	✓	✓	✓	✓	

EMERGENCY MANAGEMENT

To prepare for future natural hazards Rockcastle County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Rockcastle County's 2016 THIRA.

THIRA Hazard Ranking	
1	Flood
2	Tornado
3	Winter Storm

The Rockcastle County Emergency Management also has a Local Emergency Planning Committee (LEPC) that meets biannually and promotes emergency planning and preparedness. The LEPC includes members from various professions and is open to the public. For more information about Rockcastle County's THIRA and LEPC meetings contact the Emergency Management Director.

ROCKCASTLE COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

FLOODING

Rockcastle County's terrain is hilly in the north, rolling karst in the west-central part, and almost mountainous in the south. The highest elevation, 1,638 feet, is on a ridge in the northeast near the Jackson County Line. The lowest elevation, 810 feet, is Rockcastle River at the extreme southern tip of the county. The Roundstone Creek converges into the Rockcastle River near the City of Livingston and runs along the southern border of the County. Dix River runs through the City of Brodhead and then branches

off into various creeks and forks. There are several streams, creeks, and forks throughout Rockcastle County bringing with them the potential for flooding.

In order to address systematically the number of previous flooding occurrences, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from flooding for Rockcastle County, Kentucky and for its incorporated cities. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Rockcastle County and for its unincorporated and incorporated cities.

The incorporated cities for Rockcastle County include the City of Mt. Vernon, the City of Brodhead, and the City of Livingston. In order to capture "Flood" and "Flash Flood" events specific to the incorporated cities, the below tables include all "Flood" and "Flash Flood" events having searched the entire date range of available data within the NCEI "Storm Events Database," i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of "probability"), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the denominator derives. For Rockcastle County and its incorporated cities, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines "probability" in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the "Flood" and "Flash Flood" events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for Rockcastle County as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is

"Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 7-1: Rockcastle County Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	18.0K	1.0 K
1	COUNTY-WIDE	ROCK-CASTLE CO.	KY	7/19/1996	20:30	EST	Flash Flood		0	0	0.00K	0.00 K
2	COUNTY-WIDE	ROCK-CASTLE CO.	KY	4/16/1998	19:00	EST	Flash Flood		0	0	5.00K	0.00 K
3	GUM SULPHUR	ROCK-CASTLE CO.	KY	6/27/2000	19:05	EST	Flood		0	0	0.00K	0.00 K
4	CONWAY	ROCK-CASTLE CO.	KY	5/27/2000	12:07	EST	Flash Flood		0	0	0.00K	0.00 K
5	CONWAY	ROCK-CASTLE CO.	KY	8/3/2001	5:35	EST	Flash Flood		0	0	0.00K	0.00 K
6	CONWAY	ROCK-CASTLE CO.	KY	5/1/2002	20:20	EST	Flash Flood		0	0	0.00K	0.00 K
7	CONWAY	ROCK-CASTLE CO.	KY	5/7/2002	0:30	EST	Flood		0	0	0.00K	0.00 K
8	ROCK-CASTLE (ZONE)	ROCK-CASTLE (ZONE)	KY	2/16/2003	10:30	EST	Flood		0	0	0.00K	0.00 K
9	ROCK-CASTLE (ZONE)	ROCK-CASTLE (ZONE)	KY	6/7/2003	8:25	EST	Flood		0	0	0.00K	0.00 K
10	ROCK-CASTLE (ZONE)	ROCK-CASTLE (ZONE)	KY	2/6/2004	3:50	EST	Flood		0	0	0.00K	0.00 K
11	ROCK-CASTLE (ZONE)	ROCK-CASTLE (ZONE)	KY	9/17/2004	16:35	EST	Flood		0	0	0.00K	0.00 K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
12	CONWAY	ROCK-CASTLE CO.	KY	4/29/2005	23:38	EST	Flash Flood		0	0	0.00K	0.00 K
13	WILDIE	ROCK-CASTLE CO.	KY	1/23/2006	4:40	EST	Flash Flood		0	0	0.00K	0.00 K
14	ORLANDO	ROCK-CASTLE CO.	KY	9/25/2009	17:45	EST-5	Flash Flood		0	0	0.00K	0.00 K
	BURR	ROCK-CASTLE CO.	KY	9/26/2009	9:30	EST-5	Flash Flood		0	0	0.00K	0.00 K
15	QUAIL	ROCK-CASTLE CO.	KY	5/2/2010	11:00	EST-5	Flood		0	0	0.00K	0.00 K
	ROUND-STONE	ROCK-CASTLE CO.	KY	5/2/2010	11:00	EST-5	Flood		0	0	0.00K	0.00 K
	ROUND-STONE	ROCK-CASTLE CO.	KY	5/2/2010	16:58	EST-5	Flood		0	0	0.00K	0.00 K
	ORLANDO	ROCK-CASTLE CO.	KY	5/2/2010	13:00	EST-5	Flash Flood		0	0	0.00K	0.00 K
	OTTAWA	ROCK-CASTLE CO.	KY	5/2/2010	17:00	EST-5	Flash Flood		0	0	0.00K	0.00 K
16	OTTAWA	ROCK-CASTLE CO.	KY	9/25/2013	14:00	EST-5	Flash Flood		0	0	5.00K	0.00 K
17	MARET-BURG	ROCK-CASTLE CO.	KY	12/6/2013	17:54	EST-5	Flood		0	0	1.00K	1.00 K
18	CEDAR-VILLE	ROCK-CASTLE CO.	KY	7/23/2014	18:05	EST-5	Flash Flood		0	0	1.00K	0.00 K
19	ORLANDO	ROCK-CASTLE CO.	KY	3/4/2015	12:00	EST-5	Flood		0	0	1.00K	0.00 K
	LAMERO	ROCK-CASTLE CO.	KY	3/4/2015	22:14	EST-5	Flood		0	0	1.00K	0.00 K
20	LUNER	ROCK-CASTLE CO.	KY	4/14/2015	18:42	EST-5	Flood		0	0	1.00K	0.00 K
	LAMERO	ROCK-CASTLE CO.	KY	4/14/2015	20:42	EST-5	Flood		0	0	1.00K	0.00 K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
21	CONWAY	ROCK-CASTLE CO.	KY	7/14/2015	20:38	EST-5	Flash Flood		0	0	1.00K	0.00K
22	WITHERS	ROCK-CASTLE CO.	KY	7/20/2015	2:00	EST-5	Flash Flood		0	0	1.00K	0.00K
23	RENFRO VLY	ROCK-CASTLE CO.	KY	7/3/2017	16:30	EST-5	Flash Flood		0	0	0.00K	0.00K
24	PINE HILL	ROCK-CASTLE CO.	KY	7/6/2017	17:25	EST-5	Flood		0	0	0.00K	0.00K
25	RENFRO VLY	ROCK-CASTLE CO.	KY	2/17/2019	18:45	EST-5	Flood		0	0	0.00K	0.00K
26	WILDIE	ROCK-CASTLE CO.	KY	2/20/2019	11:53	EST-5	Flood		0	0	0.00K	0.00K
	RENFRO VLY	ROCK-CASTLE CO.	KY	2/20/2019	13:50	EST-5	Flood		0	0	0.00K	0.00K
	ROUNDST ONE	ROCK-CASTLE CO.	KY	2/20/2019	14:19	EST-5	Flood		0	0	0.00K	0.00K
27	ORLANDO	ROCK-CASTLE CO.	KY	6/7/2019	14:15	EST-5	Flood		0	0	0.00K	0.00K
	Totals: 27								0	0	18.0K	1.0K

Rockcastle County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate are assumed to be clusters of discrete events that comprise, in actuality, one event for the purpose of defining a denominator for illustrating frequency. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

That Rockcastle County, unincorporated (and its unincorporated cities) independently experienced 27 flooding events over 25 years yields that Rockcastle County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every eleven months (i.e., 27/25). Specifically, Rockcastle County, unincorporated and its unincorporated cities, experienced an average of 1.08 flooding events each year. Or, using December 31, 2020 as an endpoint, 27/300 months is 0.09 events per month. $1/0.09 = 11.1111 \approx 1$ flooding event an average of every eleven (11) months.

Table 7-2: City of Mt. Vernon Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	MT VERNON	ROCKCASTLE CO.	KY	8/3/2001	5:35	EST	Flash Flood		0	0	0.00K	0.00K
2	MT VERNON	ROCKCASTLE CO.	KY	5/4/2009	7:29	EST-5	Flood		0	0	0.00K	0.00K
3	MT VERNON	ROCKCASTLE CO.	KY	12/6/2013	16:45	EST-5	Flood		0	0	1.00K	1.00K
	Totals: 3								0	0	1.0K	1.0K

City of Mt. Vernon Flooding - Probability as Frequency of Event Occurrence

That the City of Mt. Vernon independently experienced three (3) flooding events over 25 years yields that the City of Mt. Vernon experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every eight (8) years (i.e., 3/25).

Table 7-3: City of Brodhead Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	150.5K	0.00K
1	BRODHEAD	ROCK-CASTLE CO.	KY	6/13/1997	17:00	EST	Flash Flood		0	0	3.00K	0.00K
2	BRODHEAD	ROCK-CASTLE CO.	KY	1/7/1998	15:30	EST	Flash Flood		0	0	3.00K	0.00K
3	BRODHEAD	ROCK-CASTLE CO.	KY	12/16/2000	17:21	EST	Flood		0	0	0.00K	0.00K
4	BRODHEAD	ROCK-CASTLE CO.	KY	8/3/2001	5:50	EST	Flash Flood		0	0	15.00K	0.00K
5	BRODHEAD	ROCK-CASTLE CO.	KY	5/17/2002	21:30	EST	Flash Flood		0	0	0.00K	0.00K
6	BRODHEAD	ROCK-CASTLE CO.	KY	5/27/2004	2:00	EST	Flash Flood		0	0	0.00K	0.00K
7	BRODHEAD	ROCK-CASTLE CO.	KY	7/10/2004	19:30	EST	Flash Flood		0	0	0.00K	0.00K
8	BRODHEAD	ROCK-CASTLE CO.	KY	2/6/2008	6:52	EST-5	Flash Flood		0	0	0.00K	0.00K
9	BRODHEAD	ROCK-CASTLE CO.	KY	8/16/2013	17:30	EST-5	Flash Flood		0	0	1.00K	0.00K
10	BRODHEAD	ROCK-CASTLE CO.	KY	8/31/2013	17:00	EST-5	Flood		0	0	1.00K	0.00K
11	BRODHEAD	ROCK-CASTLE CO.	KY	4/30/2014	3:00	EST-5	Flood		0	0	0.00K	0.00K
12	BRODHEAD	ROCK-CASTLE CO.	KY	4/14/2015	8:09	EST-5	Flood		0	0	1.00K	0.00K
13	BRODHEAD	ROCK-CASTLE CO.	KY	8/5/2015	17:00	EST-5	Flood		0	0	1.00K	0.00K
14	BRODHEAD	ROCK-CASTLE CO.	KY	12/23/2017	8:30	EST-5	Flood		0	0	0.00K	0.00K
15	BRODHEAD	ROCK-CASTLE CO.	KY	6/6/2019	16:08	EST-5	Flash Flood		0	0	125.00K	0.00K
16	BRODHEAD	ROCK-CASTLE CO.	KY	11/30/2019	15:07	EST-5	Flash Flood		0	0	0.50K	0.00K
	Totals: 16								0	0	150.5K	0.00K

City of Brodhead Flooding - Probability as Frequency of Event Occurrence
That the City of Brodhead independently experienced 16 flooding events over 25 years yields that the City of Brodhead experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every 19 months (i.e., 16/25).

City of Livingston

There have been no flooding events recorded in the NCI database for Livingston between 1996-2020, the entire timeframe of the database. Therefore, there is zero probability of flooding in the future.

PAST FLOOD EVENTS

Flooding may cause fatalities or injuries, disrupt or destroy infrastructure (roads, bridges, culverts, water, wastewater, gas, electric), disrupt drinking water supplies, and cause erosion and landslides. Floods can occur anytime during the year and are Kentucky's most costly natural hazard. Reviewing past flood events can help identify vulnerabilities within the county and cities enabling emergency management to better prepare for future disasters.

In early June 2019, rains flooded Dix River in Rockcastle County, close to the city of Brodhead, and also caused high water in city itself. According to Lexington television station WKYT[105]:

"Flash flooding caused major issues in Rockcastle County.

"Brodhead was one of the hardest hit areas. Emergency management officials say four inches of rain fell within two hours, flooding many roads, homes, and businesses.

"On Thursday, officials had to shut down West Main Street, saying it was so flooded it looked like a river. Water gushed over the pavement, up over sidewalks, and into nearby businesses…"

Flooding in the Dix River nearly overwhelmed the roadway crossing it:

[105] WKYT-TV. June 6, 2019. Lexington, KY. Retrieved on 2-14-2022 from Flash flooding impacts several areas of Rockcastle County (wkyt.com).

The same flood event limited access to several buildings in downtown Brodhead, including City Hall:

Several areas in the county seat of Mt. Vernon are prone to severe flooding; the below photo from March 1, 2021, on Ocean Front View Lane, demonstrates the vulnerability of structures in those areas:

The news article with which this photo appeared gives details[106]:

"Many areas of Mt. Vernon are dealing with severe flooding. People who live in the area of Ocean Front View Lane said the water kept rising as rain fell Sunday, Feb. 28. It forced several families to evacuate their homes.

"No one was hurt, but the damage to some of the homes is permanent and water is still blocking many people from returning home…

"Floodwaters trapped Ron Whittaker … at his front door.

" 'I mean, when it started coming over the top of that back porch, that was pretty scary,' Whittaker said.

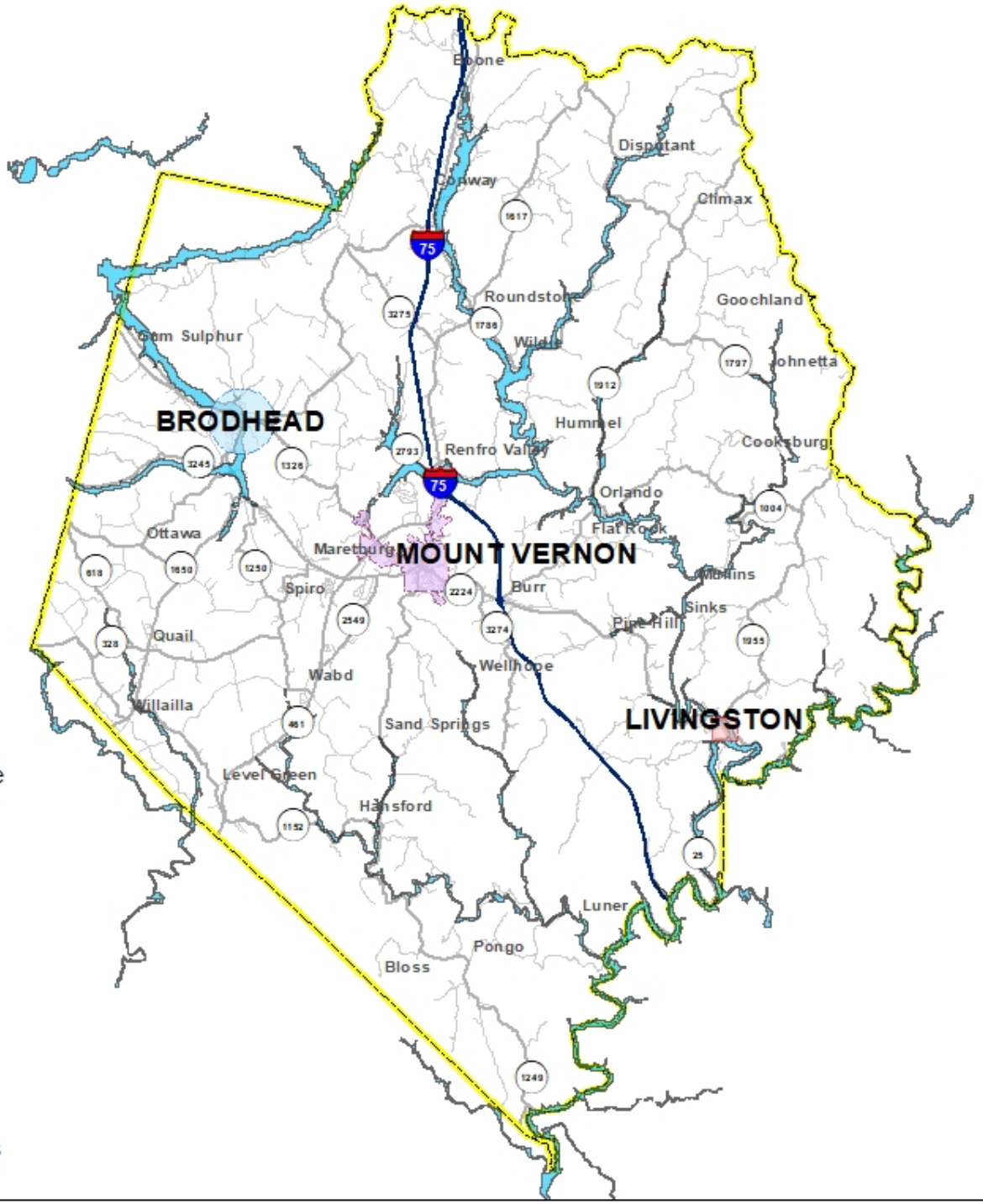
"Ron Whittaker and his wife have lived in the house for 24 years. They can't even begin to assess the damage.

[106] WKYT-TV. March 1, 2021. Lexington, KY. Retrieved on 2-14-2022 from Severe flooding near Ocean Front View Lane in Mt. Vernon (wymt.com).

“‘We, like a lot of people, didn’t have flood insurance, so, we’re going to try to see if we can get some help,’ Whittaker said…

“Earlier Monday, many areas of Rockcastle County were impossible to get to, with roads in both directions covered by water.”

Rockcastle County, KY: 100-Year Floodplain



Legend

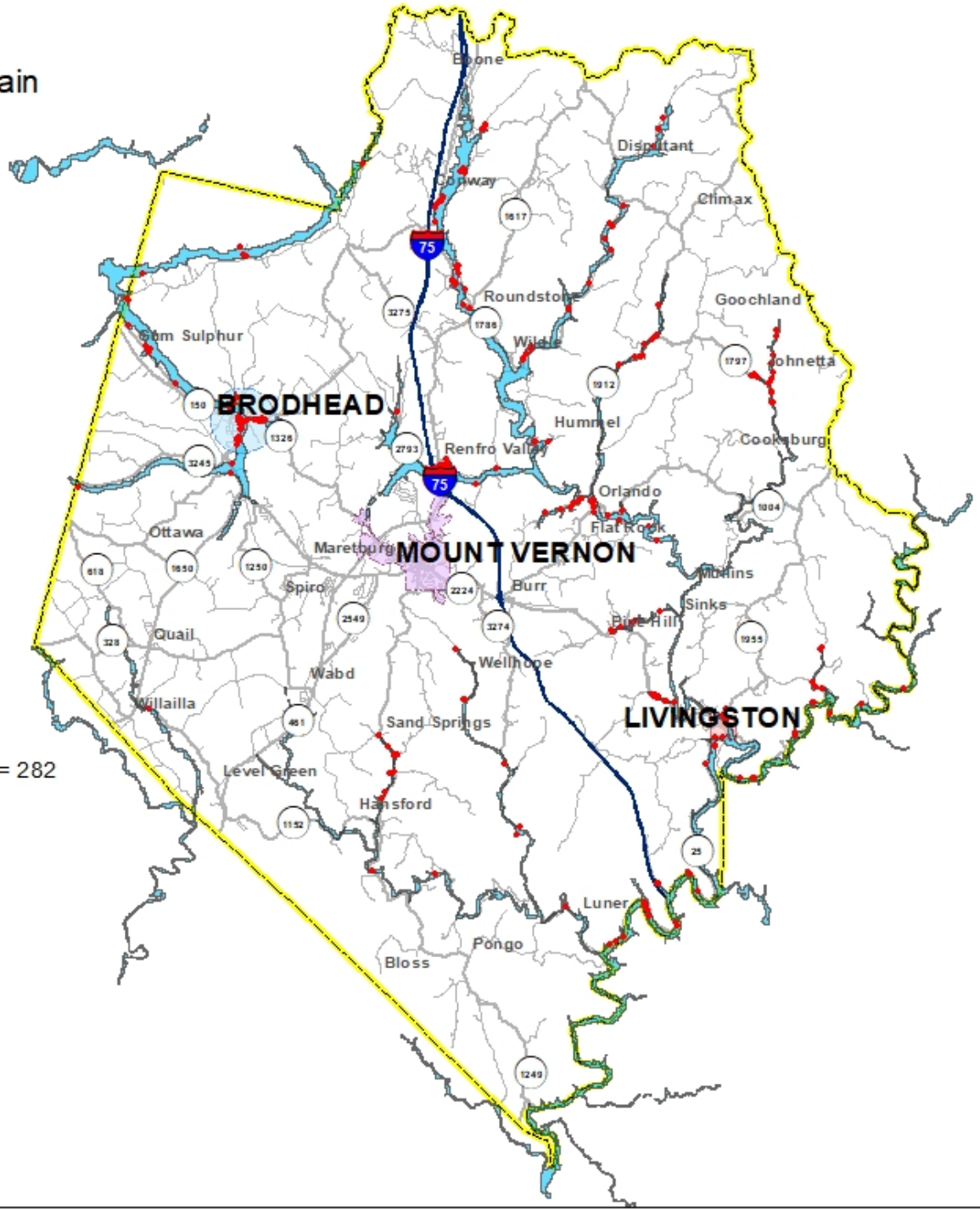
- Rockcastle County 100-Year Flood Zone
- Rockcastle County
- Brodhead
- Mount Vernon
- Livingston
- I-75
- State Roads
- Rockcastle County Roads

N

10

Miles

Rockcastle County, KY:
Structures within 100-Year Floodplain



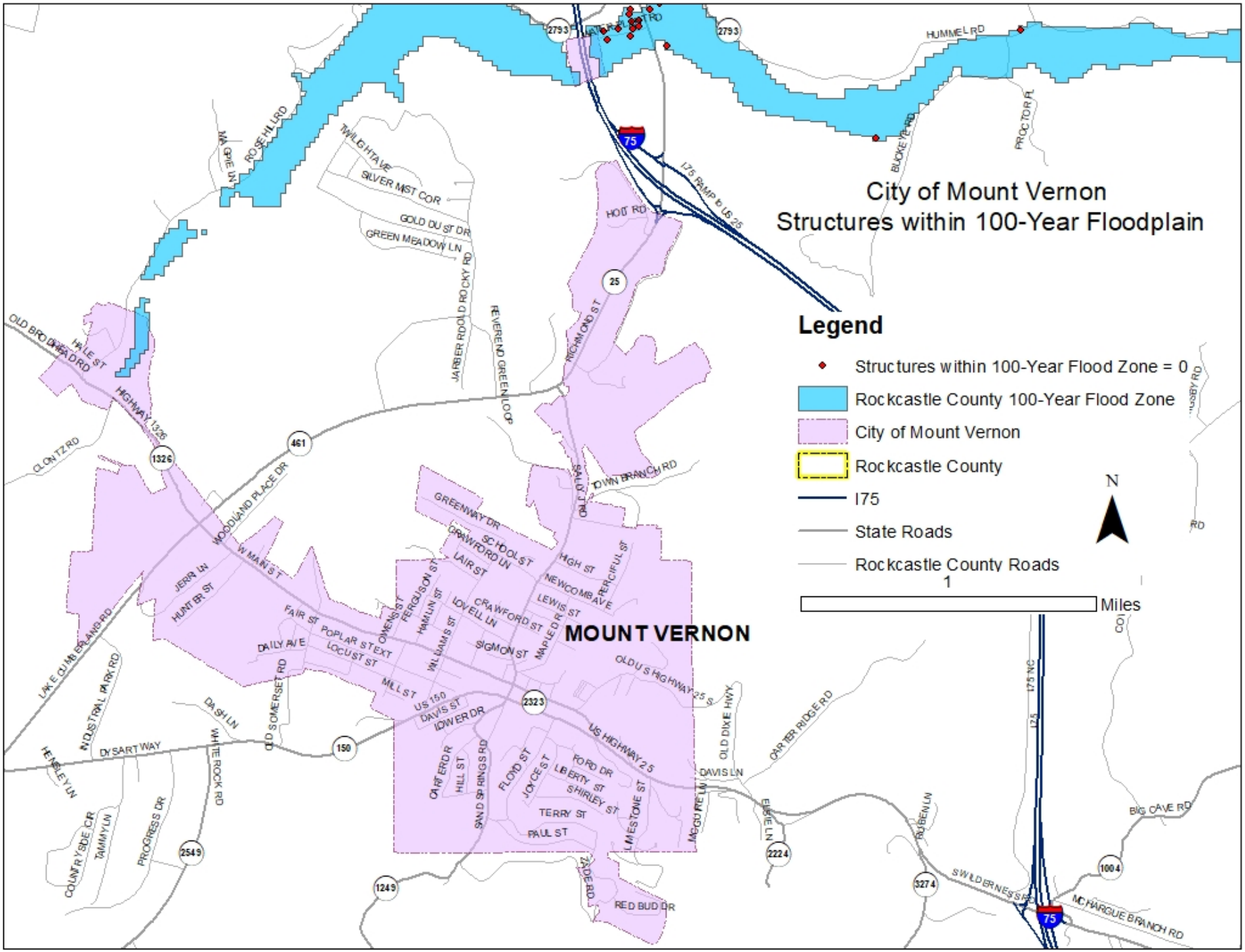
Legend

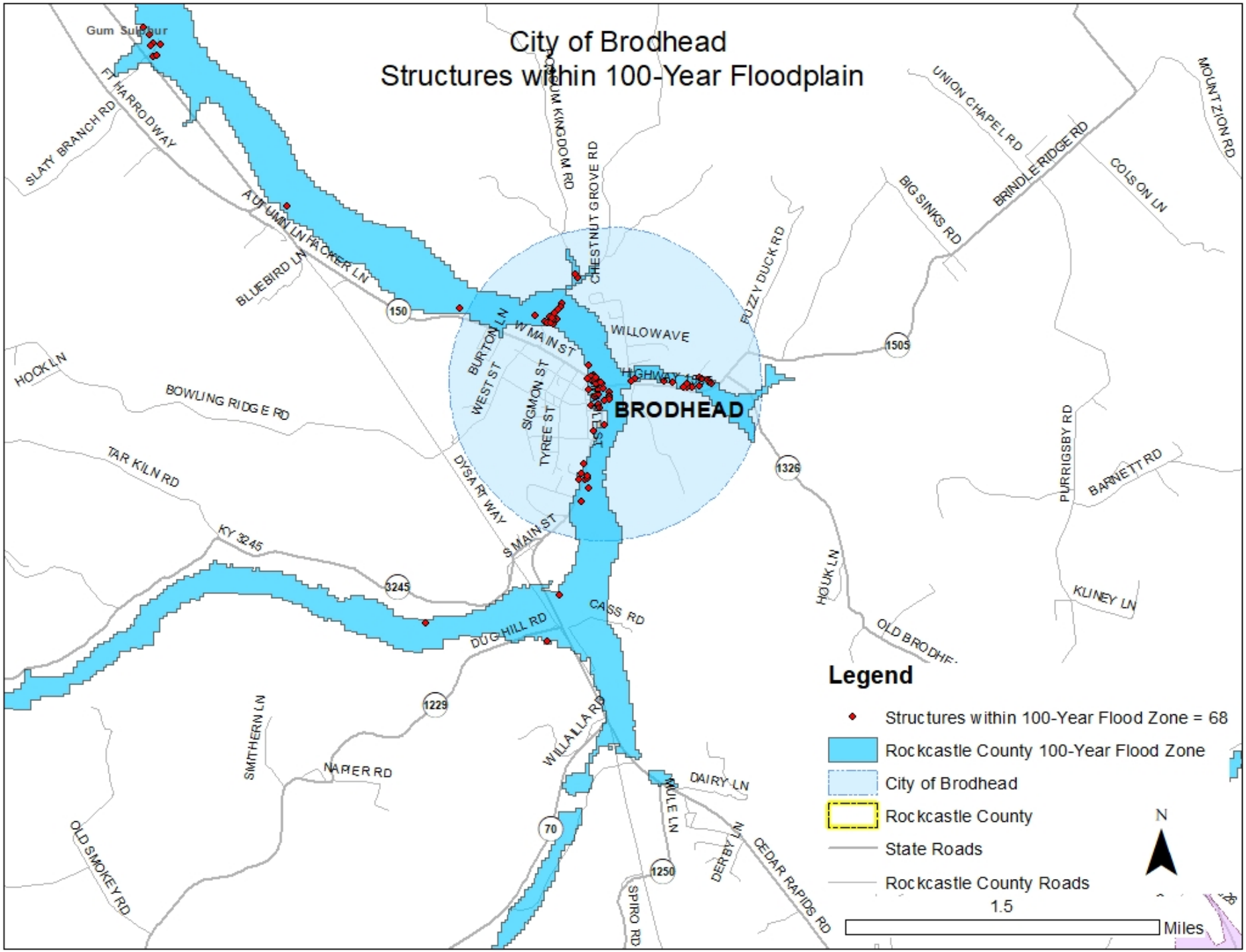
- Structures within the 100-Year Flood Zone = 282
- Rockcastle County 100-Year Flood Zone
- City of Brodhead
- City of Mount Vernon
- City of Livingston
- Rockcastle County
- I-75
- State Roads
- Rockcastle County Roads

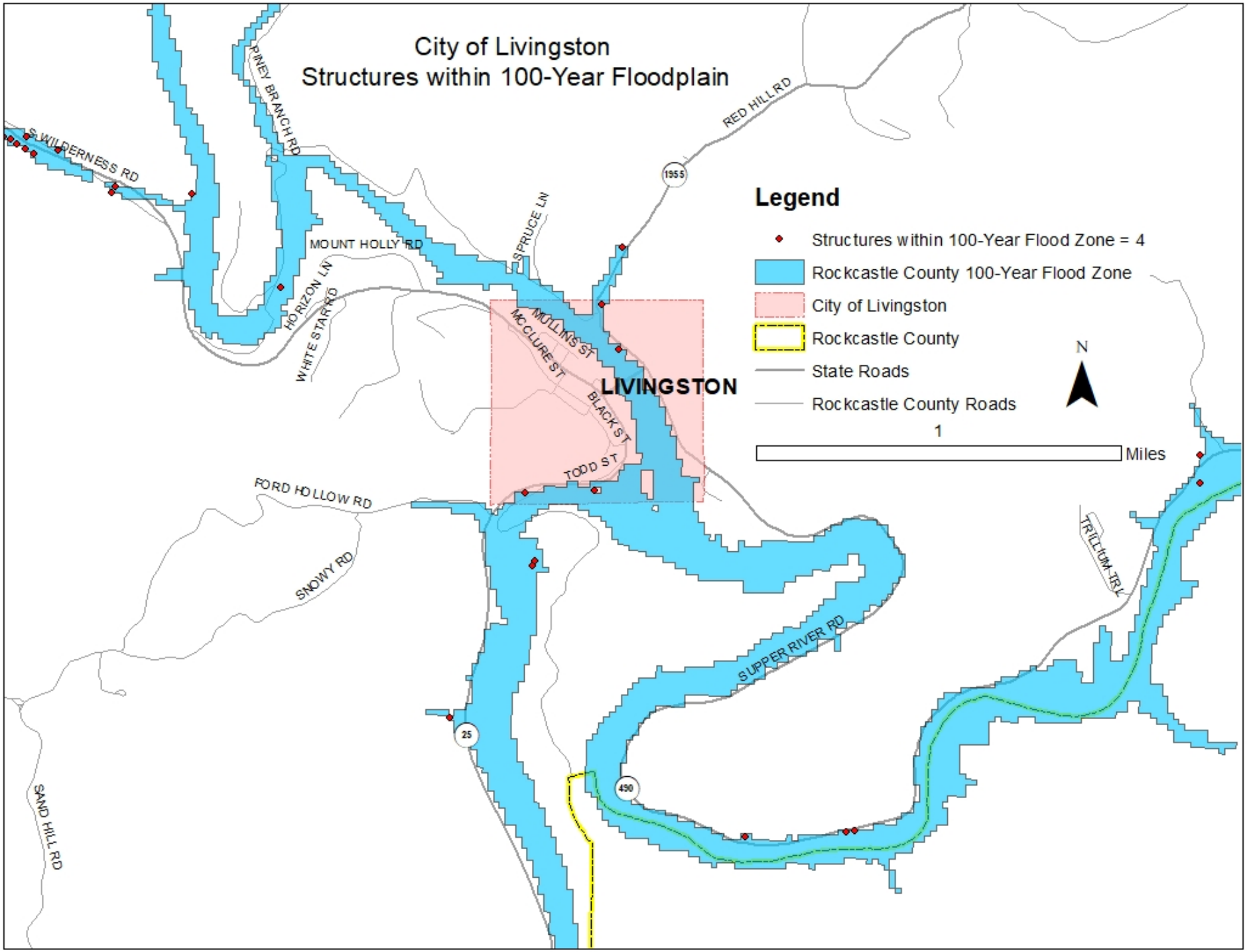
N

10

Miles


City of Mount Vernon
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 0
Rockcastle County 100-Year Flood Zone
City of Mount Vernon
Rockcastle County
I75
State Roads
Rockcastle County Roads
1
Miles
N
MOUNT VERNON
HUMMEL RD
ROSE HILL RD
TWILIGHT AVE
SILVER MIST CIR
GOLD DUST DR
GREEN MEADOW LN
HOOT RD
I75 RAMP to US 25
BUCKEYE RD
PROCTOR PL
JARBER RD
OLD ROCKY RD
REVEREND GREEN LOOP
RICHMOND ST
OLD BRODHEAD RD
HALE ST
HIGHWAY 1326
CLONTZ RD
WOODLAND PLACE DR
W MAIN ST
JERR LN
HUNTER ST
LAKE CUMBERLAND RD
INDUSTRIAL PARK RD
DASH LN
DYSART WAY
HEASLEY LN
COUNTRYSIDE CIR
TAMMY LN
PROGRESS DR
WHITE ROCK RD
OLD SOMERSET RD
SALT LT RD
DOWN BRANCH RD
GREENWAY DR
CRAWFORD LN
SCHOOL ST
LAIR ST
HIGH ST
NEWCOMB AVE
PERCIFUL ST
LEWIS ST
OWENS ST
FERGUSON ST
HAMLIN ST
LOVELL LN
CRAWFORD ST
WILLIAMS ST
MAPLE DR
SIGMON ST
FAIR ST
POPLAR ST EXT
DAILY AVE
LOCUST ST
MILL ST
US 150
DAVIS ST
TOWER DR
OLD US HIGHWAY 25 S
US HIGHWAY 25
OLD DIXIE HWY
CARTER RIDGE RD
DAVIS LN
CARTER DR
HILL ST
SAND SPRINGS RD
FLOYD ST
JOYCE ST
FORD DR
LIBERTY ST
SHIRLEY ST
TERRY ST
PAUL ST
LIMESTONE ST
MAGGIE LN
EDDIE LN
RUBEN LN
BIG CAVE RD
SWILDERNESS RD
MCHARGUE BRANCH RD
I75 NC
I75
TADER RD
RED BUD DR
461
1326
150
2323
2549
1249
2224
3274
1004
75
25
2793


City of Brodhead
Structures within 100-Year Floodplain
BRODHEAD
Gum Sulphur
FT HARRODWAY
SLATY BRANCH RD
AUTUMN LN
HACKER LN
BLUEBIRD LN
150
COLUM KINGDOM RD
CHESTNUT GROVE RD
BURTON LN
W MAIN ST
WILLOWAVE
WEST ST
SIGMON ST
TYREE ST
E MAIN ST
HIGHWAY 1
FUZZY DUCK RD
1505
UNION CHAPEL RD
BRINDLE RIDGE RD
BIG SINKS RD
COLSON LN
MOUNT ZION RD
HOCK LN
BOWLING RIDGE RD
TAR KILN RD
KY 3245
3245
DYSART WAY
S MAIN ST
1326
PURRIGSBY RD
BARNETT RD
KLINEY LN
HOUK LN
OLD BRODHE
CASS RD
DUG HILL RD
1229
SMITHERN LN
NAPIER RD
WILLALLA RD
DAIRY LN
MULE LN
DERBY LN
CEDAR RAPIDS RD
70
1250
SPIRO RD
OLD SMOKEY RD
Legend
Structures within 100-Year Flood Zone = 68
Rockcastle County 100-Year Flood Zone
City of Brodhead
Rockcastle County
State Roads
Rockcastle County Roads
N
1.5
Miles


City of Livingston
Structures within 100-Year Floodplain
Legend
Structures within 100-Year Flood Zone = 4
Rockcastle County 100-Year Flood Zone
City of Livingston
Rockcastle County
State Roads
Rockcastle County Roads
1
Miles
N
LIVINGSTON
S WILDERNESS RD
RINEY BRANCH RD
RED HILL RD
1955
MOUNT HOLLY RD
SPRUCE LN
HORIZON LN
WHITE STAR RD
MULLINS ST
MCCLURE ST
BLACK ST
TODD ST
FORD HOLLOW RD
SNOWY RD
TRILLIUM TRL
SUPPER RIVER RD
25
490
SAND HILL RD

ASSESSING VULNERABILITY: IDENTIFYING ASSETS

Using best available data CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the county. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

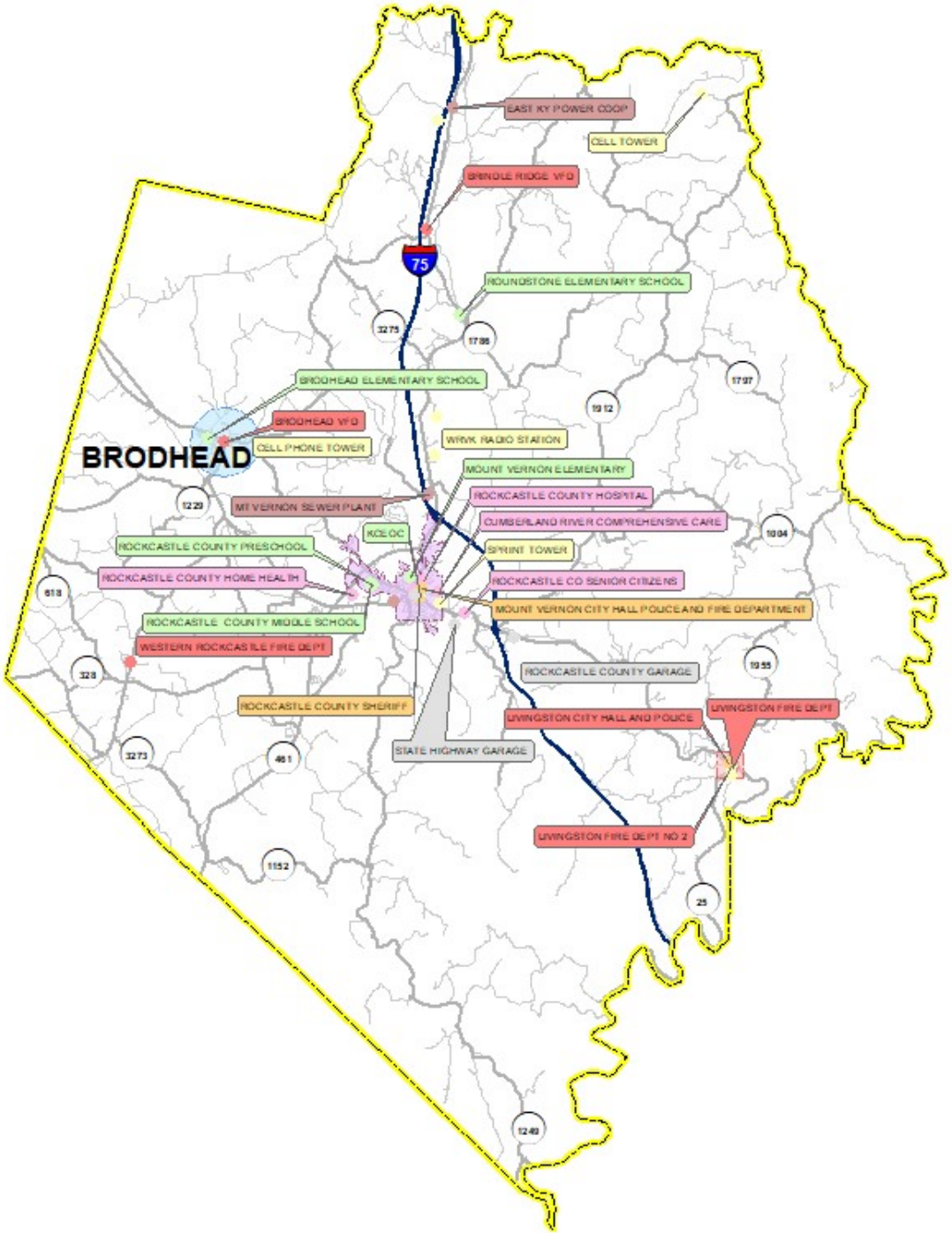
Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 7 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Rockcastle County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Rockcastle County Critical Infrastructure		***Structures Located in Floodplain**
Location	**Address**	**Property Replacement Value**
City of Brodhead		
City Hall	7 West Main St, Brodhead, KY 40409	$72,000
Brodhead Family Care	46 West Main Street Brodhead, KY 40409	$75,000
Brodhead Pharmacy	54 W. Main St Brodhead, KY 40409	$68,000
Rockcastle Health & Rehabilitation Center	371 West Main Street Brodhead, KY 40409	$2,500,000
City of Brodhead Total Assets		$9,500,000
City of Livingston		
City Hall	125 Main St. Livingston, KY 40445	$12,000
Livingston Gym	Main St. Livingston, KY 40445	$100,000
Livingston School	9200 Main St. Livingston, KY 40445	$142,500
Maintenance Building	9316 South Main St. Livingston, KY 40445	$40,000
City of Mount Vernon		
Cumberland River Comprehensive Care	260 Old US Highway 25 Mt. Vernon, KY 40456	$417,720
Cumberland Valley Health Department	120 Richmond St. Mt. Vernon, KY 40456	$375,000
Lifeline Rockcastle Home Health	145 Lewis St. Mt. Vernon, KY 40456	$67,000
Mt. Vernon City Hall	125 Richmond St Mt. Vernon, KY 40456	$280,000
Rockcastle Regional Hospital	145 Newcomb Avenue Mt. Vernon, KY 40456	TBD
Wayne Stewart Adult Health Center	439 Jerri Lane Mt. Vernon, KY 40456	$190,000
Rockcastle County Senior Citizens	1260 S. Wilderness Rd Mt. Vernon, KY 40456	$26,000
Rockcastle County Courthouse	205 E. Main St. Mt. Vernon, KY 40456	$5,500,000
Rockcastle Co. Ambulance Service	210 Newcomb Avenue Mt. Vernon, KY 40456	$1,050,000
Rockcastle County Emergency Operations Center	755 Progress Dr. Mt. Vernon, KY	$3,200,000

Rockcastle Co. Sheriff Department	S. Wilderness Rd Mt. Vernon, KY 40456	$315,500
RTEC	100 Main Street Mt. Vernon, KY 40456	$1,175,000
Source HOV	30 Industrial Park Rd Mt. Vernon, KY 40456	$950,000
White House Clinic	116 Progress Dr. Mt. Vernon, KY 40456	$1,137,500
Schools		
Board of Education	245 Richmond St Mt. Vernon, KY 40456	$2,000,000
Brodhead Elementary School	27 School St. Brodhead, KY 40409	$13,982,612
Mt. Vernon Elementary School	530 Williams Street Mt. Vernon, KY 40456	$20,000,000
Rockcastle Middle School	945 West Main Street Mt. Vernon, KY 40546	$26,976,763
Rockcastle High School	1545 Lake Cumberland Rd Mt. Vernon, KY 40456	$46,597,904
Rockcastle Area Technology Center	1555 Lake Cumberland Rd Mt. Vernon, KY 40456	Included with high school.
Rockcastle Adult Education Center & Rockcastle Academy	955 West Main Street Mt. Vernon, KY 40456	$5,154,162
Roundstone Elementary	6701 N Wilderness Rd, Mt Vernon, KY 40456	$9,098,921
Teaching & Learning Center	245 Richmond St Mt. Vernon, KY 40456	$1,000,000
Volunteer Fire Departments		
Brindle Ridge VFD	8763 N Wilderness Rd Mt. Vernon, KY 40456	$8,500
Brodhead VFD	7 W Main St. Brodhead, KY 40409	$2,000,000
Climax VFD	7562 Climax Rd Mt. Vernon, KY 40456	$400,000
Livingston VFD	9254 Main St. Livingston, KY 40445	$300,000
Mt. Vernon VFD	270 Old US Hwy 25 Mt. Vernon, KY 40456	$280,000
Pongo VFD	47 Bloss Rd Mt. Vernon, KY 40456	$105,000
Western Rockcastle VFD	3970 Willailla RD Brodhead, KY 40409	$175,500
Rockcastle Media		
WRVK	235 Red Foley Rd Mt. Vernon, KY 40456	$70,000
Mt. Vernon Signal	115 W Main St. Mt. Vernon, KY 40456	$70,000
Area Solid Waste Removal		
Rockcastle Co. Solid Waste Management	205 E. Main St. Mt. Vernon, KY 40456	TBD
Waste Water/Water Treatment		
Brodhead Sewer Plant	Chestnut Grove Rd, Brodhead, KY 40409	$1,750,000
Eastern Rockcastle Water Associates	9246 Main St. Livingston, KY 40445	$3,800
Livingston Sewer Plant	Main Street	TBD
Mt. Vernon Water Works	135 Water Plant Rd. Mt. Vernon KY 40456	TBD
Mt. Vernon Sewer Plant	390 Newcomb Avenue Mt. Vernon, KY 40456	TBD
Western Rockcastle Water Association	371 West Main Street Brodhead, KY 40409	TBD
Lift Station	HWY 1326 Brodhead, KY 40409	$4,000

Lift Station	S. Main Street Brodhead, KY 40409	$4,000
Lift Station	W. Main Street Brodhead, KY 40409	TBD
Water Tanks		
	Old Rocky RD	$2,500,000
	Faith Mountain RD	$1,500,000
	Mahaffey Hill	$240,000
	Davis Lane	$2,000,000
	Hwy 461	$1,500,000
	Hwy 1249	$1,000,000
	Big Sinks Road	$850,000
	Bowling Ridge Road	$450,000
	KY 1505	$6,000
DAMS	**HAZARD CLASS**	
Mt. Vernon Reservoir Dam	(Class A) Low	TBD
Renfro Dam	(Class C) High	TBD
Electrical Substations		
East Kentucky Power	831 Hwy 1505 Brodhead, KY 40409	TBD
Kentucky Utilities	77 Cass Street Brodhead, KY 40409	TBD
East Kentucky Power	11510 N. Wilderness Rd Mt. Vernon, Ky 40456	TBD
East Kentucky Power	2141 Lake Cumberland Rd Mt. Vernon, KY 40456	TBD
East Kentucky Power	Fairground Hill	TBD
East Kentucky Power	Industrial Park	TBD
East Kentucky Power	Climax Substation	TBD
Jackson Energy	1688 Lambert Rd Berea, KY	TBD
Jackson Energy	Conway	TBD

Rockcastle County, KY: Critical Infrastructure



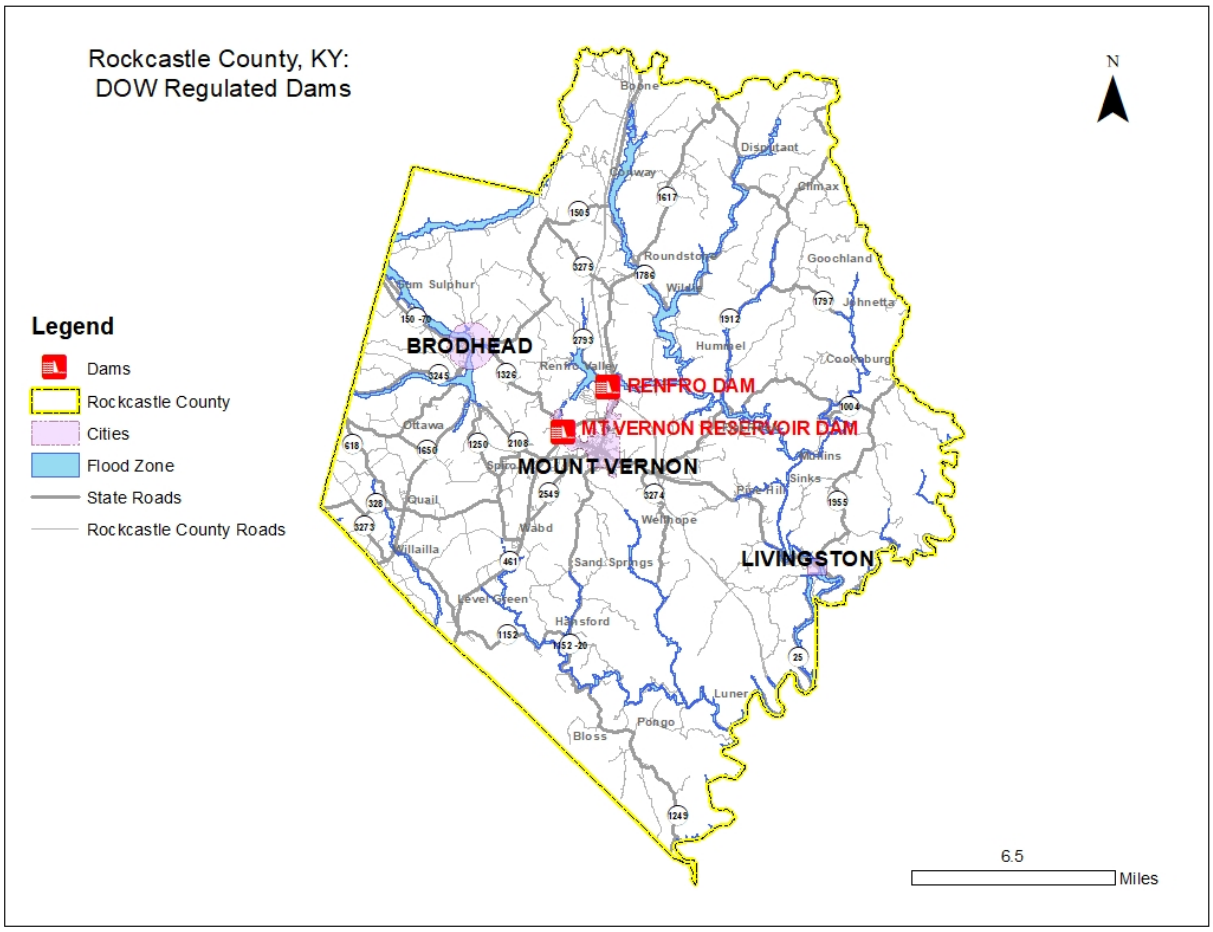
Legend

- Utilities
- Transportation
- Police
- Healthcare
- Government
- Fire & Rescue
- Education
- Communications
- Rockcastle County
- Brodhead
- Mount Vernon
- Livingston
- I-75
- State Roads
- Rockcastle County Roads

N

10

Miles



ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Rockcastle	282	$75,100.00	$21,178,200.00
City of Brodhead	68		$5,106,800.00
City of Livingston	4		$300,400.00
City of Mt. Vernon	0		0

ROCKCASTLE COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Rockcastle County, Unincorporated possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for “Repetitive-Loss” and there are two (2) definitions for “Severe Repetitive-Loss”: There are the National Flood Insurance Program (NFIP)

program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The City of Brodhead possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The City of Livingston possesses one (1) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

The following table summarizes how many properties are characterized by a "type" of property (i.e., whether "single-family occupancy," "2-4 family occupancy," or "other non-residential") and summarizes within each type the number considered "Repetitive-Loss" under the NFIP and FMA definitions and the number considered "Severe Repetitive-Loss" according to the NFIP and FMA definition. The one (1) property in City of Livingston is disaggregated as follows:

City of Livingston RL and SRL Properties by Type and by RL/SRL Definition Category

Jurisdiction	Type	Number of Type	NFIP RL	FMA RL	NFIP SRL	FMA SRL
Livingston, City of	Single-Family Occupancy	1	1	1	0	0
Livingston, City of	2-4 Family Occupancy	0	0	0	0	0
Livingston, City of	Other Non-Residential	0	0	0	0	0
TOTAL		***1***	***1***	***1***	***0***	***0***

The City of Mt. Vernon possesses zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of "Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain

management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation. The following are the floodplain coordinators for Rockcastle County.

Floodplain Coordinators				
Community Name	**Name**	**Job Title**	**Address**	**Phone Number**
Brodhead	Bryan Bussell	Floodplain Admin.	P.O. Box 556/7 West Main Brodhead, KY 40409	606-758-8635 (City) 606-308-3999 (Cell)
Livingston	Jason Medley	Mayor	P.O. Box 654 Livingston, KY 40445	606-453-2061
Mt. Vernon	Frank Baker	Public Works Director	P.O. Box 1465 Mt. Vernon, KY 40456	606-256-3437

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures.

Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210201#	Brodhead	Rockcastle	05/17/74	08/03/09	08/03/09(M)	08/03/09	No
210202#	Livingston	Rockcastle	08/02/74	06/17/86	08/03/09(M)	06/17/86	No
210374#	Mt. Vernon	Rockcastle		08/03/09	08/03/09(M)	08/03/09	No
210331#	Rockcastle Co.	Rockcastle		08/03/09	08/03/09(M)	01/13/97	No

NFIP FINANCIAL CLAIMS

Since 1978 a total of 8 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $201,013 in claims. To put it in perspective that is an average of $25,126.63 per claim or $5,025.36 per year spent on repairing flood damages. There are only 31 flood insurance policies in effect as of March 2018 and 282 identified structures located within the 100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Brodhead	3283	0	3	3	0	312	312	0	2	2	0	83,097	83,097
Livingston		0	0	0	0	0	0	2	0	2	1,667	0	1,667
Mt. Vernon	687	0	1	1	0	69	69	0	0	0	0	116,249	0
Rockcastle	17,180	5	22	27	484	4,617	5,101	0	4	4	0	0	116,249
Total	21,150	5	26	31	484	4,998	5,482	2	6	8	1,667	199,346	201,013
Nfipservices.floodsmart.gov													

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

SEVERE THUNDERSTORMS & TORNADOS

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees, power lines and mobile homes. Rainfall from thunderstorms can cause flash flooding. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures.

Table 7-4: Rockcastle County Thunderstorm/Wind Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	442.00K	11.50K
1	ROCK-CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/3/2000	19:50	EST	High Wind	58 kts. E	0	0	0.00K	0.00K
2	COUNTY-WIDE	ROCK CASTLE CO.	KY	11/12/2003	17:12	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	COUNTY-WIDE	ROCK CASTLE CO.	KY	11/12/2003	18:02	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
3	COUNTY-WIDE	ROCK CASTLE CO.	KY	5/26/2004	14:40	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
4	RENFRO VLY	ROCK CASTLE CO.	KY	5/31/2004	0:05	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
5	WILLA-ILLA	ROCK CASTLE CO.	KY	6/13/2004	13:10	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
6	MT VERNON	ROCK CASTLE CO.	KY	7/5/2004	16:35	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
7	OTTAWA	ROCK CASTLE CO.	KY	7/13/2004	21:55	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

8	MT VERNON	ROCK CASTLE CO.	KY	6/14/2005	16:05	EST	Thunder-storm Wind	50 kts. EG	0	0	1.00K	0.00K
9	BOONE	ROCK CASTLE CO.	KY	1/2/2006	17:22	EST	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
10	MT VERNON	ROCK CASTLE CO.	KY	3/9/2006	20:27	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
11	ORLANDO	ROCK CASTLE CO.	KY	3/9/2006	20:27	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	3/9/2006	20:27	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	MT VERNON	ROCK CASTLE CO.	KY	3/9/2006	20:33	EST	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
12	BRODHEAD	ROCK CASTLE CO.	KY	4/3/2006	23:08	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
13	ROUND-STONE	ROCK CASTLE CO.	KY	4/7/2006	15:04	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	4/7/2006	21:45	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
14	QUAIL	ROCK CASTLE CO.	KY	5/25/2006	21:45	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	5/25/2006	22:46	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
15	MT VERNON	ROCK CASTLE CO.	KY	5/31/2006	15:33	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
16	BRODHEAD	ROCK CASTLE CO.	KY	7/4/2006	15:21	EST	Thunder storm Wind	65 kts. EG	0	0	8.00K	0.00K

	BRODHEAD	ROCK CASTLE CO.	KY	7/4/2006	15:28	EST	Thunder-storm Wind	55 kts. EG	0	0	2.00K	0.00K
17	CONWAY	ROCK CASTLE CO.	KY	7/21/2006	19:08	EST	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	CONWAY	ROCK CASTLE CO.	KY	7/21/2006	20:16	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
19	DISPU-TANTA	ROCK CASTLE CO.	KY	8/20/2006	7:28	EST	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K
20	MT VERNON	ROCK CASTLE CO.	KY	9/24/2006	2:39	EST	Thunder-storm Wind	60 kts. EG	0	0	3.00K	0.00K
21	MT VERNON	ROCK CASTLE CO.	KY	4/3/2007	18:59	EST -5	Thunder-storm Wind	53 kts. EG	0	0	1.00K	0.00K
22	MT VERNON	ROCK CASTLE CO.	KY	6/5/2007	15:54	EST -5	Thunder-storm Wind	60 kts. EG	0	0	20.00 K	0.00K
	COOKS-BURG	ROCK CASTLE CO.	KY	6/5/2007	16:47	EST -5	Thunder-storm Wind	55 kts. EG	0	0	20.00 K	0.00K
23	LIVING-STON	ROCK CASTLE CO.	KY	1/29/2008	22:00	EST -5	Thunder-storm Wind	52 kts. EG	0	0	2.00K	0.00K
24	LIVING-STON	ROCK CASTLE CO.	KY	7/22/2008	14:35	EST -5	Thunders-torm Wind	55 kts. EG	0	0	7.00K	0.00K
25	BRODHEAD	ROCK CASTLE CO.	KY	4/5/2009	20:30	EST -5	Thunder-storm Wind	55 kts. EG	0	0	50.00 K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	BRODHEAD	ROCK CASTLE CO.	KY	4/5/2009	20:36	EST -5	Thunder-storm Wind	59 kts. MG	0	0	0.00K	0.00K
	MT VERNON	ROCK CASTLE CO.	KY	4/5/2009	20:45	EST -5	Thunder-storm Wind	55 kts. EG	0	0	5.00K	0.00K

26	MT VERNON	ROCK CASTLE CO.	KY	6/25/2009	19:49	EST -5	Thunder-storm Wind	55 kts. EG	0	0	35.00 K	0.00K
27	WILLAILLA	ROCK CASTLE CO.	KY	5/8/2010	22:15	EST -5	Thunder-storm Wind	51 kts. EG	0	0	1.00K	0.00K
28	MT VERNON	ROCK CASTLE CO.	KY	5/15/2010	17:12	EST -5	Thunder-storm Wind	55 kts. EG	0	0	5.00K	0.00K
29	BRODHEAD	ROCK CASTLE CO.	KY	8/5/2010	13:08	EST -5	Thunder-storm Wind	50 kts. EG	0	0	1.00K	0.00K
30	BRODHEAD	ROCK CASTLE CO.	KY	8/15/2010	17:15	EST -5	Thunder-storm Wind	50 kts. EG	0	0	1.00K	0.00K
31	BRODHEAD	ROCK CASTLE CO.	KY	4/27/2011	8:28	EST -5	Thunder-storm Wind	52 kts. EG	0	0	3.00K	0.00K
	CONWAY	ROCK CASTLE CO.	KY	4/27/2011	8:32	EST -5	Thunder-storm Wind	52 kts. EG	0	0	2.00K	0.00K
32	BOONE	ROCK CASTLE CO.	KY	8/21/2011	21:50	EST -5	Thunder-storm Wind	55 kts. EG	0	0	10.00 K	0.00K
33	WELLHOPE	ROCK CASTLE CO.	KY	7/5/2012	14:30	EST -5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
34	CLIMAX	ROCK CASTLE CO.	KY	8/9/2012	11:15	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
35	MT VERNON	ROCK CASTLE CO.	KY	1/30/2013	6:36	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	PONGO	ROCK CASTLE CO.	KY	1/30/2013	6:45	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
36	BRODHEAD	ROCK CASTLE CO.	KY	4/11/2013	17:30	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K

37	MT VERNON	ROCK CASTLE CO.	KY	5/21/2013	16:00	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
38	PONGO	ROCK CASTLE CO.	KY	7/13/2013	12:35	EST -5	Thunder-storm Wind	60 kts. EG	0	0	10.00 K	0.00K
	BURR	ROCK CASTLE CO.	KY	7/13/2013	12:53	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	ORLANDO	ROCK CASTLE CO.	KY	7/13/2013	14:00	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
39	MT VERNON	ROCK CASTLE CO.	KY	8/31/2013	16:26	EST -5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
40	ROCKFORD	ROCK CASTLE CO.	KY	11/17/2013	20:00	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
41	CLIMAX	ROCK CASTLE CO.	KY	12/22/2013	0:25	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	MT VERNON	ROCK CASTLE CO.	KY	12/22/2013	0:30	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	LIVING-STON	ROCK CASTLE CO.	KY	12/22/2013	0:35	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	MT VERNON	ROCK CASTLE CO.	KY	2/20/2014	23:35	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	5/21/2014	20:43	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	MARET-BURG	ROCK CASTLE CO.	KY	5/21/2014	20:45	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	5/21/2014	20:48	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

	PINE HILL	ROCK CASTLE CO.	KY	5/21/2014	20:51	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	LIVING-STON	ROCK CASTLE CO.	KY	5/21/2014	20:53	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	PONGO	ROCK CASTLE CO.	KY	5/21/2014	20:56	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	MARET-BURG	ROCK CASTLE CO.	KY	5/21/2014	21:02	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
42	RENFRO VLY	ROCK CASTLE CO.	KY	5/27/2014	16:10	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
43	LIVING-STON	ROCK CASTLE CO.	KY	7/14/2014	12:38	EST -5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	LIVING-STON	ROCK CASTLE CO.	KY	7/14/2014	12:38	EST -5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	LIVING-STON	ROCK CASTLE CO.	KY	7/14/2014	12:39	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
44	HANSFORD	ROCK CASTLE CO.	KY	7/23/2014	17:30	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
45	ROUND-STONE	ROCK CASTLE CO.	KY	7/27/2014	14:00	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
46	MT VERNON	ROCK CASTLE CO.	KY	8/20/2014	16:25	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	LIVING-STON	ROCK CASTLE CO.	KY	8/20/2014	16:32	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	LIVING-STON	ROCK CASTLE CO.	KY	8/20/2014	16:35	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K

47	BRODHEAD	ROCK CASTLE CO.	KY	10/7/2014	4:10	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	PINE HILL	ROCK CASTLE CO.	KY	10/7/2014	4:35	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
48	OTTAWA	ROCK CASTLE CO.	KY	7/9/2015	13:01	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	OTTAWA	ROCK CASTLE CO.	KY	7/9/2015	13:01	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/9/2015	13:02	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/9/2015	13:02	EST -5	Thunder-storm Wind	61 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/9/2015	13:02	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/9/2015	13:06	EST -5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/9/2015	13:06	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	SAND SPGS	ROCK CASTLE CO.	KY	7/9/2015	13:06	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
49	GUM SULPHUR	ROCK CASTLE CO.	KY	7/10/2015	13:40	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
50	MT VERNON	ROCK CASTLE CO.	KY	7/14/2015	5:24	EST -5	Thunder-storm Wind	60 kts. EG	0	0	0.00K	0.00K
	MT VERNON	ROCK CASTLE CO.	KY	7/14/2015	5:30	EST -5	Thunder-storm Wind	55 kts. EG	0	0	0.00K	0.00K

51	CONWAY	ROCK CASTLE CO.	KY	5/7/2016	17:48	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
52	MT VERNON	ROCK CASTLE CO.	KY	6/23/2016	18:28	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	MULLINS	ROCK CASTLE CO.	KY	6/23/2016	18:40	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
53	BRODHEAD	ROCK CASTLE CO.	KY	7/4/2016	15:33	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/4/2016	15:33	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
54	MULLINS	ROCK CASTLE CO.	KY	7/7/2016	17:18	EST -5	Thunder-storm Wind	50 kts. MG	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	7/8/2016	14:15	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
55	MARET-BURG	ROCK CASTLE CO.	KY	5/11/2017	16:30	EST -5	Thunder-storm Wind	45 kts. EG	0	0	0.00K	0.10K
56	BRODHEAD	ROCK CASTLE CO.	KY	5/24/2017	15:13	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
57	MT VERNON	ROCK CASTLE CO.	KY	7/6/2017	16:40	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.00K
58	BRODHEAD	ROCK CASTLE CO.	KY	2/25/2018	0:56	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
59	MT VERNON	ROCK CASTLE CO.	KY	3/17/2018	16:46	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	1.00K
60	BURR	ROCK CASTLE CO.	KY	7/20/2018	18:42	EST -5	Thunder-storm Wind	53 kts. EG	0	0	0.00K	0.00K

61	MT VERNON	ROCK CASTLE CO.	KY	11/6/2018	1:11	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
62	BRODHEAD	ROCK CASTLE CO.	KY	5/26/2019	17:07	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
63	WILLAILLA	ROCK CASTLE CO.	KY	7/11/2019	16:30	EST -5	Thunder-storm Wind	55 kts. EG	0	0	5.00K	0.00K
64	BRODHEAD	ROCK CASTLE CO.	KY	4/8/2020	23:35	EST -5	Thunder-storm Wind	70 kts. EG	0	0	250.00K	10.00K
65	WABD	ROCK CASTLE CO.	KY	6/10/2020	17:00	EST -5	Thunder-storm Wind	52 kts. EG	0	0	0.00K	0.40K
66	MARET-BURG	ROCK CASTLE CO.	KY	7/6/2020	19:22	EST -5	Thunder-storm Wind	51 kts. EG	0	0	0.00K	0.00K
	QUAIL	ROCK CASTLE CO.	KY	7/6/2020	19:31	EST -5	Thunder-storm Wind	50 kts. EG	0	0	0.00K	0.00K
	Totals:								0	0	442.00K	11.50K

Rockcastle County Severe Thunderstorms - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically, this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/3/2000. The denominator is set at 20 years, keeping the denominator consistent to maintain comparability between counties.

That Rockcastle County experienced 66 severe thunderstorm/wind events over 20 years yields that Rockcastle County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every three months and 22 days (i.e., 66/240). Specifically, Rockcastle County experienced an average of three (3) severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.27 events per month. $1/.27 = 3.7 \approx 1$ severe thunderstorm event on average every three months and 22 days.

Table 7-5: Rockcastle County Hailstorm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	4.500M	1.000M
1	MT VERNON	ROCK CASTLE CO.	KY	6/3/1996	20:05	EST	Hail	1.75 in.	0	0	0.00K	0.00K
2	MT VERNON	ROCK CASTLE CO.	KY	4/16/1998	18:37	EST	Hail	1.00 in.	0	0	0.00K	0.00K
3	COUNTYWIDE	ROCK CASTLE CO.	KY	5/1/2002	19:15	EST	Hail	2.75 in.	0	0	4.500M	1.000M
4	CONWAY	ROCK CASTLE CO.	KY	11/10/2002	21:18	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	CONWAY	ROCK CASTLE CO.	KY	11/10/2002	21:35	EST	Hail	1.00 in.	0	0	0.00K	0.00K
5	BRODHEAD	ROCK CASTLE CO.	KY	4/2/2006	22:50	EST	Hail	0.75 in.	0	0	0.00K	0.00K
6	ROUNDSTONE	ROCK CASTLE CO.	KY	4/7/2006	15:04	EST	Hail	1.75 in.	0	0	0.00K	0.00K
7	CONWAY	ROCK CASTLE CO.	KY	4/19/2006	4:17	EST	Hail	1.75 in.	0	0	0.00K	0.00K
8	BRODHEAD	ROCK CASTLE CO.	KY	6/11/2006	19:12	EST	Hail	1.00 in.	0	0	0.00K	0.00K
9	QUAIL	ROCK CASTLE CO.	KY	4/5/2009	20:28	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	CLIMAX	ROCK CASTLE CO.	KY	4/5/2009	20:43	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
10	MT VERNON	ROCK CASTLE CO.	KY	7/1/2009	0:20	EST-5	Hail	2.00 in.	0	0	0.00K	0.00K

11	BRODHEAD	ROCK CASTLE CO.	KY	10/18/2011	18:10	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
12	PONGO	ROCK CASTLE CO.	KY	3/2/2012	18:57	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
13	PONGO	ROCK CASTLE CO.	KY	7/13/2013	12:35	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
14	MT VERNON	ROCK CASTLE CO.	KY	4/29/2014	19:30	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
15	BRODHEAD	ROCK CASTLE CO.	KY	7/27/2014	12:38	EST-5	Hail	1.50 in.	0	0	0.00K	0.00K
	ORLANDO	ROCK CASTLE CO.	KY	7/27/2014	13:10	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
16	BOONE	ROCK CASTLE CO.	KY	8/2/2014	13:15	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
17	WILLAILLA	ROCK CASTLE CO.	KY	10/6/2014	19:44	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	BRODHEAD	ROCK CASTLE CO.	KY	10/7/2014	15:52	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
18	BOONE	ROCK CASTLE CO.	KY	4/25/2015	19:11	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	ROCKFORD	ROCK CASTLE CO.	KY	4/25/2015	19:12	EST-5	Hail	2.00 in.	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	CONWAY	ROCK CASTLE CO.	KY	4/25/2015	19:12	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	ROCKFORD	ROCK CASTLE CO.	KY	4/25/2015	19:12	EST-5	Hail	2.75 in.	0	0	0.00K	0.00K

	ROUNDSTONE	ROCK CASTLE CO.	KY	4/25/2015	19:15	EST-5	Hail	2.00 in.	0	0	0.00K	0.00K
	CONWAY	ROCK CASTLE CO.	KY	4/25/2015	19:18	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
19	BRODHEAD	ROCK CASTLE CO.	KY	3/27/2017	17:00	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	MARETBURG	ROCK CASTLE CO.	KY	3/27/2017	17:36	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
20	SAND SPGS	ROCK CASTLE CO.	KY	4/29/2017	17:40	EST-5	Hail	1.25 in.	0	0	0.00K	0.00K
21	BRODHEAD	ROCK CASTLE CO.	KY	5/24/2017	15:14	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
22	BRODHEAD	ROCK CASTLE CO.	KY	4/3/2018	21:22	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	BOONE	ROCK CASTLE CO.	KY	4/3/2018	21:34	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
23	MARETBURG	ROCK CASTLE CO.	KY	4/8/2020	23:46	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	4.500M	1.000M

Rockcastle County Hailstorms - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 6/3/1996. The last date recorded for a hailstorm in Rockcastle County is 4/8/2020; the denominator is set at 20 years to maintain comparability across counties.

That Rockcastle County experienced 23 events with hail 1" or larger over 20 years yields that Rockcastle County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 10 months (i.e., 23/240). Specifically, Rockcastle County experienced an

average of 1.2 severe hailstorm events every year. Or, using December 31, 2020 as an endpoint, this is 0.1 events per month. 1/.1 = 10 ≈ 1 severe hailstorm event an average of every 10 months.

Table 7-6: Rockcastle County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	35.00K	0.00K
1	OTTAWA	ROCK CASTLE CO.	KY	4/20/1996	4:28	EST	Tornado	F1	0	0	20.00K	0.00K
2	MT VERNON	ROCK CASTLE CO.	KY	4/16/1998	18:35	EST	Tornado	F0	0	0	15.00K	0.00K
3	LEVEL GREEN	ROCK CASTLE CO.	KY	6/10/1998	20:34	EST	Tornado	F0	0	0	0.00K	0.00K
4	BRODHEAD	ROCK CASTLE CO.	KY	7/4/2016	15:27	EST-5	Tornado	EF1	0	0	0.00K	0.00K
	Totals:								0	0	35.00K	0.00K

Rockcastle County Tornados - Probability as Frequency of Event Occurrence

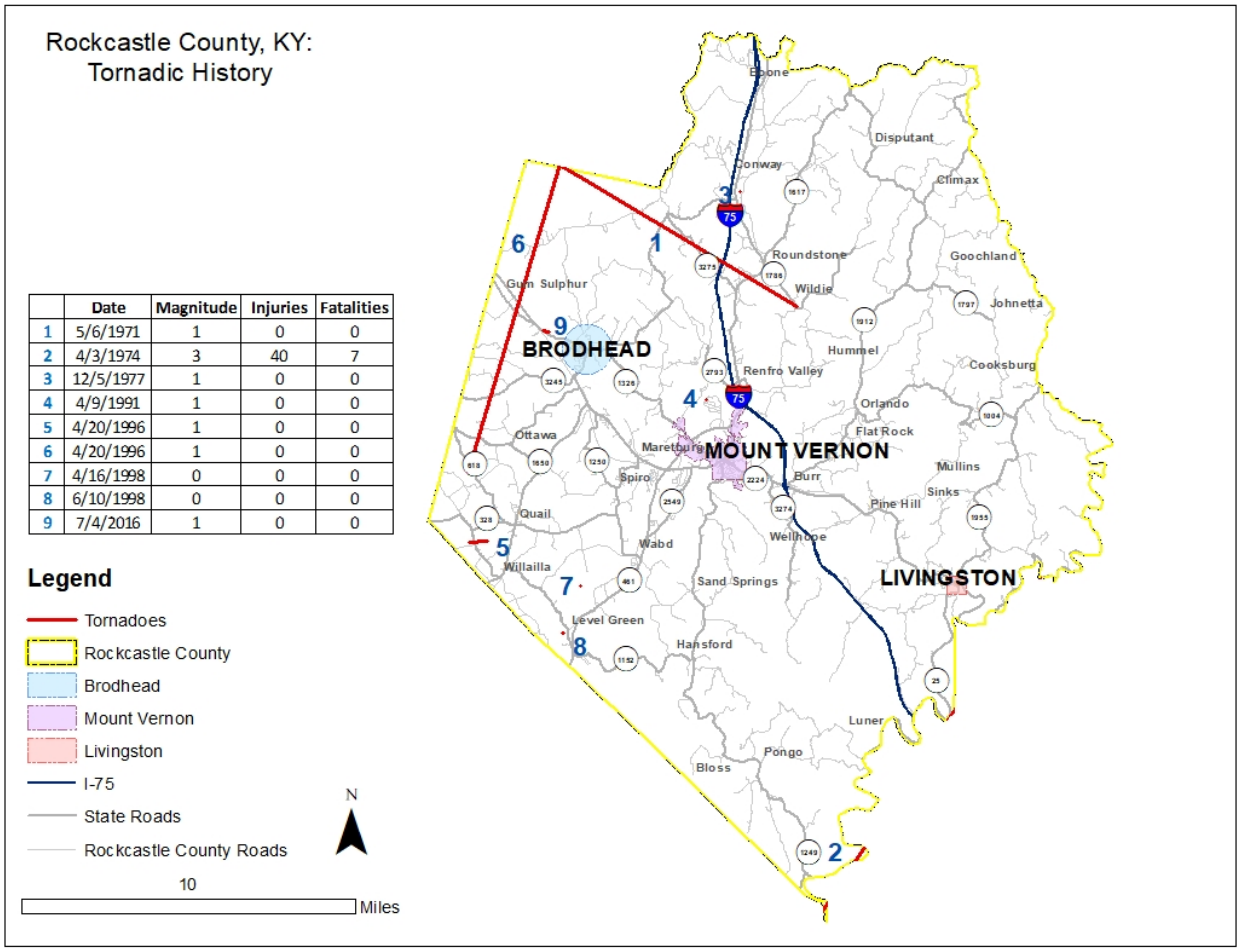
Although the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 4/20/1996. The last date recorded for a tornado in Rockcastle County is 7/4/2016; the denominator is set at 20 years to maintain comparability across counties. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen.

That Rockcastle County experienced 4 events with tornados over 20 years yields that Rockcastle County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado event every 59 months (i.e., 4/240). Or, using December 31, 2020 as an endpoint, this is 0.017 events per month. 1/.017 = 58.8 ≈ 1 tornado event an average of every 59 months or approximately once every five years.

PAST SEVERE STORM EVENTS

On July 4, 2016 an EF-1 tornado with 90 mph winds touched down in Brodhead. The tornado was on the ground for around 15 to 20 seconds. The tornado picked up a car and moved it 70 ft, damaged around a half-dozen homes, and uprooted trees. The event left around 40 people without electricity. No one was injured. On March 17, 2018 thunderstorms brought heavy rain, lightning and hail as well as widespread damage across portions of Rockcastle County. Trees were knocked over and a few barns were destroyed.

Thunderstorms can produce tornados, floods, lightning and damaging winds. They may occur individually, in clusters or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios. Through studying past severe thunderstorm events, the county and cities, can become better prepared for future disasters.



	Date	Magnitude	Injuries	Fatalities
1	5/6/1971	1	0	0
2	4/3/1974	3	40	7
3	12/5/1977	1	0	0
4	4/9/1991	1	0	0
5	4/20/1996	1	0	0
6	4/20/1996	1	0	0
7	4/16/1998	0	0	0
8	6/10/1998	0	0	0
9	7/4/2016	1	0	0

SEVERE WINTER WEATHER

Winter storms can range from a moderate snow over a few hours to a blizzard with blinding, wind-driven snow that lasts for several days. Some winter storms are large enough to affect several states, while others affect only a single community. Many winter storms are accompanied by dangerously low temperatures and sometimes by strong winds, icing, sleet, and freezing rain. Severe winter weather threatens utilities, critical facilities, and vulnerable populations. Hazardous road conditions can cause major problems throughout the county.

Table 7-7: Rockcastle County Severe Winter Weather Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	3	8.00K	0.00K
1	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
4	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/24/1999	9:00	EST	Heavy Snow		0	0	0.00K	0.00K
5	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/20/2001	3:00	EST	Heavy Snow		0	0	0.00K	0.00K
7	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/19/2002	6:30	EST	Heavy Snow		0	0	0.00K	0.00K
8	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/4/2002	14:00	EST	Heavy Snow		0	0	1.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/4/2002	14:00	EST	Heavy Snow		0	0	0.00K	0.00K
9	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/16/2003	21:55	EST	Heavy Snow		0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
10	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/25/2004	12:20	EST	Ice Storm		0	0	0.00K	0.00K
11	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/17/2007	13:50	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/17/2007	15:20	EST-5	Winter Weather		0	0	0.00K	0.00K
12	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	11/21/2008	4:00	EST-5	Winter Weather		0	0	0.00K	0.00K
13	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/27/2009	2:00	EST-5	Ice Storm		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/27/2009	2:30	EST-5	Ice Storm		0	0	0.00K	0.00K
14	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/2/2009	6:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/3/2009	16:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/3/2009	19:42	EST-5	Winter Weather		0	0	0.00K	0.00K
15	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/21/2009	20:00	EST-5	Winter Weather		0	0	0.00K	0.00K
16	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	3/12/2009	17:30	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	3/12/2009	17:40	EST-5	Winter Weather		0	0	0.00K	0.00K
17	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/29/2010	16:45	EST-5	Heavy Snow		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/29/2010	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/29/2010	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/29/2010	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCKC ASTLE (ZONE)	ROCKC ASTLE (ZONE)	KY	1/29/2010	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/29/2010	16:45	EST-5	Winter Weather		0	0	0.00K	0.00K
18	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/15/2010	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
19	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/12/2010	10:45	EST-5	Winter Weather		0	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
20	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/15/2010	21:00	EST-5	Ice Storm		0	0	0.00K	0.00K
21	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	6.00K	0.00K
22	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/14/2012	15:00	EST-5	Winter Weather		0	0	0.00K	0.00K
23	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/15/2013	14:59	EST-5	Ice Storm		0	0	0.00K	0.00K
24	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/25/2013	6:00	EST-5	Ice Storm		0	0	0.00K	0.00K
25	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/2/2014	5:30	EST-5	Winter Weather		0	3	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/2/2014	7:05	EST-5	Winter Weather		0	0	0.00K	0.00K
	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/2/2014	17:00	EST-5	Winter Weather		0	0	0.00K	0.00K
26	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	3/2/2014	20:15	EST-5	Winter Storm		0	0	0.00K	0.00K
27	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/16/2015	4:30	EST-5	Winter Storm		0	0	0.00K	0.00K
28	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/20/2015	22:30	EST-5	Winter Storm		0	0	0.00K	0.00K

	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
29	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	3/4/2015	23:00	EST-5	Winter Storm		0	0	0.00K	0.00K
30	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/22/2016	2:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
31	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/14/2016	15:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
32	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	1/16/2018	3:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
33	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	3/11/2018	22:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
34	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	12/9/2018	0:30	EST-5	Winter Weather		0	0	0.00K	0.00K
35	ROCK CASTLE (ZONE)	ROCK CASTLE (ZONE)	KY	2/7/2020	3:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	Totals: 35								0	3	7.00K	0.00K

Rockcastle County Severe Winter Storms - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Rockcastle County experienced 35 severe winter weather events over 25 years yields that Rockcastle County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every five months (i.e., 35/300). Specifically, Rockcastle County

experienced an average of 1.4 severe winter weather events each year. Or, using December 31, 2020, as an endpoint, this is 0.1167 events per month. 1/0.1167 = 8.57 ≈ 1 severe winter storm event an average of every 8 1/2 months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through October. This indicates that the winter months for Rockcastle County are November through March, a total of 5 months. When the frequency is calculated using the five winter months only (35/125), it reveals that Rockcastle County experienced an average of 1.4 events per winter period, or 0.28 events per winter month. 1/0.28 = 3.57 or about 1 severe winter storm events an average of every 3 1/2 winter months.

Rockcastle County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Storm total snowfall amounts of 12 to 15 inches were reported [in Rockcastle County]. The highest amounts occurred in Brodhead where 15 inches fell, and in Mount Vernon, where 14 inches was measured. Interstate 75 was shut down in Rockcastle County at times Friday afternoon through Saturday morning due to multiple crashes leaving 3,000 people stranded in their vehicles at one time."[107]

Rockcastle County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	ROCKCASTLE (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	ROCKCASTLE (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
3	ROCKCASTLE (ZONE)	12/23/1998	12/24/1998	Winter Storm	
4	ROCKCASTLE (ZONE)	12/24/1999	12/24/1999	Heavy Snow	Snowfall of 2 to 5 inches occurred across southeast Kentucky. The greatest snowfall occurred in a band from Rockcastle and Jackson counties thru Owsley, Clay, Perry, Leslie, Harlan and Letcher counties. The greatest snowfall amounts occurred in Perry and Harlan counties where 5 inches was reported. Temperatures remained below freezing thru December 25th, allowing much of the area to enjoy a white Christmas.
5	ROCKCASTLE (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
6	ROCKCASTLE (ZONE)	1/20/2001	1/20/2001	Heavy Snow	
7	ROCKCASTLE (ZONE)	1/19/2002	1/19/2002	Heavy Snow	
8	ROCKCASTLE (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported. Power lines were down.
	ROCKCASTLE (ZONE)	12/4/2002	12/5/2002	Heavy Snow	4 inches of snow was reported. Power lines were down.
9	ROCKCASTLE (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 4 inches of snow were reported.
10	ROCKCASTLE (ZONE)	1/25/2004	1/25/2004	Ice Storm	

[107] "Storm Events Database Event Details – Rockcastle County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

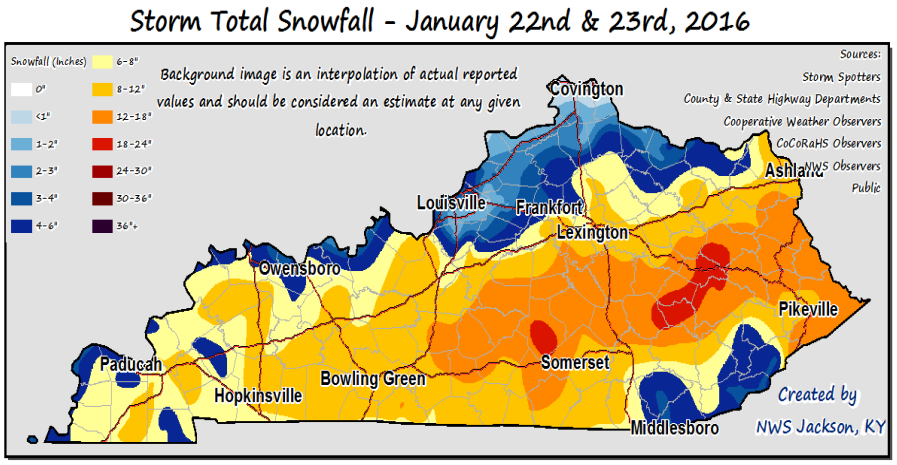
Count	County	Begin Date	End Date	Type	Extent: Event Narrative
11	ROCKCASTLE (ZONE)	2/17/2007	2/17/2007	Winter Weather	Estimated 2 inches of snowfall in Mount Vernon.
	ROCKCASTLE (ZONE)	2/17/2007	2/17/2007	Winter Weather	Estimated 4 inches of snowfall in Mount Vernon.
12	ROCKCASTLE (ZONE)	11/21/2008	11/21/2008	Winter Weather	A trained weather observer reported a snowfall of a half inch Mount Vernon.
13	ROCKCASTLE (ZONE)	1/27/2009	1/28/2009	Ice Storm	One quarter of an inch of ice accumulation due to freezing rain occurred in valley locations around the county. Ridgetop locations experiences ice accumulations of three eights to one quarter of an inch.
	ROCKCASTLE (ZONE)	1/27/2009	1/28/2009	Ice Storm	Rockcastle County Highway Dept estimated one quarter to one half of an inch of ice accumulation from freezing rain in Mount Vernon.
14	ROCKCASTLE (ZONE)	2/2/2009	2/2/2009	Winter Weather	A trained spotter reported that 1.8 inches of snow had fallen 1 mile south southeast of Mount Vernon.
	ROCKCASTLE (ZONE)	2/3/2009	2/4/2009	Winter Weather	Two inches of snow fell in Mount Vernon.
	ROCKCASTLE (ZONE)	2/3/2009	2/3/2009	Winter Weather	An inch of snow fell in Mount Vernon.
15	ROCKCASTLE (ZONE)	2/21/2009	2/21/2009	Winter Weather	A trained spotter measured a 2 inche snowfall 1 mile south southeast of Mount Vernon.
16	ROCKCASTLE (ZONE)	3/12/2009	3/13/2009	Winter Weather	Two and six tenths of an inch of snow fell 1 mile south southeast of Mount Vernon.
	ROCKCASTLE (ZONE)	3/12/2009	3/13/2009	Winter Weather	Three inches of snow fell in Mount Vernon.
	ROCKCASTLE (ZONE)	3/12/2009	3/13/2009	Winter Weather	Three and a half inches of snow fell in Brodhead.
17	ROCKCASTLE (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept estimated 6 inches of snowfall countywide.
	ROCKCASTLE (ZONE)	1/29/2010	1/30/2010	Winter Weather	A trained spotter measured just shy of 3 inches of snow 4 miles northwest of Mount Vernon.
	ROCKCASTLE (ZONE)	1/29/2010	1/30/2010	Winter Weather	Two inches of snow had fallen in Mount Vernon.
	ROCKCASTLE (ZONE)	1/29/2010	1/30/2010	Winter Weather	A spotter estimated 2 inches of snow on the ground in Brodhead with side road conditions deteriorating rapidly.
	ROCKCASTLE (ZONE)	1/29/2010	1/30/2010	Winter Weather	One and a quarter inches of snow had fallen in Mount Vernon.
	ROCKCASTLE (ZONE)	1/29/2010	1/30/2010	Winter Weather	An inch of snow had fallen 4 miles northwest of Mount Vernon.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
18	ROCKCASTLE (ZONE)	2/15/2010	2/16/2010	Winter Weather	An average of 2.5 to 3 inches of snow fell across the county.
	ROCKCASTLE (ZONE)	2/15/2010	2/16/2010	Winter Weather	The storm total snowfall 1 mile east of Mount Vernon since dawn Monday was 4 inches.
	ROCKCASTLE (ZONE)	2/15/2010	2/16/2010	Winter Weather	The 24 hour snowfall total in Mount Vernon was 1 inch.
19	ROCKCASTLE (ZONE)	12/12/2010	12/12/2010	Winter Weather	An inch of snow fell in Mount Vernon. Several vehicles were reported to have slid off I75 as it became snow covered.
20	ROCKCASTLE (ZONE)	12/15/2010	12/16/2010	Ice Storm	Half an inch of ice had accumulated in Mount Vernon.
21	ROCKCASTLE (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estimated that 3 inches of snow had fallen in Mount Vernon. Five accidents, one with injuries, had been reported since the snow began. Roads around the county had become slick and hazardous.
22	ROCKCASTLE (ZONE)	1/14/2012	1/15/2012	Winter Weather	An inch of snow fell in Mount Vernon.
23	ROCKCASTLE (ZONE)	1/15/2013	1/16/2013	Ice Storm	Jackson Energy reported that 85 customers were without power in the Maretburg area.
24	ROCKCASTLE (ZONE)	1/25/2013	1/25/2013	Ice Storm	Up to 1/2 of ice was reported 1 mile southwest of Livingston, with 1/8 reported in Mt. Vernon and the remainder of the county. Several accidents were reported on I-75 and other county roads during the morning.
25	ROCKCASTLE (ZONE)	1/2/2014	1/2/2014	Winter Weather	There were a total of 13 vehicle accidents reported in Rockcastle county, 3 of which involved injuries. The accidents occurred as the result of icy road conditions.
	ROCKCASTLE (ZONE)	1/2/2014	1/2/2014	Winter Weather	Freezing rain and slick roads were reported in Rockcastle county.
	ROCKCASTLE (ZONE)	1/2/2014	1/2/2014	Winter Weather	Roads were snow covered and slick with black ice underneath the layer of snow. Eight tenths of an inch of snow had fallen in Maretburg.
26	ROCKCASTLE (ZONE)	3/2/2014	3/3/2014	Winter Storm	Freezing rain covered trees and sidewalks with a thin coating of ice. Up to one inch of sleet and 2-6 inches of snow were also reported across the county.
27	ROCKCASTLE (ZONE)	2/16/2015	2/16/2015	Winter Storm	The first snow fall reports out of Rockcastle county were received at around 8 am on February 16 by a volunteer storm spotter and a COOP observer who each measured 2.5 inches of snow in Brodhead and Mount Vernon respectively. On average, 8 to 12 inches of snow fell across the county by storms end. By the time the snow had ended, Brodhead had picked up 14 inches of snow, while just shy of 13 inches was measured in Mount Vernon.
28	ROCKCASTLE (ZONE)	2/20/2015	2/21/2015	Winter Storm	Quarter inch ice accumulations were reported in Mount Vernon.
29	ROCKCASTLE (ZONE)	3/4/2015	3/5/2015	Winter Storm	Four to six inches of snow accumulated across the county.
30	ROCKCASTLE (ZONE)	1/22/2016	1/23/2016	Heavy Snow	Storm total snowfall amounts of 12 to 15 inches were reported. The highest amounts occurred in Brodhead where 15 inches fell, and in Mount Vernon, where 14 inches was measured. Interstate 75 was shut down in Rockcastle County at times Friday afternoon

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
					through Saturday morning due to multiple crashes leaving 3,000 people stranded in their vehicles at one time.
31	ROCKCASTLE (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 4 to 5 inches across the county.
32	ROCKCASTLE (ZONE)	1/16/2018	1/16/2018	Heavy Snow	
33	ROCKCASTLE (ZONE)	3/11/2018	3/12/2018	Heavy Snow	
34	ROCKCASTLE (ZONE)	12/9/2018	12/9/2018	Winter Weather	
35	ROCKCASTLE (ZONE)	2/7/2020	2/7/2020	Winter Weather	
36	ROCKCASTLE (ZONE)	2/1/2021	2/1/2021	Winter Weather	A member of the public reported that 2.3 inches of snow had fallen in Mount Vernon.
37	ROCKCASTLE (ZONE)	2/11/2021	2/11/2021	Ice Storm	Half an inch of ice accumulation due to freezing rain had occurred near Rockford.
	ROCKCASTLE (ZONE)	2/11/2021	2/11/2021	Ice Storm	A tree was brought down due to ice accretion from freezing rain and gusty winds on Highway 25 in Mount Vernon. The tree was blocking part of the road.
	ROCKCASTLE (ZONE)	2/11/2021	2/11/2021	Ice Storm	Three tenths of an inch of ice accumulation due to freezing rain had occurred near Hiatt.
38	ROCKCASTLE (ZONE)	2/14/2021	2/16/2021	Ice Storm	Three tenths of an inch of ice accumulation due to freezing rain was observed in Spiro.
	ROCKCASTLE (ZONE)	2/14/2021	2/16/2021	Ice Storm	A tree fell due to weight of ice on it. The tree fell onto a nearby home and some power lines along KY 618 near Brodhead.
39	ROCKCASTLE (ZONE)	2/17/2021	2/18/2021	Heavy Snow	A trained spotter measured 3.5 inches of snow in Mount Vernon.
	ROCKCASTLE (ZONE)	2/17/2021	2/18/2021	Heavy Snow	Six inches of snow was measured in Brodhead.

PAST WINTER STORM EVENT

In January 2016 a major snow storm slammed Kentucky. Tractor trailers were unable to climb the snowy, steep hills of Rockcastle and Laurel Counties blocking the highway. Due to the severity of the snow storm Kentucky State Police closed I-75 in both directions. Several thousand motorists were stranded on I-75. Emergency workers took food and water to people stuck in vehicles. Around 150 people sought refuge at Red Cross shelters opened for stranded motorists along I-75 in Berea, Mt. Vernon, and London. Kentucky State Police checked on motorists unable to leave the highway.



By reviewing past winter storm events emergency personnel can identify vulnerabilities within their county and cities enabling them to become better prepared for future events.

WILDFIRES

During November 2016 a large wildfire in Rockcastle County, on Cove Branch Road near I-75 and Renfro Valley occurred. This wildfire consumed around 75 acres. Weather conditions were so dangerous that firefighters were ordered to stop directly attacking the fire. The wildfire put five to six homes 'at risk' and fire lines were created around the houses.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20. Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties

for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[108]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Rockcastle County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	0	0.0	0.000%
Class B	0.25 to 9 Acres	9	37.0	90.000%
Class C	10 to 99 Acres	1	17.0	10.000%
Class D	100 to 299 Acres	0	0.0	0.000%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

[108] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Rockcastle	2013	21	276.0	127,770
	2014	15	480.0	
	2015	3	65.5	
	2016	9	613.0	
	2017	21	1485.3	
	2018	3	378.0	
	2019	8	50.0	
	2020	2	4.0	

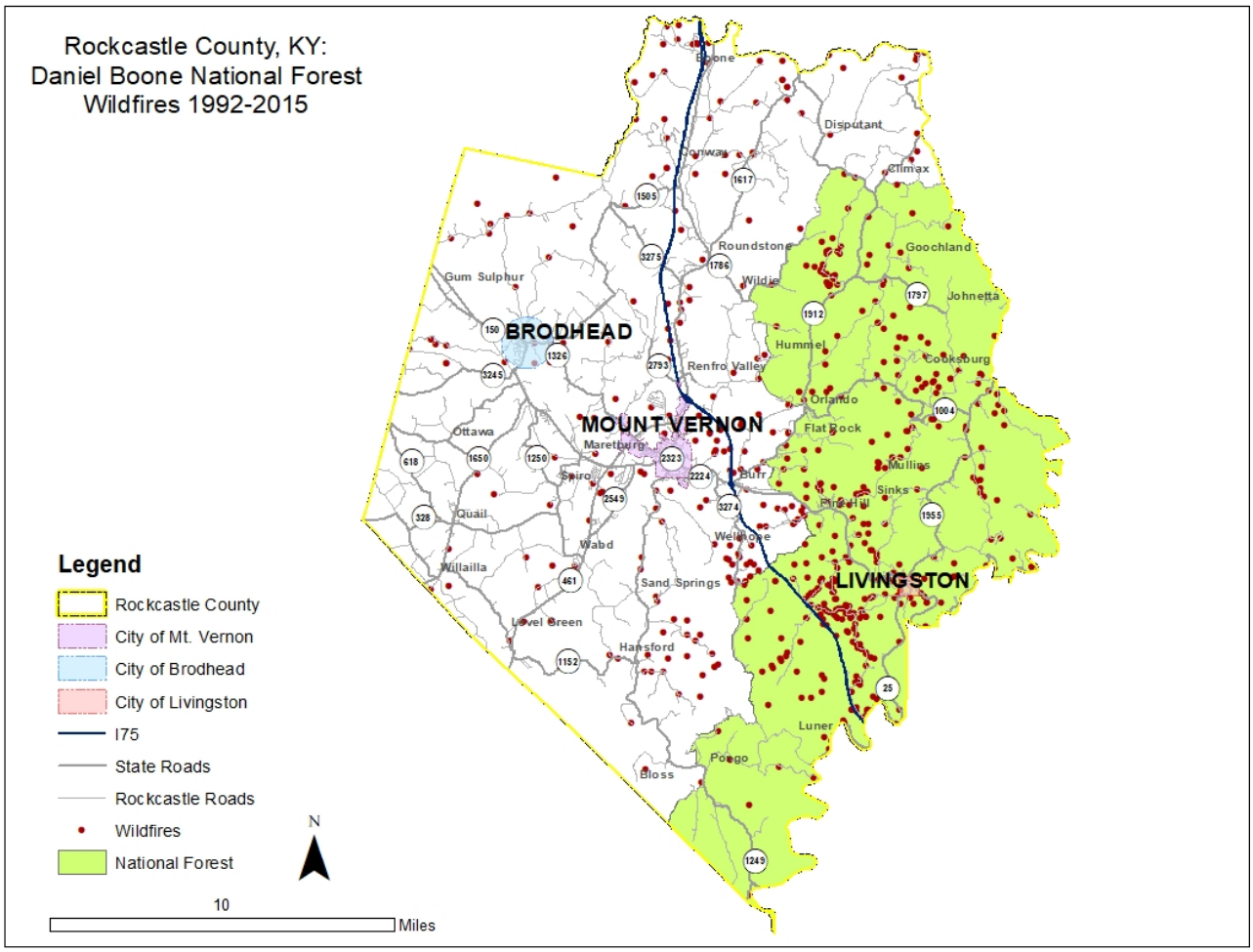
Table 1-4 Rockcastle County Summary of Impacts From Wildfires, 2019-2020		
# of Fires		10
Injuries		0
Fatalities		0
Suppression Costs	$	8,190
# Houses Saved		3
Value of Houses Saved	$	165,000
# Houses Lost		0
Value of Houses Lost	$	-
# Structures Saved		4
Value of Structures Saved	$	17,000
# Structures Lost		1
Value of Structures Lost	$	5,000

In 2019-2020 (the last years for which data is available), Rockcastle County suffered 10 wildfires of all class types. Two years equals 730 days. Thus, there were 10/730 fires per day, or 0.0137 fires per day, or 1 wildfire of all class types every 72.99 days (1/0.0137). Within particular wildfire classes, there were no Class A wildfires between 2019-2020. There were 9 Class B wildfires between 2019-2020. This translates to 9/730 fires where between 0.25 to 9 acres were burned, or 0.0123 Class B fires per day, or one (1) Class B wildfire about every 81.3 days (1/0.0123). There was one (1) Class C wildfire between 2019-2020. This translates to 1/730 fires where between 10 to 99 acres were burned, or 0.0014 Class C fires per day, or one (1) Class C wildfire about every 714.29 days (1/0.0014). There were no Class D to Class G wildfires – fires where 100 to 5,000 or more acres were burned – in 2019-2020 in Rockcastle County.

All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current.

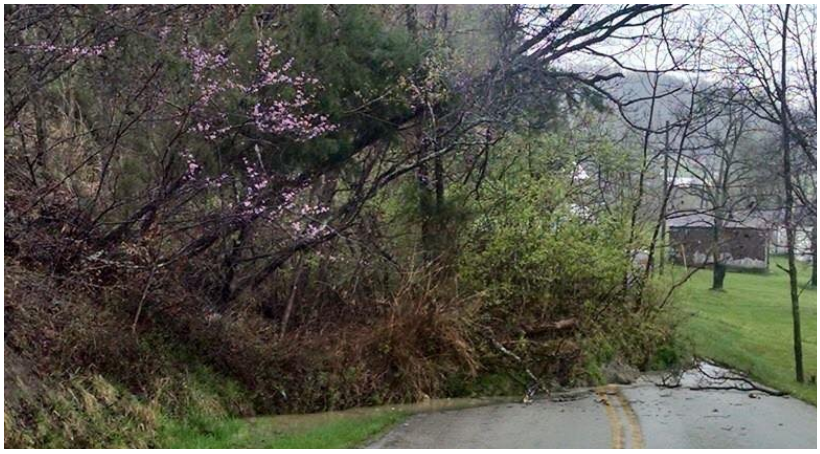
This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[109]

[109] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf



LANDSLIDES

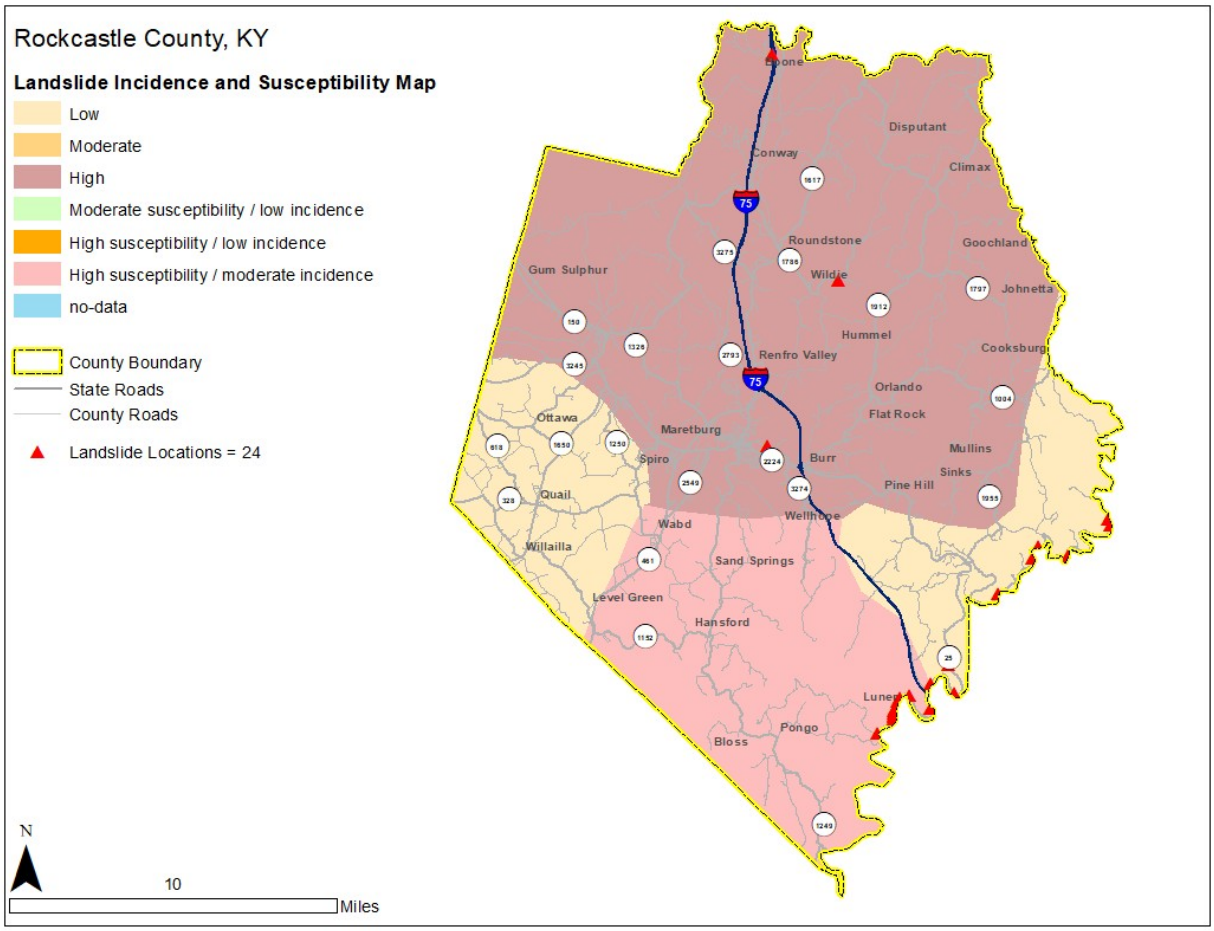
Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field. Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils.



The picture on the left shows a mudslide that occurred at KY-3245 in Brodhead, KY on April 14, 2015 due to heavy rainfall.

The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and Geologic maps in the early investigation for development of property is important.

All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.



Count	County	City	Loca-tion	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narra-tive	Impact: Cost
1	Rock-castle	Bern-stadt	KY 1329		2008		Clay Shale; Sandstone; Limestone								
2	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
3	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
4	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
5	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
6	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
7	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
8	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
9	Rock-castle	Billows	KY 1329		2008		Mudstone; Sandstone; Limestone								
10	Rock-castle	Berea	I 75		2018		Shale								

11	Rock-castle	Bernstadt	KY 1329	Above Road	10/13/2009	Land-slide	Shale; Sandstone; Limestone								
12	Rock-castle	Wildie	KY 1786	Above Road; Stream at Bottom	1/19/2017		Shale; Siltstone; Sandstone							Road Blocked	
13	Rock-castle	Berea	I 75	Above Road		Land-slide; Rota-tional	Shale; Siltstone								
14	Rock-castle	Bernstadt	KY 1329												
15	Rock-castle	Bernstadt	KY 1329												
16	Rock-castle	Bernstadt	KY 1329	Above Road		Land-slide	Shale; Sandstone; Limestone								
17	Rock-castle	Billows	KY 1329												

Rockcastle County Landslides - Probability as Frequency of Event Occurrence

Rockcastle County, unincorporated (and its unincorporated cities) independently experienced 17 landslide events over 30 years. Thus, Rockcastle County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every 21 months (i.e., 17/30). Specifically, Rockcastle County, unincorporated and its unincorporated cities experienced an average of 0.6 landslide events each year. Or, using December 31, 2021, as an endpoint, 17/360 months is 0.0472 events per month. $1/0.0472 = 21.187 \approx 1$ landslide event an average of every 21 months, or every 1.75 years.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Rock-castle	Brod-head	KY 3545				Siltstone; Silty-Clay Shale		250 feet						

Brodhead Landslides - Probability as Frequency of Event Occurrence

Incorporated Brodhead independently experienced 1 landslide event within its city limits over 30 years. Therefore, Brodhead experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every 30 years (i.e., 1/30). Or, using December 31, 2021, as an endpoint, 1/360 months is 0.0028 events per month. 1/0.0028 = 357 ≈ 1 landslide event an average of every 360 months, or one every 30 years.

Count	County	City	Location	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Movement Rate	Impact: Damage Narrative	Impact: Cost
1	Rockcastle	Livingston	KY 490	Below Road	2014	Landslide	Shale; Siltstone; Sandstone; Coal								
2	Rockcastle	Livingston	KY 490	Below Road	2014	Landslide	Sand; Silt; Clay; Gravel								
3	Rockcastle	Livingston	US 25		2/17/2016	Landslide	Shale; Claystone; Limestone; Sandstone								
4	Rockcastle	Livingston	KY 490		2019		Shale; Siltstone; Sandstone; Coal								
5	Rockcastle	Livingston	KY 490		2019		Shale; Siltstone; Sandstone; Coal								
6	Rockcastle	Livingston	KY 490		2019		Shale; Siltstone; Sandstone; Coal								
7	Rockcastle	Livingston	KY 490		2019		Shale; Siltstone; Sandstone; Coal								
8	Rockcastle	Livingston	KY 490												$ 184,250

9	Rock-castle	Living-ston	KY 89	Below Road		Land-slide	Shale; Siltstone; Sandstone; Underclay; Ironstone; Coal				18-203 feet				
10	Rock-castle	Living-ston	KY 89	Below Road		Land-slide	Shale; Siltstone; Sandstone; Underclay; Ironstone; Coal				18-203 feet				
11	Rock-castle	Living-ston	KY 89	Below Road		Land-slide	Shale; Siltstone; Sandstone; Underclay; Ironstone; Coal				18-203 feet				

Livingston Landslides - Probability as Frequency of Event Occurrence

Incorporated Livingston independently experienced 11 landslide events within its city limits over 30 years. Therefore, Livingston experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 2.7 years (i.e., 11/30). Specifically, Livingston experienced an average of 0.37 landslide events each year. Or, using December 31, 2021, as an endpoint, 11/360 months is 0.0305 events per month. $1/0.0305 = 32.79 \approx 1$ landslide event an average of every 32 months, or one every 2.7 years.

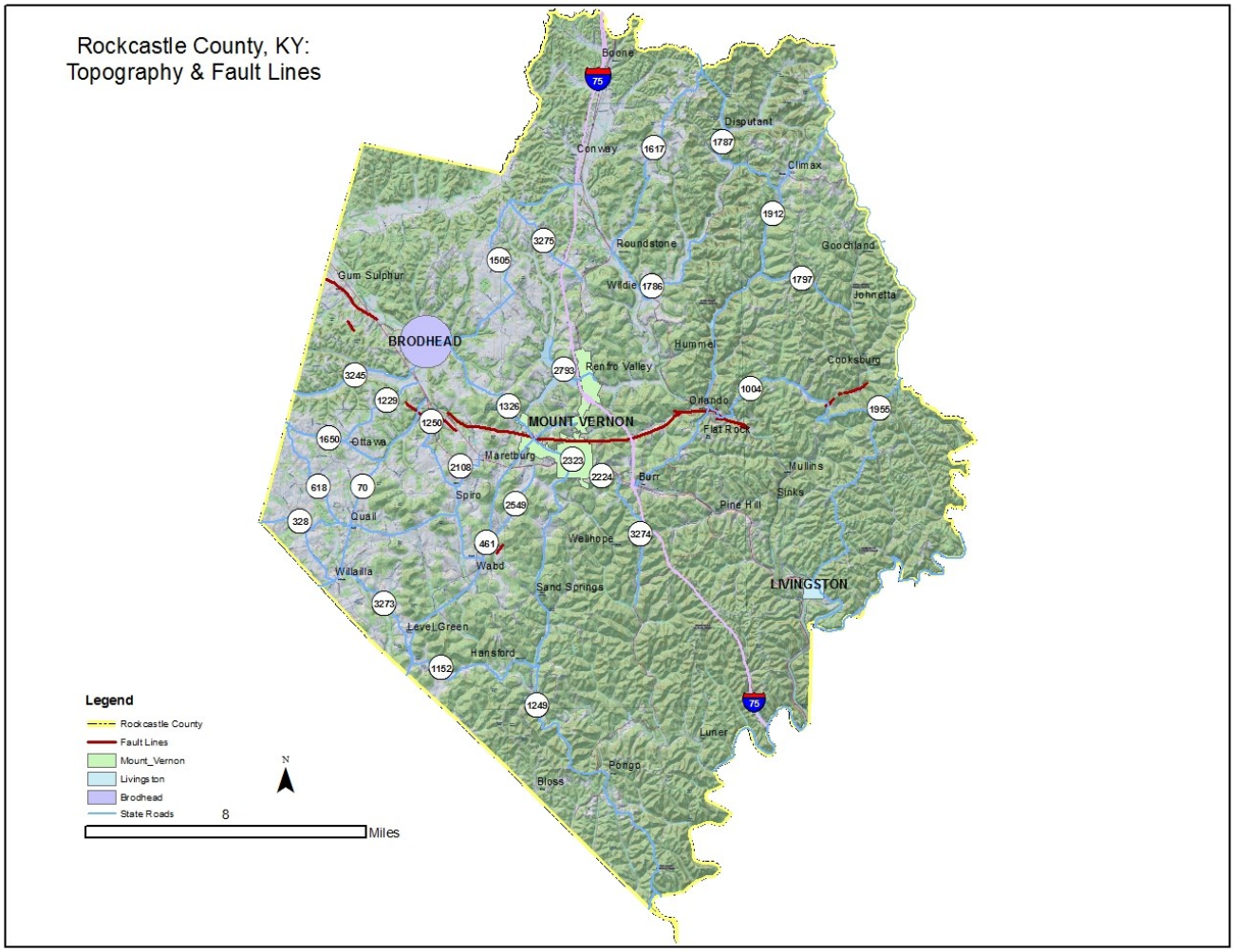
Count	County	City	Loca-tion	Failure Location	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Rock-castle	Mount Vernon	KY 1207A	General Road Embank-ment	2017		Shale; Siltstone; Sandstone; Coal								
2	Rock-castle	Mount Vernon	KY 3274		2019		Limestone								
3	Rock-castle	Mount Vernon	US 25		2019		Limestone								

Mount Vernon Landslides - Probability as Frequency of Event Occurrence

Incorporated Mount Vernon independently experienced 3 landslide events within its city limits over 30 years. Therefore, Mount Vernon experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 10 years (i.e., 3/30). Specifically, Mount Vernon experienced an average of 0.1 landslide events each year. Or, using December 31, 2021, as an endpoint, 3/360 months is 0.0083 events per month. $1/0.0083 = 120 \approx 1$ landslide event an average of every 120 months, or one every 10 years.

EARTHQUAKES

Earthquakes can happen anytime of the year and without warning. The risk in Kentucky is higher in identified seismic zones such as the New Madrid Fault Zone in the western part of the state. However, no earthquakes have been recorded in Rockcastle County since 1/1/1900 according to the records available through the United States Geological Survey (USGS).



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Rockcastle County was about 53.9 persons in 2010 (the latest data available in Census Quickfacts[29]). This small population size and commensurate low density of structures suggest that the impact of an earthquake would be at the lower end of the range estimated for a given earthquake magnitude. The US Geological Survey states[30]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations… (M)agnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year." The largest known earthquake occurred in 1960 off the coast of Chile and had a magnitude of 9.5.

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

Michigan Technological University's Earthquake Magnitude Scale[31] puts a number to the potential for damage:

Rockcastle County has no recorded earthquakes in the USGS Earthquake Hazard Program database. Since earthquakes have been recorded by the USGS in Rockcastle County, the occurrence of an earthquake of 5.5 or above in magnitude, where damage to structures typically begins, would be very rare.[32],[33] There have been no recorded events at 5.5 or above on the Earthquake Magnitude Scale and thus there are no recorded past damages and impacts from earthquakes for Rockcastle County and its incorporated cities.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Rockcastle County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Rockcastle County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Rockcastle County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Rockcastle County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Rockcastle County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Bell County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

ROCKCASTLE COUNTY GOALS & OBJECTIVES

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

Objective(s)

1.1 Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive area.

Goal #2 *Protect Rockcastle County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

Objective(s)

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect the Rockcastle's most vulnerable populations and structures.

2.2 Decrease the number of FEMA-identified "repetitive loss properties."

Goal #3 *Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

Objective(s)

3.1 Increase the level of knowledge and awareness for Rockcastle County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

Goals Correlation to Hazards			
Hazards	**Goal #1**	**Goal #2**	**Goal#3**
Landslide	✓	✓	✓
Severe Storm		✓	✓
Tornado		✓	✓
Flood	✓	✓	✓
Winter Storm		✓	✓
Wildfire		✓	✓

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Purchase tent for emergency shelter.	✓				Purchased through other funds.
Purchase Portable Lights	✓				Purchased through other funds.
Fix Cass Road Bridge in Brodhead.	✓				FEMA funds were not used in completing this project.
Fix Mahaffey Hill Tile Road in Livingston.				✓	
Purchase generator for sewer plant in Livingston.				✓	Has not been purchased. Continue to seek funding.
Fix sewer and storm drains in Livingston.				✓	
Protect the gym floor in Livingston.	✓				
Purchase caterpillar generator for water plant in Mt. Vernon.				✓	Has not been purchased. Continue to seek funding.
Purchase caterpillar generator for sewer plant in Mt. Vernon.				✓	Has not been purchased. Continue to seek funding.
Acquire/relocate trailer park on Spring Street in Mt. Vernon.			✓		There are only two trailers remaining at the Spring Street Trailer Park. Continue to work on project.

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

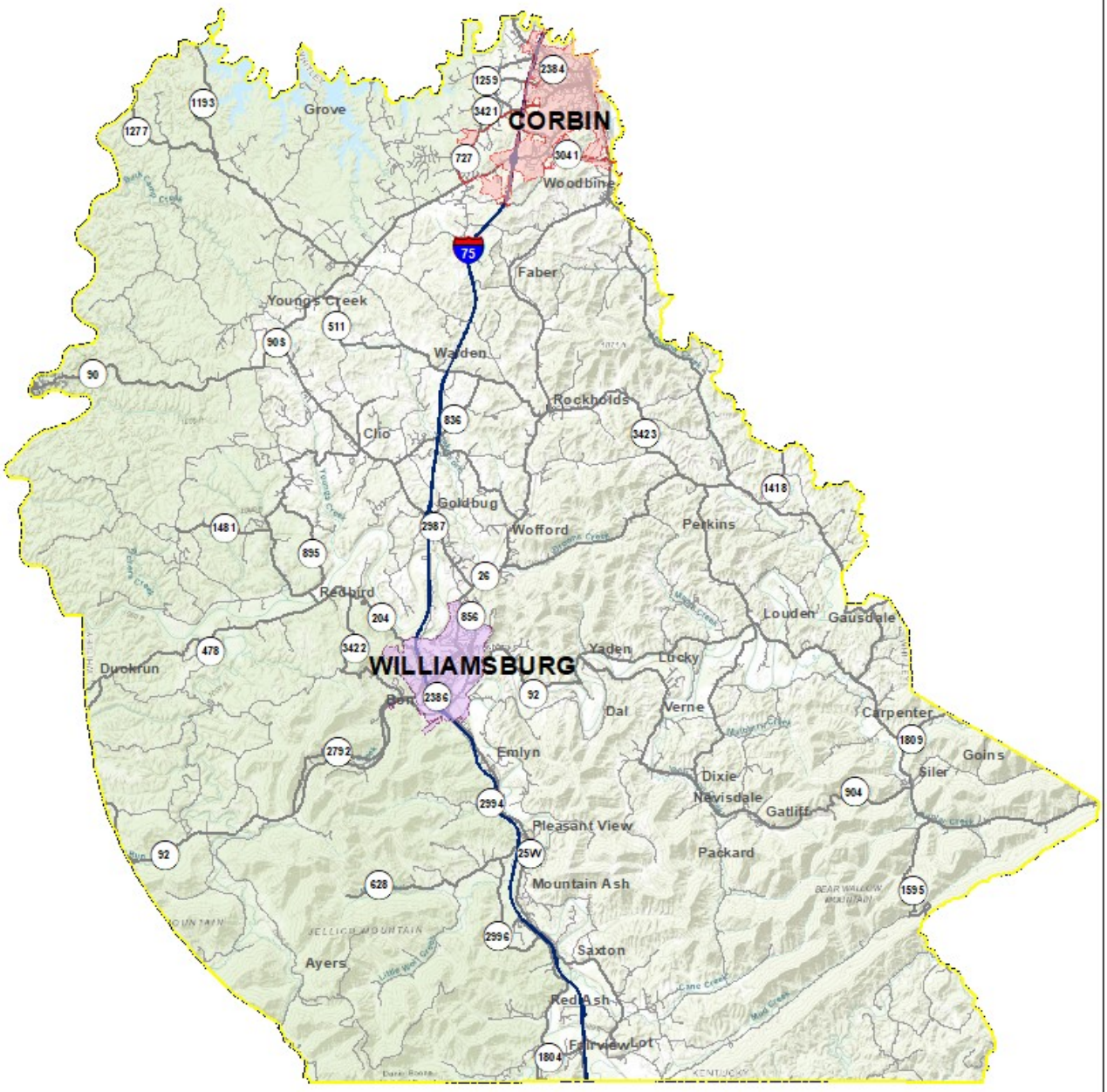
Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

ROCKCASTLE COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Purchase generators for fire departments within the County.	All Hazards	County & City		X			Continuous	1	5	1	County, City, & Various Grants	1
Purchase generators for ambulance services in the County.	All Hazards	County & City		X			Short Term	1	5	1	County, City, & Various Grants	1
Purchase generators for schools in the County.	All Hazards	County, City, & Board of Education		X			Continuous	1	5	1	County, City, & Various Grants	3
Purchase generators for sewer plants in the County.	All Hazards	County & City		X			Continuous	1	1	1	County, City, & Various Grants	3
Purchase generators for water plants in the County.	All Hazards	County & City		X			Continuous	1	1	1	County, City, & Various Grants	3
Purchase generator for City Hall.	All Hazards	County & City		X			Short Term	1	1	1	County, City, & Various Grants	1
Complete engineer study to resolve flooding issues at Ford Drive near Library.	Flood	County & City		X			Continuous	5	1	5	County, City, & Various Grants	5

Whitley County, KY:
Hazard Mitigation Overview



XII. WHITLEY COUNTY OVERVIEW

Whitley County is located within the Cumberland Plateau of southeastern Kentucky, which is greatly overlapped by the broad Eastern Coal Field region of the state. Because of its location in the midst of the Cumberland Mountains, elevations in the County range from 723 to 2220 feet above sea level. A large amount of land, 38,000 acres, of western Whitley County are preserved within the Daniel Boone National Forest. Cumberland Falls, located in Cumberland Falls State Resort Park, is the site of the largest waterfall in the Commonwealth of Kentucky.

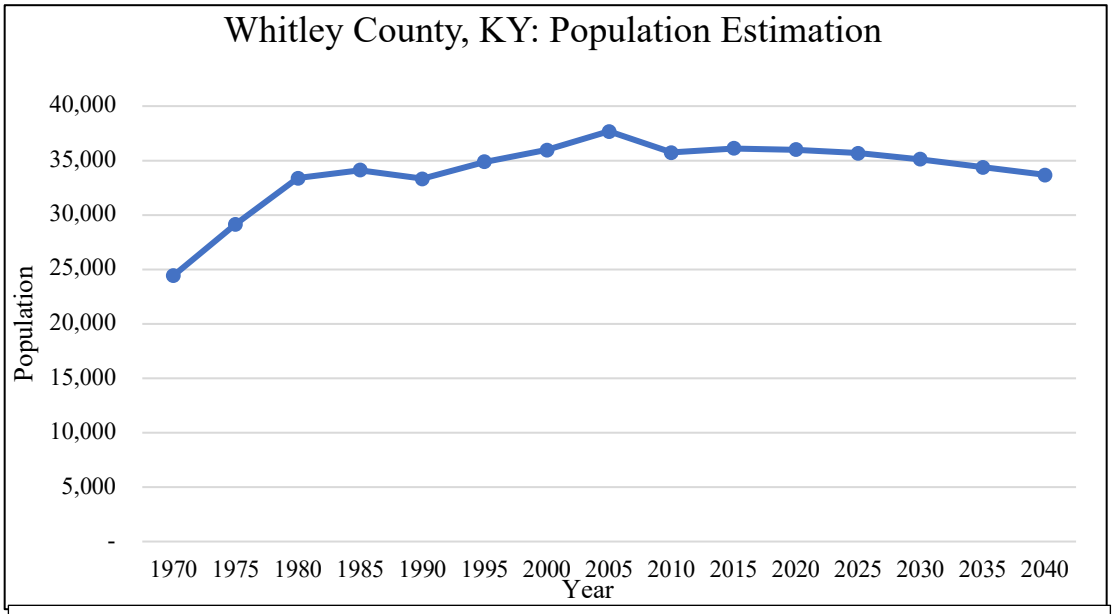
Whitley County, KY: Quick Facts	
Total Population, July 1, 2019	36,264
Population per Square Miles, 2010	81.4
Land Area in Square Miles, 2010	437.83
Housing Units, July 1, 2016	15,206
Persons in Poverty, percent	29.3%
Median Value of Owner-Occupied Housing Units, 2011-2015	$77,900
Median Household Income, 2011-2015	$31,014
Total Employment, 2015	10,254
Total Employer Establishments, 2015	625
Source: U.S. Census Bureau	

WHITLEY COUNTY POPULATION

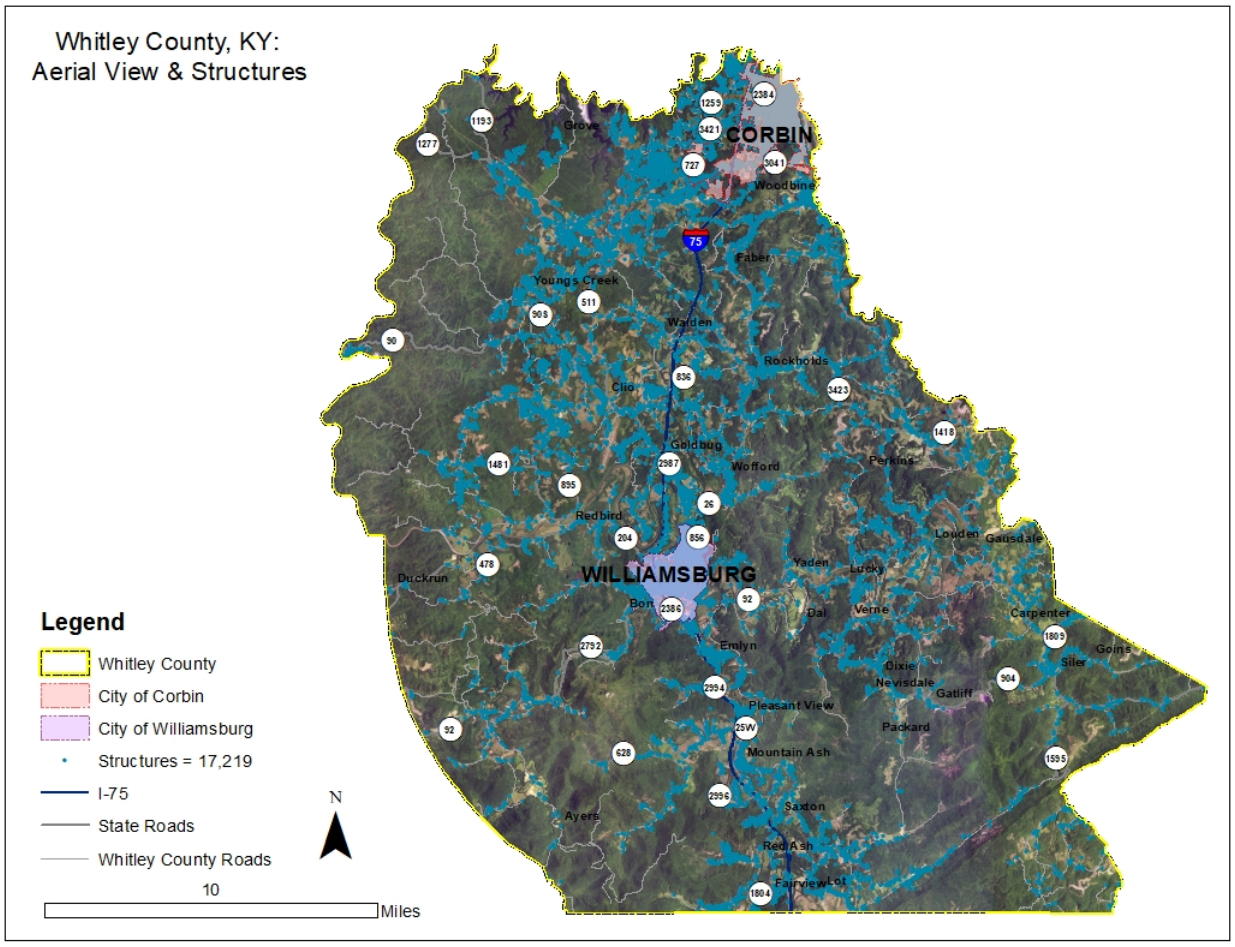
Whitley County has two cities; Williamsburg, which is the county seat and Corbin which is shared with Knox County. In 2019, Whitley County's estimated population was 36,264. Between 2010 and 2019, Whitley County experienced a growth rate of 1.8%. However, it is predicted that the population will decline over the next few decades.

Population Estimates 2012-2019					
County - City	**2012**	**2015**	**2019**	**Change**	
Whitley County	35,621	36,000	36,264	1.8% increase	
City of Corbin*	7,010	6,923	7,325	4.5% increase	
City of Williamsburg	5,258	5,250	5,260	0.0039% increase	
Source: U.S. Census Bureau					

*The City of Corbin is located in at the intersection of Whitley, Knox, and Laurel counties. The majority of the residents live in Whitley County; however, the above population figures reflect the total population of Corbin, not just the Whitley County residents.



Source: U.S. Census Bureau & KY State Data Center



According to the United States Census there were 15,530 housing units located in Whitley County in

2019. The above map illustrates where the residential & commercial structures are located based on CVADD ArcGIS database.

COMMUNITY CAPABILITIES

Whitley County has a unique set of capabilities that enable it to accomplish hazard mitigation and reduce long-term vulnerability. The Whitley County Fiscal Court is comprised of a Judge Executive and 4 Magistrates. The City of Williamsburg is a Home Rule class city lead by a Mayor-Council government. The City of Corbin is a Home Rule class city and has a Manager form of government. Both the Fiscal Court, City Council, and Board of Commissioners have the financial, administrative, technical, planning and regulatory capabilities to accomplish hazard mitigation.

Whitley County Plans & Programs									
	Emergency Operation Plan	Zoning Ordinance	Comprehensive Economic Development Strategy	Local Emergency Planning Committee	Threat and Hazard Identification and Risk Assessment	Region 13 Healthcare Coalition	Six Year KY Highway Plan	Chemical Stockpile Emergency Preparedness Plan (CSEPP)	Firewise
Whitley County	✓		✓	✓	✓	✓	✓		
City of Williamsburg	✓	✓	✓	✓	✓	✓	✓		
City of Corbin	✓	✓	✓	✓	✓	✓	✓		
Oak Grove Fire Department									✓

EMERGENCY MANAGEMENT

To prepare for future natural hazards Whitley County has a Threat and Hazard Identification and Risk Assessment (THIRA) plan in place. This plan describes the types of risks as well as the probability and likelihood of future events. Emergency Managers use THIRA for prevention, protection, mitigation, response, and recovery. The following is an abbreviated list of threats listed in the Whitley County THIRA.

THIRA Hazard Ranking	
1	Snow Storm
2	Flood
3	Train Derailment

The Whitley County Emergency Management also has a Local Emergency Planning Committee (LEPC) that meets quarterly and promotes emergency planning and preparedness. The LEPC includes members from various professions and is open to the public. For more information about Whitley County's THIRA and/or LEPC meetings contact the Emergency Management Director.

WHITLEY COUNTY RISK ASSESSMENT

The exposure of people, property, and other community assets to natural hazards can result in disasters. The type and severity of these disasters are based on the extent of the hazard and the vulnerability of the asset, as well as the community's capability to mitigate, prepare for, respond to, and recover from events. The following chart summarizes the natural hazards that have had a negative impact on the people and places of Whitley County. These hazards were discussed and reviewed during the community meetings.

Rank	Natural Hazards
1	Severe Winter Weather
2	Flood
3	Severe Thunderstorms
4	Landslide
5	Tornado

While natural hazards can be very unpredictable, understanding when and where they have historically occurred can help communities better plan and prepare for future events.

WHITLEY COUNTY FLOODING

The Cumberland River crosses Whitley County from east to west, carving a path through the City of Williamsburg. The Cumberland River and its tributary, Clear Fork, which runs southward through the county, have the potential to cause severe flooding. The construction of a $20 million floodwall and levee was completed in 1999 in the City of Williamsburg. The floodwall and levee were constructed to better protect the vulnerable people and buildings from the Cumberland River and have proven to be very beneficial.

Top Left: Williamsburg Levee (Left Bank) Looking Upstream

Top Right: Williamsburg Floodwall & Levee (Left Bank) Looking Downstream

Left: Williamsburg Levee (Left Bank) Looking Upstream

In order to address systematically the number of previous flooding occurrences, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from flooding for Whitley County, Kentucky and for its incorporated cities. The tables include what the National Weather Service (NWS) labels "Flood" and "Flash Flood" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the flooding event. Still, it is the best available data for a systematic illustration of flooding events for Whitley County and for its unincorporated and incorporated cities.

The incorporated cities for Whitley County include the City of Williamsburg and the City of Corbin. In order to capture "Flood" and "Flash Flood" events specific to the incorporated cities, the below tables include all "Flood" and "Flash Flood" events having searched the entire date range of available data within the NCEI "Storm Events Database," i.e., between January 1, 1950 and October 31, 2020. This date range represents 70 years and 10 months of data. For the purpose of illustrating frequency of events (i.e., one interpretation of "probability"), this date range is truncated at the starting date: The date of the earliest recorded event will serve as the opening of the date range from which the

denominator derives. For Whitley County and its incorporated cities, the date range begins in 1996 and ends in 2020. (Though at the time of this writing, NCEI data ends October 31, 2020, this assessment will use the whole year for the denominator used to illustrate frequency.) The date range represents 25 years. (The multi-hazard mitigation plan further defines "probability" in terms of frequency of events subsequently categorized as five-point Likert scale.)

Finally, it should also be noted that a portion of the "Flood" and "Flash Flood" events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for Whitley County as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 8-1: Whitley County Severe Winter Weather Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								3	0	4,351.2K	
1	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/1/1996	0:01	EST	Flood		0	0	2.00K	0.00K
2	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	3/3/1997	7:00	EST	Flood		0	0	5.00K	0.00K
3	COUNTYWIDE	WHITLEY CO.	KY	4/16/1998	19:00	EST	Flash Flood		0	0	150.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	4/17/1998	6:45	EST	Flood		0	0	500.00K	10.00K
	COUNTYWIDE	WHITLEY CO.	KY	4/18/1998	22:00	EST	Flash Flood		0	0	10.00K	0.00K
4	ROCKHOLDS	WHITLEY CO.	KY	1/9/1999	7:00	EST	Flash Flood		0	0	0.00K	0.00K
5	LOT	WHITLEY CO.	KY	8/13/2001	2:08	EST	Flash Flood		0	0	1.00K	0.00K
6	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	3/18/2002	1:42	EST	Flood		0	0	0.00K	0.00K
7	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/16/2003	9:09	EST	Flood		0	0	3.660M	0.00K
8	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/18/2003	8:30	EST	Flood		0	0	0.00K	0.00K
9	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/23/2003	9:51	EST	Flood		0	0	0.00K	0.00K
10	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	4/9/2003	7:28	EST	Flood		0	0	0.00K	0.00K
11	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/5/2004	19:00	EST	Flood		0	0	0.00K	0.00K
	COUNTYWIDE	WHITLEY CO.	KY	2/5/2004	14:00	EST	Flash Flood		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/6/2004	16:44	EST	Flood		0	0	0.00K	0.00K
12	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	3/6/2004	23:00	EST	Flood		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
13	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	9/17/2004	9:15	EST	Flood		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	9/18/2004	2:27	EST	Flood		0	0	0.00K	0.00K
14	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/2/2004	1:10	EST	Flood		0	0	0.00K	0.00K
15	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/10/2004	11:43	EST	Flood		0	0	0.00K	0.00K
16	FABER	WHITLEY CO.	KY	1/23/2006	4:10	EST	Flash Flood		0	0	0.00K	0.00K
17	ROCKHOLDS	WHITLEY CO.	KY	8/29/2006	16:42	EST	Flash Flood		0	0	0.00K	0.00K
18	WOODBINE	WHITLEY CO.	KY	9/23/2006	19:13	EST	Flash Flood		0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	9/23/2006	19:48	EST	Flash Flood		0	0	0.00K	0.00K
19	WOODBINE	WHITLEY CO.	KY	7/28/2008	14:40	EST -5	Flash Flood		0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	7/28/2008	16:00	EST -5	Flash Flood		0	0	0.00K	0.00K
20	BARK CAMP	WHITLEY CO.	KY	5/3/2009	23:35	EST -5	Flash Flood		0	0	0.00K	0.00K
21	CLIO	WHITLEY CO.	KY	6/11/2009	6:00	EST -5	Flood		0	0	0.00K	0.00K
	KRUPP	WHITLEY CO.	KY	6/11/2009	6:00	EST -5	Flood		0	0	0.00K	0.00K
	KRUPP	WHITLEY CO.	KY	6/11/2009	7:45	EST -5	Flash Flood		0	0	0.00K	0.00K
22	BARTON	WHITLEY CO.	KY	6/17/2009	12:00	EST -5	Flood		0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	6/17/2009	12:00	EST -5	Flood		0	0	0.00K	0.00K
	WALDEN	WHITLEY CO.	KY	6/17/2009	16:15	EST -5	Flash Flood		0	0	0.00K	0.00K
	KRUPP	WHITLEY CO.	KY	6/17/2009	16:15	EST -5	Flash Flood		0	0	0.00K	0.00K
	CLIO	WHITLEY CO.	KY	6/17/2009	17:00	EST -5	Flash Flood		0	0	0.00K	0.00K
	HIGHLAND PARK	WHITLEY CO.	KY	6/17/2009	17:00	EST -5	Flash Flood		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	BARTON	WHITLEY CO.	KY	6/17/2009	17:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	ROCKHOLDS	WHITLEY CO.	KY	6/17/2009	17:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	WOFFORD	WHITLEY CO.	KY	6/17/2009	17:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	6/17/2009	17:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	6/17/2009	17:00	EST-5	Flash Flood		0	0	0.00K	0.00K
23	LOT	WHITLEY CO.	KY	1/24/2010	13:00	EST-5	Flood		0	0	0.00K	0.00K
	YOUNGS CREEK	WHITLEY CO.	KY	1/24/2010	13:00	EST-5	Flood		0	0	0.00K	0.00K
	MEADOW CREEK	WHITLEY CO.	KY	1/24/2010	14:55	EST-5	Flood		0	0	0.00K	0.00K
24	WOFFORD	WHITLEY CO.	KY	5/14/2010	16:05	EST-5	Flash Flood		0	0	0.00K	0.00K
25	SAXTON	WHITLEY CO.	KY	7/27/2010	16:57	EST-5	Flash Flood		0	0	0.00K	0.00K
26	CORBIN	WHITLEY CO.	KY	8/21/2010	21:40	EST-5	Flood		0	0	0.00K	0.00K
	CLIO	WHITLEY CO.	KY	8/21/2010	23:25	EST-5	Flood		0	0	0.00K	0.00K
	WOFFORD	WHITLEY CO.	KY	8/21/2010	23:25	EST-5	Flood		0	0	0.00K	0.00K
	KRUPP	WHITLEY CO.	KY	8/21/2010	23:25	EST-5	Flood		0	0	0.00K	0.00K
27	BARTON	WHITLEY CO.	KY	9/11/2010	3:00	EST-5	Flood		0	0	0.00K	0.00K
28	BALLTOWN	WHITLEY CO.	KY	11/30/2010	11:00	EST-5	Flood		0	0	1.00K	1.00K
	WOFFORD	WHITLEY CO.	KY	11/30/2010	11:00	EST-5	Flood		0	0	0.00K	0.00K
	BURK HOLLOW	WHITLEY CO.	KY	11/30/2010	11:30	EST-5	Flood		0	0	1.00K	1.00K
	WOODBINE	WHITLEY CO.	KY	11/30/2010	11:30	EST-5	Flood		0	0	1.00K	1.00K
	MEADOW CREEK	WHITLEY CO.	KY	11/30/2010	11:30	EST-5	Flood		0	0	1.00K	1.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	ROCKHOLDS	WHITLEY CO.	KY	11/30/2010	11:30	EST-5	Flood		0	0	1.00K	1.00K
	PLEASANT VIEW	WHITLEY CO.	KY	11/30/2010	11:30	EST-5	Flood		0	0	1.00K	1.00K
29	LIBERTY	WHITLEY CO.	KY	2/25/2011	1:00	EST-5	Flood		0	0	0.00K	0.00K
30	MOUNTAIN ASH	WHITLEY CO.	KY	4/27/2011	17:52	EST-5	Flash Flood		0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	4/27/2011	22:30	EST-5	Flash Flood		0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	4/27/2011	22:30	EST-5	Flash Flood		0	0	0.00K	0.00K
31	WOODBINE	WHITLEY CO.	KY	5/24/2011	14:35	EST-5	Flash Flood		0	0	0.00K	0.00K
32	GOINS	WHITLEY CO.	KY	6/20/2011	3:20	EST-5	Flash Flood		0	0	0.00K	0.00K
	ROCKHOLDS	WHITLEY CO.	KY	6/20/2011	12:29	EST-5	Flood		0	0	0.00K	0.00K
33	WALDEN	WHITLEY CO.	KY	7/21/2011	9:23	EST-5	Flash Flood		0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	7/21/2011	9:40	EST-5	Flash Flood		0	0	0.00K	0.00K
34	JONES	WHITLEY CO.	KY	11/28/2011	12:00	EST-5	Flood		0	0	0.00K	0.00K
35	BARTON	WHITLEY CO.	KY	8/5/2012	12:30	EST-5	Flood		0	0	1.00K	0.00K
	FABER	WHITLEY CO.	KY	8/5/2012	12:30	EST-5	Flash Flood		0	0	1.00K	0.00K
36	MEADOW CREEK	WHITLEY CO.	KY	8/7/2012	8:20	EST-5	Flash Flood		0	0	1.00K	0.00K
37	HIGHLAND PARK	WHITLEY CO.	KY	9/3/2013	0:40	EST-5	Flash Flood		0	0	1.00K	0.00K
	VERNE	WHITLEY CO.	KY	9/3/2013	0:40	EST-5	Flash Flood		0	0	1.00K	0.00K
38	WOODBINE	WHITLEY CO.	KY	12/6/2013	23:00	EST-5	Flood		0	0	1.00K	1.00K
39	PARKERS	WHITLEY CO.	KY	2/21/2014	1:00	EST-5	Flash Flood		3	0	1.00K	0.00K
40	WOFFORD	WHITLEY CO.	KY	7/27/2014	21:35	EST-5	Flash Flood		0	0	1.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
39	PARKERS	WHITLEY CO.	KY	2/21/2014	1:00	EST -5	Flash Flood		3	0	1.00K	0.00K
40	WOFFORD	WHITLEY CO.	KY	7/27/2014	21:35	EST -5	Flash Flood		0	0	1.00K	0.00K
41	GOINS	WHITLEY CO.	KY	7/8/2015	9:00	EST -5	Flood		0	0	1.00K	0.00K
	LOT	WHITLEY CO.	KY	7/8/2015	9:00	EST -5	Flood		0	0	1.00K	0.00K
	NEVISDALE	WHITLEY CO.	KY	7/8/2015	9:00	EST -5	Flood		0	0	1.00K	0.00K
42	CLIO	WHITLEY CO.	KY	12/25/2015	11:04	EST -5	Flood		0	0	1.00K	0.00K
	CLIO	WHITLEY CO.	KY	12/25/2015	11:41	EST -5	Flood		0	0	1.00K	0.00K
43	HIGHLAND PARK	WHITLEY CO.	KY	4/23/2017	7:30	EST -5	Flood		0	0	0.00K	0.00K
	EMLYN	WHITLEY CO.	KY	4/23/2017	13:10	EST -5	Flood		0	0	0.00K	0.00K
44	BARTON	WHITLEY CO.	KY	7/5/2015	2:20	EST -5	Flash Flood		0	0	1.00K	0.00K
45	NEVISDALE	WHITLEY CO.	KY	7/8/2015	8:00	EST -5	Flash Flood		0	0	1.00K	0.00K
	SILER	WHITLEY CO.	KY	7/8/2015	8:00	EST -5	Flash Flood		0	0	1.00K	0.00K
	LOT	WHITLEY CO.	KY	7/8/2015	8:15	EST -5	Flash Flood		0	0	1.00K	0.00K
46	VERNE	WHITLEY CO.	KY	7/27/2016	17:30	EST -5	Flash Flood		0	0	0.10K	0.01K
	ROCKHOLDS	WHITLEY CO.	KY	7/27/2016	23:00	EST -5	Flash Flood		0	0	0.10K	0.01K
47	FABER	WHITLEY CO.	KY	4/21/2017	18:00	EST -5	Flash Flood		0	0	0.00K	0.00K
48	WALDEN	WHITLEY CO.	KY	5/31/2018	17:30	EST -5	Flash Flood		0	0	0.10K	0.00K
49	WOODBINE	WHITLEY CO.	KY	8/10/2018	12:00	EST -5	Flood		0	0	0.00K	0.00K
	TIDALWAVE	WHITLEY CO.	KY	8/10/2018	14:15	EST -5	Flood		0	0	0.00K	0.00K
50	WOODBINE	WHITLEY CO.	KY	9/22/2018	17:30	EST -5	Flood		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
51	HIGHLAND PARK	WHITLEY CO.	KY	2/20/2019	11:00	EST-5	Flood		0	0	0.00K	0.00K
	GAUSDALE	WHITLEY CO.	KY	2/20/2019	12:30	EST-5	Flood		0	0	0.00K	0.00K
52	MOUNTAIN ASH	WHITLEY CO.	KY	2/22/2019	13:00	EST-5	Flood		0	0	0.00K	0.00K
53	BARTON	WHITLEY CO.	KY	2/6/2020	7:28	EST-5	Flood		0	0	0.00K	0.00K
	Totals: 53								3	0	4,351.2K	17.02

Whitley County Flooding - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise, in actuality, one event each for the purpose of defining a denominator for illustrating frequency. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other.

That Whitley County, unincorporated (and its unincorporated cities) independently experienced 53 flooding events over 25 years yields that Whitley County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every 5.5 months (i.e., 53/25). Specifically, Whitley County, unincorporated and its unincorporated cities experienced an average of 2.12 flooding events each year. Or, using December 31, 2020 as an endpoint, 53/300 months is 0.1767 events per month. $1/0.1767 = 5.6593 \approx 1$ flooding event an average of every 5.5 months.

Table 8-2: City of Williamsburg Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:									0		
1	WILLIAMS-BURG	WHITLEY CO.	KY	11/30/1996	16:00	EST	Flash Flood		0	0	10.00K	0.00K
2	WILLIAMS-BURG	WHITLEY CO.	KY	6/14/1997	13:05	EST	Flash Flood		0	0	5.00K	0.00K
3	WILLIAMS-BURG	WHITLEY CO.	KY	6/27/2000	19:00	EST	Flood		0	0	0.00K	0.00K
4	WILLIAMS-BURG	WHITLEY CO.	KY	3/17/2002	8:15	EST	Flood		0	0	0.00K	0.00K
5	WILLIAMS-BURG	WHITLEY CO.	KY	1/24/2002	6:30	EST	Flash Flood		0	0	0.00K	0.00K
	WILLIAMS-BURG	WHITLEY CO.	KY	1/24/2002	18:50	EST	Flash Flood		0	0	0.00K	0.00K
	WILLIAMS-BURG	WHITLEY CO.	KY	1/24/2002	18:56	EST	Flash Flood		0	0	0.00K	0.00K
6	WILLIAMS-BURG	WHITLEY CO.	KY	3/17/2002	21:45	EST	Flash Flood		0	0	50.00K	0.00K
7	WILLIAMS-BURG	WHITLEY CO.	KY	8/26/2002	11:25	EST	Flash Flood		0	0	0.00K	0.00K
8	WILLIAMS-BURG	WHITLEY CO.	KY	7/16/2003	6:05	EST	Flash Flood		0	0	0.00K	0.00K
9	WILLIAMS-BURG	WHITLEY CO.	KY	8/4/2003	4:24	EST	Flash Flood		0	0	0.00K	0.00K
10	WILLIAMS-BURG	WHITLEY CO.	KY	1/23/2006	4:10	EST	Flash Flood		0	0	0.00K	0.00K
11	WILLIAMS-BURG	WHITLEY CO.	KY	8/29/2006	17:22	EST	Flash Flood		0	0	0.00K	0.00K
12	WILLIAMS-BURG	WHITLEY CO.	KY	5/3/2009	23:36	EST-5	Flash Flood		0	0	0.00K	0.00K
	WILLIAMS-BURG	WHITLEY CO.	KY	5/4/2009	2:20	EST-5	Flood		0	0	0.00K	0.00K
13	WILLIAMS-BURG	WHITLEY CO.	KY	8/19/2010	8:30	EST-5	Flood		0	0	0.00K	0.00K
14	WILLIAMS-BURG	WHITLEY CO.	KY	9/3/2013	0:40	EST-5	Flash Flood		0	0	1.00K	0.00K
15	WILLIAMS-BURG	WHITLEY CO.	KY	7/27/2014	21:00	EST-5	Flood		0	0	1.00K	0.00K
	WILLIAMS-BURG	WHITLEY CO.	KY	7/27/2014	21:35	EST-5	Flash Flood		0	0	1.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
16	WILLIAMS-BURG	WHITLEY CO.	KY	2/6/2020	2:00	EST-5	Flood		1	0	4.000M	0.00K
	Totals: 16								1	0	72.00K	0.00K

City of Williamsburg Flooding - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate clusters of discrete events that comprise, in actuality, one event each for the purpose of defining a denominator for illustrating frequency.

That the City of Williamsburg independently experienced 16 flooding events over 25 years yields that the City of Williamsburg experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every 19 months. (i.e., 16/25).

Table 8-3: City of Corbin Flooding Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
1	CORBIN	WHITLEY CO.	KY	2/15/2003	11:37	EST	Flash Flood		0	0	0.00K	0.00K
2	CORBIN	WHITLEY CO.	KY	6/30/2003	13:50	EST	Flash Flood		0	0	0.00K	0.00K
3	CORBIN	WHITLEY CO.	KY	7/16/2003	5:25	EST	Flash Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	7/16/2003	6:00	EST	Flash Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	7/16/2003	6:00	EST	Flash Flood		0	0	0.00K	0.00K
4	CORBIN	WHITLEY CO.	KY	7/23/2003	17:02	EST	Flash Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	7/23/2003	17:27	EST	Flash Flood		0	0	0.00K	0.00K
5	CORBIN	WHITLEY CO.	KY	1/2/2004	9:25	EST	Flash Flood		0	0	0.00K	0.00K
6	CORBIN	WHITLEY CO.	KY	12/9/2004	15:04	EST	Flash Flood		0	0	0.00K	0.00K
7	CORBIN	WHITLEY CO.	KY	1/23/2006	3:35	EST	Flash Flood		0	0	0.00K	0.00K
8	CORBIN	WHITLEY CO.	KY	5/3/2009	23:27	EST-5	Flash Flood		0	0	0.00K	0.00K
9	CORBIN	WHITLEY CO.	KY	9/26/2009	8:10	EST-5	Flash Flood		0	0	0.00K	0.00K
10	CORBIN	WHITLEY CO.	KY	5/2/2010	23:00	EST-5	Flash Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	5/2/2010	23:00	EST-5	Flash Flood		0	0	0.00K	0.00K
11	CORBIN	WHITLEY CO.	KY	8/18/2010	7:44	EST-5	Flash Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	8/18/2010	7:45	EST-5	Flash Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	8/18/2010	7:42	EST-5	Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	8/18/2010	7:44	EST-5	Flood		0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	8/18/2010	10:00	EST-5	Flood		0	0	0.00K	0.00K

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
12	CORBIN	WHITLEY CO.	KY	8/5/2012	12:30	EST-5	Flash Flood		0	0	1.00K	0.00K
13	CORBIN	WHITLEY CO.	KY	2/21/2015	18:19	EST-5	Flood		0	0	1.00K	0.00K
14	CORBIN	WHITLEY CO.	KY	8/18/2018	18:12	EST-5	Flash Flood		0	0	0.00K	0.00K
15	CORBIN	WHITLEY CO.	KY	6/20/2019	7:28	EST-5	Flash Flood		0	0	0.00K	0.00K
	Totals: 15									0	2.00K	0

City of Corbin Flooding - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate clusters of discrete events that comprise, in actuality, one event each for the purpose of defining a denominator for illustrating frequency.

That the City of Corbin independently experienced 15 flooding events over 25 years yields that the City of Corbin experienced (and, thus, can expect to experience in the future) an average frequency of one flooding event every 20 months (i.e., 15/25).

PAST FLOOD EVENTS

In April 2017 heavy rains caused the Cumberland River to crest at 28.38 ft. The flood caused several roads to be inundated with water; Wolf Creek River Road, Feather Creek Road, Doc Siler Road, Lot Mud Creek Road and various portions of Highway 1804, Skaggs Branch Road and Keswick Road. The flooding caused several culverts to be washed out and resulted in a mudslide on Jellico Creek Road. There was also a small mudslide which forced the closure of the Exit 15 northbound onramp for over an hour. There were three high water rescues during this flood event.

In February 2018 heavy rainfall caused the Cumberland River to crest at 29.52 ft making it the 15th highest flood crest in Williamsburg's history. The University of Cumberlands' football field was submerged under water, George Hayes Road was flooded, and Briar Creek park was under water. The following are pictures of the shelter house at Bill Rains Community Park and the football field near Briar Creek Park.

Flooding causes some communities in the County to become isolated due to roads being closed or under water. A situation occurred in the past where EMS could not get to a house due to the road being flooded and fire fighters had to get a boat to rescue the person. They have also used a boat to deliver medicine to vulnerable people.

CUMBERLAND RIVER HISTORICAL CRESTS

Due to the high probability of flooding, emergency managers watch the Cumberland River closely. NOAA has a flood gauge located at the City of Williamsburg to assist with the prediction and preparation of flood events. The following is a list of the historic crests of the Cumberland River at Williamsburg.

Historic Crests		
1	35.03 ft	07/07/1977
2	35.00 ft	03/31/1886
3	34.54 ft	03/15/1975
4	34.20 ft	01/10/1946
5	33.78 ft	01/31/1957
6	32.70 ft	03/25/1929
7	31.96 ft	02/13/1994
8	31.13 ft	11/30/1973
9	31.10 ft	05/09/1984

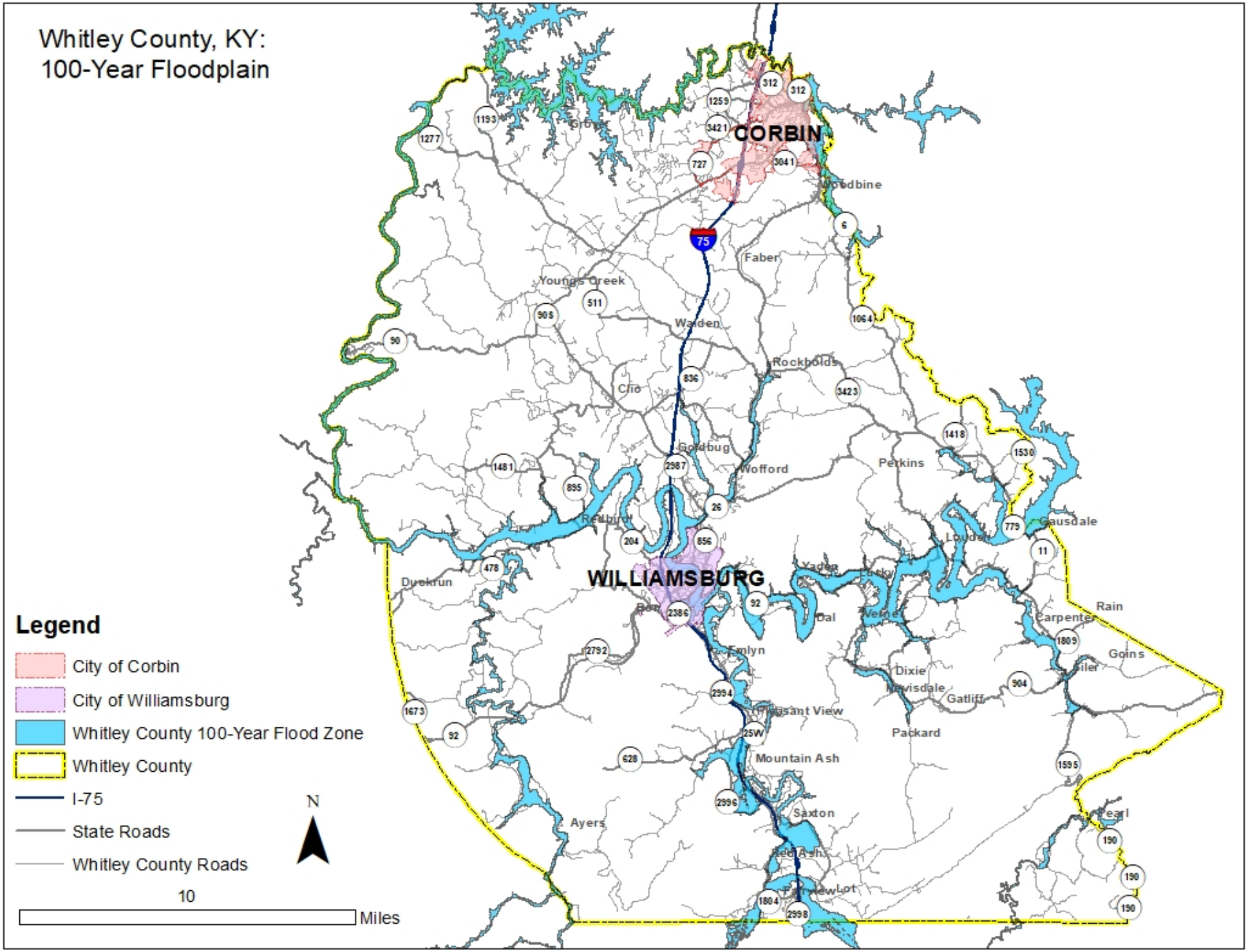
Flood Categories	
Major Flood Stage	32
Moderate Flood Stage	27.5
Flood Stage	21
Action Stage	17

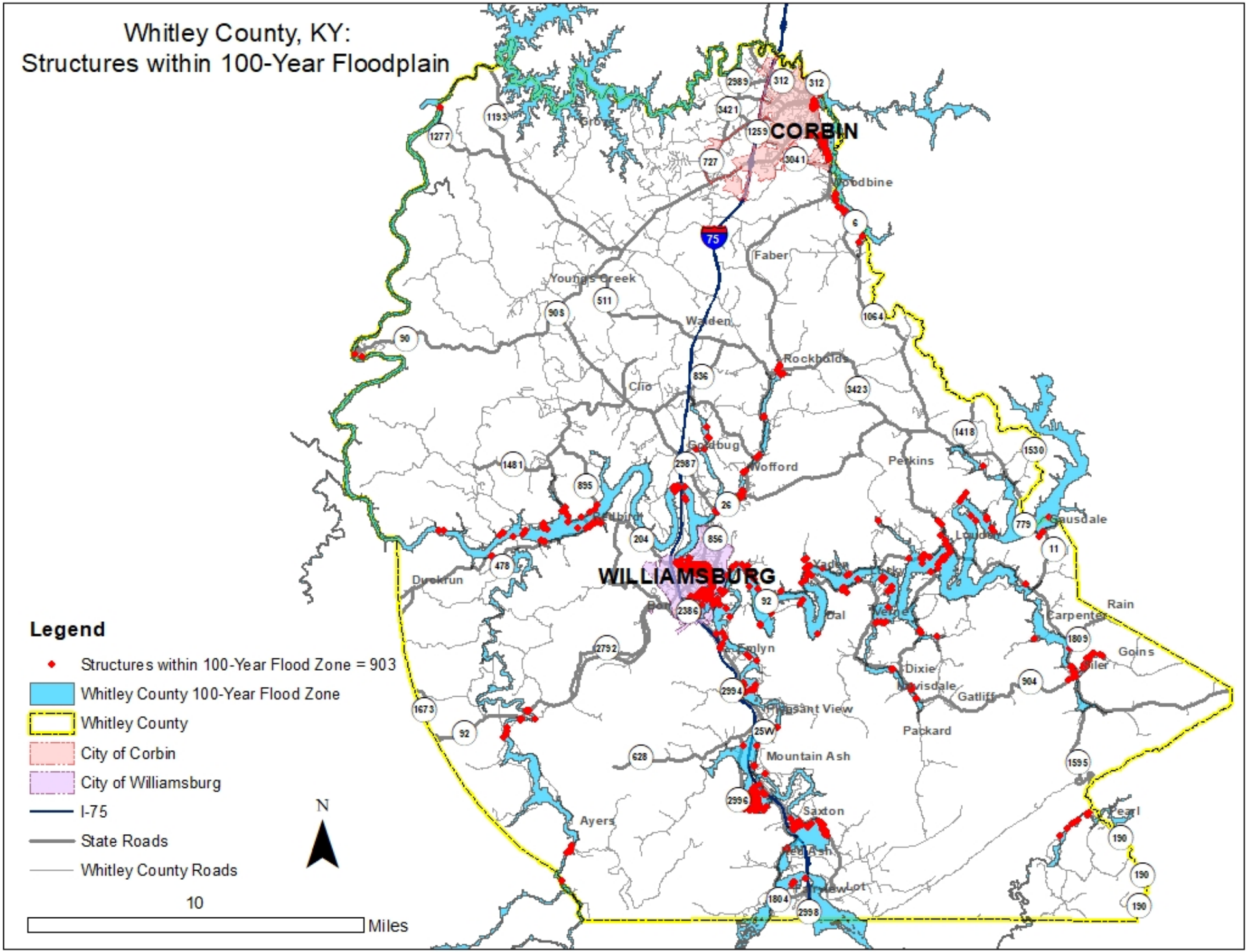
10	30.90 ft	02/04/1939

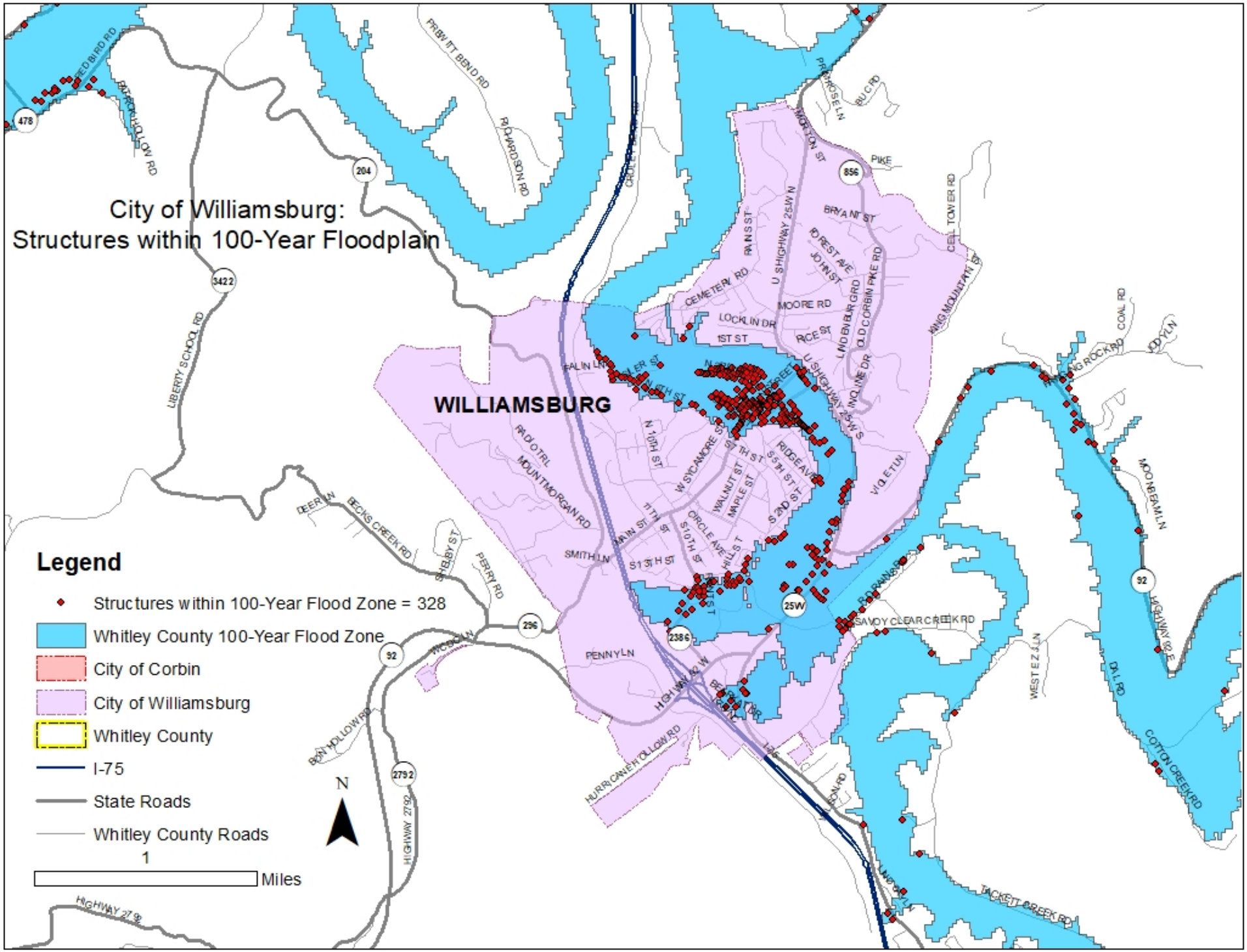
A small change in water level can drastically alter the outcome of a flood event. The following chart explains the possible flood impacts at various crest levels.

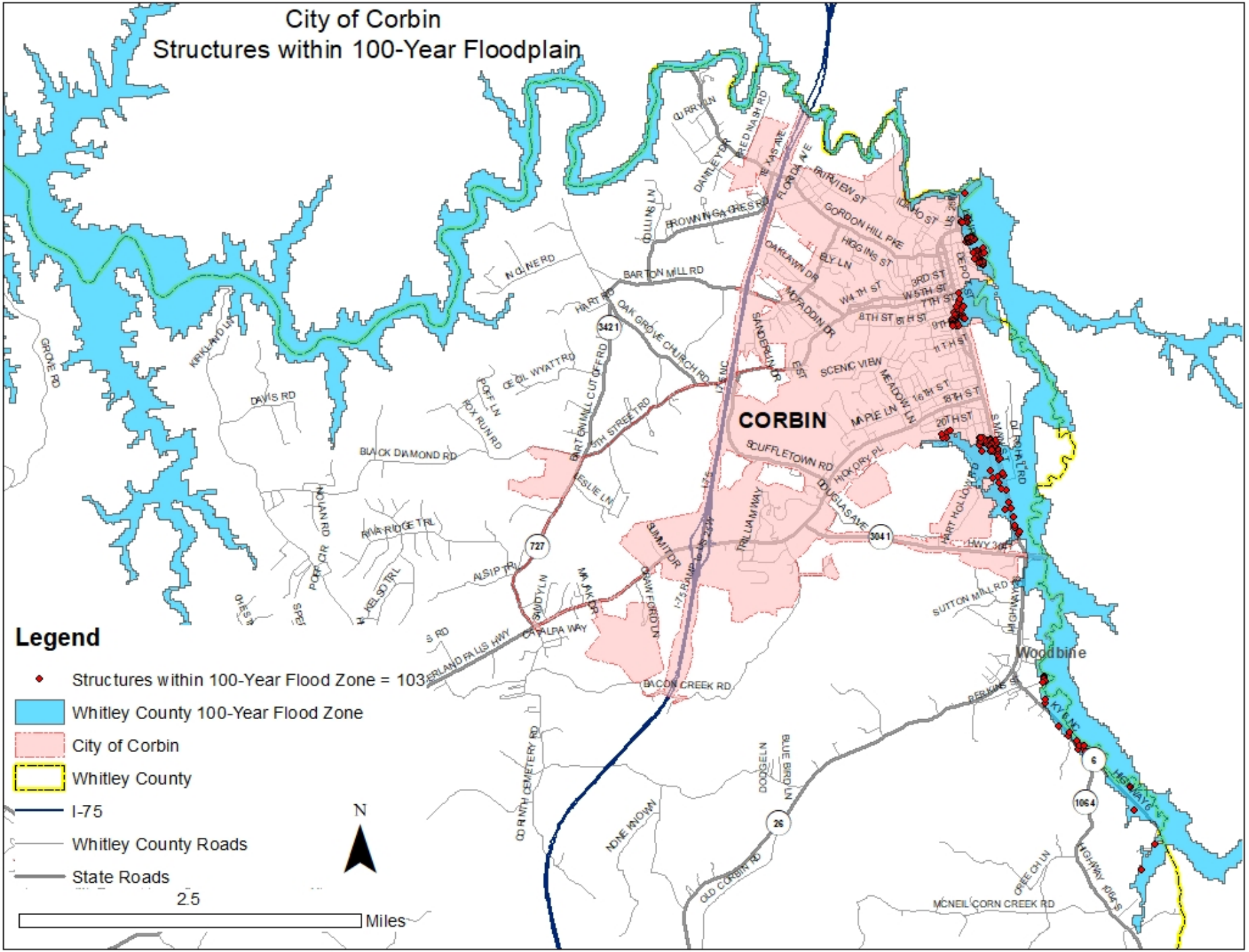
Flood Impacts	
39.4 ft	The levee and floodwall will begin to overtop.
37 ft	Floodwall is threatened. Full evacuation of Williamsburg downtown area is necessary.
36 ft	Overtopping or failure of levee and floodwall is possible.
35.03 ft	Flooding will exceed the highest flood on record.
31 ft	Flooding threatens many homes and businesses. Roads begin to flood, severing evacuation routes. Major flooding threatens downtown area.
25 ft	Low lying areas along George Hayes Road floods.
21 ft	Flooding threatens low lying roads and structures.

Flooding may cause fatalities or injuries, disrupt or destroy infrastructure (roads, bridges, culverts, water, wastewater, gas, electric), disrupt drinking water supplies, and cause erosion and landslides. Floods can occur anytime during the year and are Kentucky's most costly natural hazard. Reviewing past flood events can identify vulnerabilities within the County and Cities enabling emergency management to better prepare for future disasters.


Whitley County, KY:
100-Year Floodplain
CORBIN
WILLIAMSBURG
Woodbine
Faber
Youngs Creek
Walden
Rockholds
Clio
Goldbug
Wofford
Perkins
Newbury
Duckrun
Emlyn
Dixie
Gatliff
Pleasant View
Packard
Mountain Ash
Saxton
Ayers
Cedar Ash
Pine View Lot
Carpenter
Goins
Rain
Pearl
Legend
City of Corbin
City of Williamsburg
Whitley County 100-Year Flood Zone
Whitley County
I-75
State Roads
Whitley County Roads
N
10
Miles


Whitley County, KY:
Structures within 100-Year Floodplain
CORBIN
WILLIAMSBURG
Woodbine
Faber
Youngs Creek
Walden
Rockholds
Clio
Goldbug
Wofford
Perkins
Dyekrun
Ayers
Mountain Ash
Saxton
Packard
Gatliff
Dixie
Carpenter
Goins
Rain
Pearl
Emlyn
Pleasant View
Legend
Structures within 100-Year Flood Zone = 903
Whitley County 100-Year Flood Zone
Whitley County
City of Corbin
City of Williamsburg
I-75
State Roads
Whitley County Roads
N
10
Miles


City of Williamsburg:
Structures within 100-Year Floodplain
WILLIAMSBURG
Legend
Structures within 100-Year Flood Zone = 328
Whitley County 100-Year Flood Zone
City of Corbin
City of Williamsburg
Whitley County
I-75
State Roads
Whitley County Roads
1
Miles
N
478
204
3422
92
296
2792
2386
856
25W
PREWITT BEND RD
REEDBIRD RD
BARREL HOLLOW RD
RICHARDSON RD
LIBERTY SCHOOL RD
CEMETERY RD
LOCKLIN DR
1ST ST
MOORE RD
MORTON ST
PIKE
BRYANT ST
JOHNST
FOREST AVE
OLD CORBIN PIKE RD
CELL TOWER RD
KING MOUNTAIN DR
COAL RD
MOUNTAIN ROCK RD
MOONBEAM LN
HIGHWAY 92 E
DIL RD
COTTON CREEK RD
WEST EZ LN
SAVOY CLEAR CREEK RD
RADIO TRL
MOUNT MORGAN RD
DEER LN
BECKS CREEK RD
SMITH LN
PERRY RD
PENNY LN
HIGHWAY 92 W
HURRICANE HOLLOW RD
BOW HOLLOW RD
HIGHWAY 2792
HIGHWAY 279
JACKETT CREEK RD
MAIN ST
7TH ST
N 10TH ST
W SYCAMORE ST
WALNUT ST
MAPLE ST
CIRCLE AVE
HILL ST
S 10TH ST
S 13TH ST
S 5TH ST
S 2ND ST
RIDGE AVE
VIOLET LN


City of Corbin
Structures within 100-Year Floodplain
CORBIN
Woodbine
Legend
Structures within 100-Year Flood Zone = 103
Whitley County 100-Year Flood Zone
City of Corbin
Whitley County
I-75
Whitley County Roads
State Roads
2.5
Miles
N

ASSESSING VULNERABILITY: IDENTIFYING ASSESTS

Using best available data CVADD staff, with input from community members, attempted to identify vulnerable buildings, critical facilities, and infrastructure located within the county. Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.

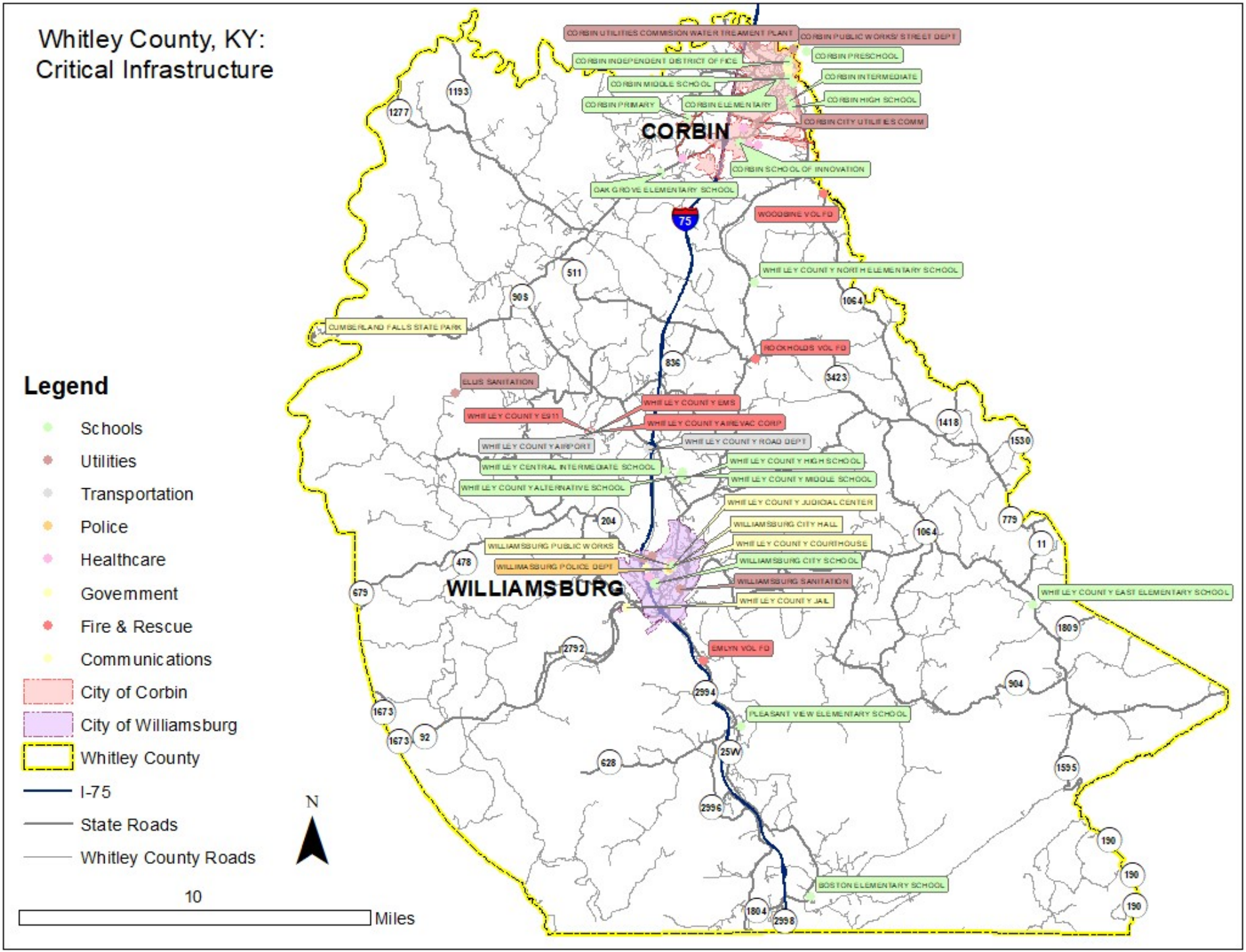
Structural points from CVADD's 911 ArcGIS database were incorporated into HAZUS-MH 4.0 software to determine facilities (residential and commercial) located within the 100-year-floodplain. The analysis determined 14 critical facilities are located within the 100-year-floodplain. The following chart list the critical facilities located in Whitley County. The replacement property values should be considered a broad estimate and may not reflect the actual replacement cost.

Whitley County Critical Infrastructure		***Structures Located in Floodplain**
Location	**Address**	**Property Replacement Value**
City of Williamsburg		
Whitley County Court House	200 Main Street Williamsburg, KY 40769	$8,040,000
Whitley County Judicial Center	100 Main Street Williamsburg, KY 40769	$13,000,000
Williamsburg City Hall	423 Main Street Williamsburg, KY 40769	TBD
Williamsburg Police Department	423 Main Street Williamsburg, KY 40769	TBD
Williamsburg Public Works (Maintenance)	219 North 4th Street Williamsburg, KY 40769	$300,000
Whitley County Health Department	368 Penny Lane Williamsburg, KY 40769	TBD
State Highway Department Building/Garage	1606 Hwy 25W South Williamsburg, KY 40769	TBD
State Highway Department Engineer's Office Hazard Information Center for District	1606 Hwy 25W South Williamsburg, KY 40769	TBD
Williamsburg National Guard	215 Hurricane Hollow Road Williamsburg, KY 40769	TBD
Williamsburg Nursing Home	287 11th Street Williamsburg, KY 40769	$2,500,000
City of Corbin		
Corbin City Hall	805 Main Street Corbin, KY 40702	$6,000,000
Corbin Police Department	805 Main street Corbin, KY 40702	Included in City Hall
Corbin Street Department	50 Miller Lane Corbin, KY 40701	Included in City Hall
Corbin Utilities Commission (Main Office)	1515 Cumberland Falls Hwy. Corbin, KY 40701	$3,500,000
Whitley County Health Department (Corbin Branch)	3750 Cumberland Falls Hwy. Corbin, KY 40701	$1,030,408
Baptist Regional Medical Center	1 Trillium Way Corbin, KY 40702	$102,500,000
The Heritage Nursing Home	192 Heritage Drive South Corbin, KY 40702	$3,140,500

Whitley County		
Whitley County E-911	998 Aviation Blvd. Williamsburg, KY 40769	TBD
Whitley County EMS	1000 Aviation Blvd. Williamsburg, KY 40769	$1,268,190
Whitley County Detention Center	1439 W. Hwy 92 Williamsburg, KY 40769	$6,944,000
Whitley County Road Department	224 Prewitt Bend Road Williamsburg, KY 40769	$466,900
Williamsburg- Whitley County Airport	1000 Aviation Blvd. Williamsburg, KY 40769	$5,000,000
Air Evac Corporation	1002 Aviation Blvd. Williamsburg, KY 40769	$20,000
Cumberland Falls State Park	7351 Highway 90 Corbin, KY 40701	$16,553,343
Water Treatment		
City of Williamsburg Water Treatment Plant	440 Croley Bend Road Williamsburg, KY 40769	$2,480,632
Corbin Utilities Commission (Water Treatment Plant)	60 W. Hinkle Street Corbin, KY 40701	$5,000,000
Jellico Water and Electric	410 S Main St. Jellico, TN 37762	TBD
Cumberland Falls Highway Water District	6926 Cumberland Falls Hwy Corbin, KY 40701	$66,000
Waste Water Treatment Facilities		
City of Williamsburg Waste Water Treatment Plant	440 Croley Bend Road Williamsburg, KY 40769	TBD
Corbin Utilities Commission (Sewer Treatment Plant)	Boone Street Corbin, KY 40701	$4,000,000
Cumberland Falls State Park Waste Water Plant	7351 Highway 90 Corbin, KY 40701	Included in above value.
Electrical Infrastructure		
Kentucky Utilities		TBD
Cumberland Valley & Rural Electric Cooperative Corp.	6219 N. Hwy. 25 E Gray, KY 40734	TBD
Jellico Water & Electric	410 S Main St. Jellico, TN 37762	TBD
Corbin Utilities Commission	1515 Cumberland Fall Hwy Corbin, KY 40701	TBD
Gas Infrastructure		
Delta Natural Gas Company	2011 S. Main Street Corbin, KY 40701	$100,000
Schools		
Corbin Primary (K-2)	3551 Street Road Corbin, KY 40701	$4,930,211
Corbin Central Primary (3-4)	710 West 8th Street Corbin, KY 40701	$3,858,426
Corbin Intermediate (5-6)	404 17th Street Corbin, KY 40701	$200,000
Corbin Middle (7-8)	706 South Kentucky Avenue Corbin, KY 40701	$75,000
Corbin High School (9-12)	1901 Snyder Street Corbin, KY 40701	$10,000,000
Williamsburg Independent School (K-12)	1000 Main Street Williamsburg, KY 40769	$2,500,000
Oak Grove (K-6)	4505 Cumberland Falls Hwy Corbin, KY 40701	$500,000

Boston Elementary (K-6)	3291 Hwy. 1804 Williamsburg, KY 40769	$5,165,000
Pleasant View (K-6)	85 Stringtown Road Williamsburg, KY 40769	$500,000
Whitley North (K-6)	6670 Hwy. 26 Rockholds, KY 40759	$85,000
Whitley East (K-6)	13781 Hwy. 92 East P.O. Box 949 Siler, KY 40763	$6,425,000
Whitley Central Elementary (K-2)	520 Boulevard of Champions Williamsburg, KY 40769	$99,250,000
Whitley Middle School (7-8)	351 Boulevard of Champions Williamsburg, KY 40769	Included in WCE
Whitley County High School (9-12)	350 Boulevard of Champions Williamsburg, KY 40769	Included in WCE
Whitley Intermediate (3-6)	2940 North Hwy. 25W Williamsburg, Ky 40769	$767,250
Rockholds Alternative	29 School Street Rockholds, KY 40759	$125,000
Universities		
University of the Cumberlands	6191 College Station Drive Williamsburg, KY 40769	$101,000,000
Eastern Kentucky University	100 One Pennington Way Corbin, KY 40701	$7,500,000
Volunteer Fire Departments		
Woodbine Volunteer Fire & Rescue Department	877 Hwy 6 Woodbine, KY 40771	$7,000
Corbin Fire Department	805 Main Street Corbin, KY 40702	TBD
Oak Grove Fire & Rescue Department	4613 Cumberland Falls Hwy	$75,000
Williamsburg Fire Department	845 US HWY 25 Williamsburg, KY 40769	TBD
Goldbug Volunteer Fire Department	869 Hwy 26 Williamsburg, KY 40769	TBD
Emlyn Volunteer Fire Department	3254 Hwy 25 Emlyn, KY 40730	$57,000
Pleasant View Fire Department	59 Wolf Creek River Road Williamsburg, KY 40769	$75,000
Patterson Creek Volunteer Fire Department	4088 Hwy 904 Williamsburg, KY 40769	$30,500
South Whitley Volunteer Fire Department	3480 Hwy 1804 Williamsburg, KY 40769	$10,000
Rockholds Volunteer Fire Department	93 Elm Street Rockholds, KY 40759	$45,000
Area Solid Waste Removal		
City of Williamsburg Sanitation Department	843 U.S Hwy 25W South Williamsburg, KY 40769	TBD
City of Corbin Public Works	50 Miller Lane Corbin, KY 40701	$655,040
Ellis Sanitation	2141 Craig Road Williamsburg, KY 40769	TBD
Rogers Sanitation	P.O. Box 203 Woodbine, KY 40771	TBD
Waste Connections of Kentucky	P.O. Box 808 Lily, KY 40740	TBD
Poff Carting Services, LLC	P.O. Box 200 Pittsburg, KY 40755	TBD

Stericycle, Inc (Medical Waste Provider)	One Technology Place Beaver Dam, KY 42320	TBD
Whitley County Media List		
The News Journal Williamsburg Office	105 South 2nd Street Williamsburg, KY 40769	$55,000
WEKC	402 Main Street Williamsburg, KY 40769	$36,000
WEZJ & WEKX-FM	522 Main Street Williamsburg, KY 40769	$36,000
WNLW	147 Croley Bend Road Williamsburg, KY 40769	TBD
The Time Tribune	201 N. Kentucky Avenue Corbin, KY 40701	$212,000
The New Journal Corbin Office	215 North Main Street Corbin, KY 40701	$200,000
WCTT	821 Adams Road Corbin, KY 40701	TBD
WKDP	821 Adams Road Corbin, KY 40701	TBD
New Wave Communications	105 West 3rd Street Corbin, KY 40701	$110,000
TV-19 Williamsburg	6191 College Station Drive Williamsburg, KY 40769	TBD
TV-18 Corbin		TBD
Dish Network, Direct TV		TBD
Other		
CSX Railroad		TBD


Whitley County, KY:
Critical Infrastructure
Legend
Schools
Utilities
Transportation
Police
Healthcare
Government
Fire & Rescue
Communications
City of Corbin
City of Williamsburg
Whitley County
I-75
State Roads
Whitley County Roads
10
Miles
N
CORBIN
WILLIAMSBURG
CORBIN UTILITIES COMMISION WATER TREAMENT PLANT
CORBIN PUBLIC WORKS/ STREET DEPT
CORBIN INDEPENDENT DISTRICT OF FICE
CORBIN PRESCHOOL
CORBIN MIDDLE SCHOOL
CORBIN INTERMEDIATE
CORBIN PRIMARY
CORBIN ELEMENTARY
CORBIN HIGH SCHOOL
CORBIN CITY UTILITIES COMM
CORBIN SCHOOL OF INNOVATION
OAK GROVE ELEMENTARY SCHOOL
WOODBINE VOL FD
WHITLEY COUNTY NORTH ELEMENTARY SCHOOL
CUMBERLAND FALLS STATE PARK
ROCKHOLDS VOL FD
ELLIS SANITATION
WHITLEY COUNTY EMS
WHITLEY COUNTY E911
WHITLEY COUNTY AIREVAC CORP
WHITLEY COUNTY AIRPORT
WHITLEY COUNTY ROAD DEPT
WHITLEY CENTRAL INTERMEDIATE SCHOOL
WHITLEY COUNTY HIGH SCHOOL
WHITLEY COUNTY ALTERNATIVE SCHOOL
WHITLEY COUNTY MIDDLE SCHOOL
WHITLEY COUNTY JUDICIAL CENTER
WILLIAMSBURG CITY HALL
WILLIAMSBURG PUBLIC WORKS
WHITLEY COUNTY COURTHOUSE
WILLIAMSBURG POLICE DEPT
WILLIAMSBURG CITY SCHOOL
WILLIAMSBURG SANITATION
WHITLEY COUNTY JAIL
WHITLEY COUNTY EAST ELEMENTARY SCHOOL
EMLYN VOL FD
PLEASANT VIEW ELEMENTARY SCHOOL
BOSTON ELEMENTARY SCHOOL
75
25W
1193
1277
511
908
836
3423
1418
1530
1064
779
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1595
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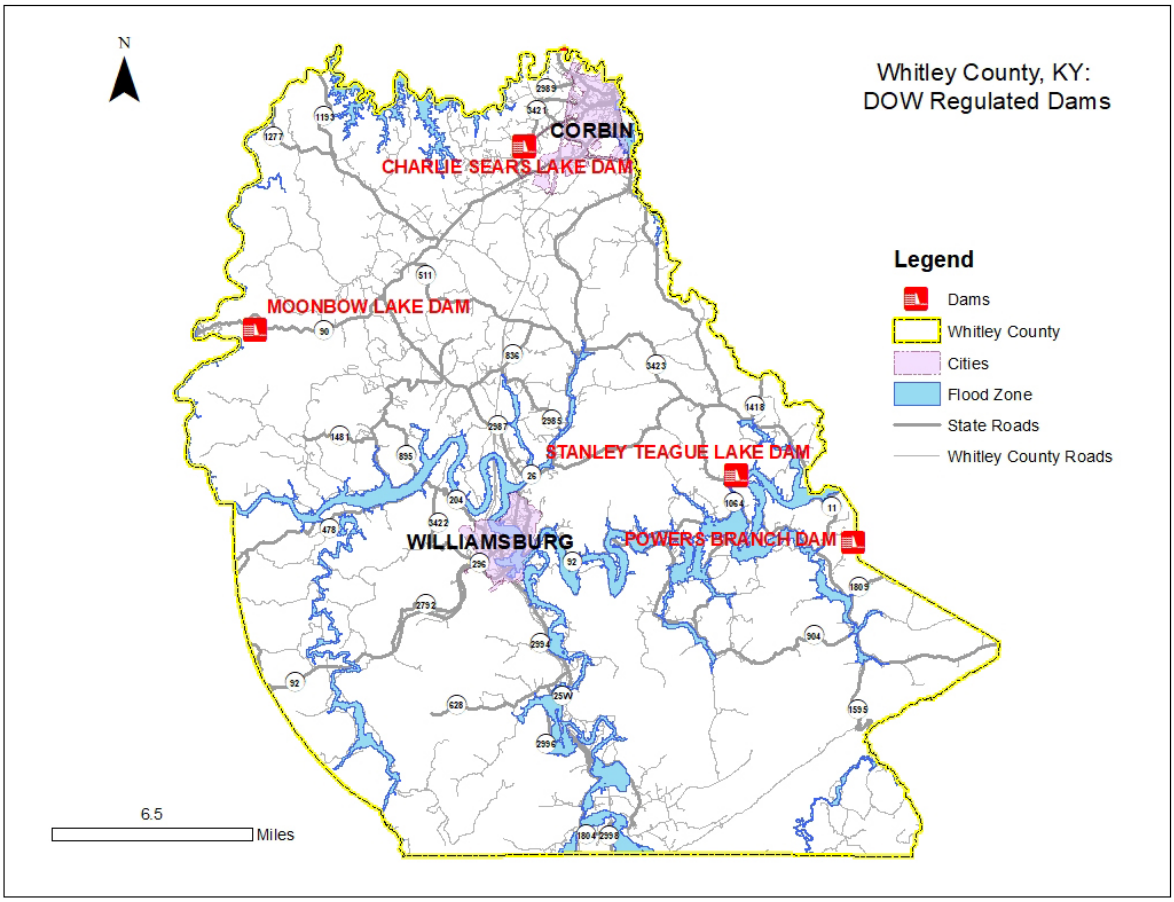
1809
190
1804
2998



ESTIMATED POTENTIAL FLOOD DAMAGE

To determine potential flood damage incurred from a 100-year flood, the median value of owner-occupied homes from the U.S. Census Bureau was used as the average structure value. Critical facilities, residential, and commercial properties are all included in the structure list. This amount was then multiplied by the number of structures located within the 100-year plain. This estimate is limited to structures digitally mapped by CVADD GIS Department and does not include infrastructure.

	Number of structures within floodplain	Median value of owner-occupied housing units.	Estimated Total Loss
Whitley	903	$79,100.00	$71,427,300.00
City of Corbin	103		$8,147,300.00
City of Williamsburg	328		$25,944,800.00

WHITLEY COUNTY REPETITIVE-LOSS/SEVERE REPETITIVE-LOSS

Whitley County, Unincorporated, the **City of Corbin**, and the **City of Williamsburg** all possess zero (0) Repetitive-Loss (RL) and/or Severe Repetitive-Loss (SRL) properties. There are two (2) definitions for "Repetitive-Loss" and there are two (2) definitions for "Severe Repetitive-Loss": There are the National Flood Insurance Program (NFIP) program definitions of

"Repetitive-Loss" and "Severe Repetitive-Loss" and there are the Flood Mitigation Assistance (FMA) definitions of "Repetitive-Loss" and "Severe Repetitive-Loss."

FLOODPLAIN MANAGEMENT

A floodplain is an area adjacent to streams, creeks, and rivers that provide floodwater storage. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. Floodplain Coordinators are fundamental to the effective management of floodplain resources and flood mitigation. The following are the floodplain coordinators for Whitley County.

Floodplain Coordinators				
Community Name	Name	Job Title	Address	Phone Number
City of Corbin	Willard McBurney	Mayor	805 South Main St. Corbin, KY 40701	606-523-6520
Whitley County	Bryan Angel Paul Lawson	Floodplain Admin. Health Dept. Environmentalist	368 Penny Ln Williamsburg, KY 40769	606-549-3380
City of Williamsburg	Herschel Roberts	Zoning Admin.	423 Main Street P.O. Box 119 Williamsburg, KY 40769	606-549-6033 606-215-0356

NATIONAL FLOOD INSURANCE

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Flood Insurance Rate Maps (FIRMs) can determine whether a property is located in a high-risk, medium-risk, or low-risk area. FIRMs can be found online at http://msc.fema.gov. The following is an overview of the county's participation with the National Flood Insurance Program.

FEMA Community Status Book – Communities Participating in National Flood Program							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
210227C	Corbin	Knox & Whitley	06/1474	12/18/86	03/16/15	12/18/86	No
210226C	Whitley Co.	Whitley	12/20/74	06/15/79	03/16/15	01/05/89	No
210228C	Williamsburg	Whitley	01/25/74	01/05/89	03/16/15	01/05/89	No

NFIP FINANCIAL CLAIMS

Since 1978 a total of 17 structures have sustained damages due to flooding causing direct and private insurances to payout a total of $86,921 in claims. To put it in perspective that is an average of $5,113 per claim or $2,173.03 per year spent on repairing flood damages. There are only 41 flood insurance policies in effect as of March 2018 and 903 identified structures located within the

100-year-floodplain. For property owners without flood insurance a 100-year flood event could be catastrophic.

NFIP Policy and Loss Data as of March 2018													
Community Name	Total Premium	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT	DIR	WYO	TOT
		Current Policies			**Coverage in Thousands**			**Flood Losses**			**Dollars Paid Historical**		
Whitley Co.	24659	5	28	33	1,354	4,749	6,103	2	3	5	533	2,109	2,642
Williamsburg	10542	1	7	8	395	751	1,146	7	5	12	18,375	65,904	84,279
Total	35201	6	35	41	1,749	5,500	7,249	9	8	17	18,908	68,013	86,921
Nfipservices.floodsmart.gov													

Total Premium	The total amount of premium for policies
Current Policies TOT	The number of policies within the community/county. All condo units are counted for each condo master policy.
Coverage/Thousands Total	The total coverage amount, in thousands of dollars, for all policies within the community/county.
Flood Claims TOT	The total number of claims reported within the community/county for all claims.
Dollars Paid Historical	The total amount paid on claims within the community/county for all claims since 1978.
WYO	Write Your Own – Private Insurance Providers
TOT	Total

SEVERE WINTER WEATHER

In order to address systematically the number of previous severe winter weather events, their locations, their impacts, and the probability of future occurrences (as a function of frequency over a defined number of years), the Cumberland Valley ADD multi-jurisdictional, multi-hazard mitigation plan document relies upon the National Centers for Environmental Information (NCEI) and its "Storm Events Database." Citing directly: "The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

1. "The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
2. "Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
3. "Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from **January 1950 to October 2020**, as entered by NOAA's National Weather Service (NWS)."

Below are tables relaying previous occurrences, locations, and impacts from severe winter weather for the eight counties in the Cumberland Valley Area Development District in Kentucky. The tables include what the National Weather Service (NWS) labels "Heavy Snow", "Ice Storm", "Winter Storm", and "Winter Weather" events. The below list of events should not be considered exhaustive and the property and crop damage amounts identified should be considered broad estimates and not representative of the true or total costs (impacts) from the

severe winter weather event. Still, it is the best available data for a systematic illustration of severe winter weather events for CVADD counties.

Finally, it should also be noted that a portion of the severe winter weather events that were reported and subsequently recorded in the NCEI "Storm Events Database" are recorded for all counties as a "Zone." These data events occur between 1996 and 2004 and will be marked as NCEI marks it (i.e., within parentheses). Other table terminology used for convenience include: "PrD" is "Property Damage Estimated Amount." "CrD" is "Crop Damage Estimated Amount." "Dth" is "Deaths Reported." "Inj" is "Injuries Reported."

Table 8-4: Whitley County Severe Winter Weather Events, 1996-2020

No.	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								1	0	26.00K	0.00K
1	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/6/1996	15:00	EST	Heavy Snow		0	0	0.00K	0.00K
2	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/3/1998	18:00	EST	Heavy Snow		0	0	0.00K	0.00K
3	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/23/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
4	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/22/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
5	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/2/2000	23:00	EST	Heavy Snow		0	0	0.00K	0.00K
6	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/6/2002	5:00	EST	Heavy Snow		0	0	0.00K	0.00K
7	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/19/2002	5:30	EST	Winter Storm		0	0	0.00K	0.00K
8	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/4/2002	12:04	EST	Heavy Snow		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/4/2002	12:04	EST	Heavy Snow		0	0	0.00K	0.00K
9	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/16/2003	16:05	EST	Heavy Snow		0	0	0.00K	0.00K
10	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/25/2004	7:00	EST	Ice Storm		0	0	0.00K	0.00K
11	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	3/7/2008	22:00	EST-5	Ice Storm		0	0	0.00K	0.00K
12	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/3/2009	3:30	EST-5	Winter Weather		0	0	0.00K	0.00K

13	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/5/2009	5:00	EST-5	Winter Weather		0	0	0.00K	0.00K
14	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/18/2009	14:00	EST-5	Winter Weather		0	0	1.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/18/2009	14:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/18/2009	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
15	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/29/2010	18:08	EST-5	Heavy Snow		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/29/2010	18:08	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/29/2010	18:08	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/29/2010	18:08	EST-5	Heavy Snow		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/29/2010	21:15	EST-5	Heavy Snow		0	0	0.00K	0.00K
16	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/15/2010	6:00	EST-5	Winter Weather		0	0	0.00K	0.00K
17	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/12/2010	18:00	EST-5	Winter Weather		0	0	0.00K	0.00K

18	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/15/2010	21:00	EST-5	Ice Storm		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/15/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/15/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
19	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/24/2010	22:00	EST-5	Winter Weather		0	0	0.00K	0.00K
20	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/20/2011	16:55	EST-5	Winter Weather		0	0	0.00K	0.00K
21	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/9/2011	14:00	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/9/2011	14:00	EST-5	Winter Weather		0	0	25.00K	0.00K
22	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/19/2012	11:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/19/2012	11:30	EST-5	Winter Weather		0	0	0.00K	0.00K
	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/19/2012	11:30	EST-5	Heavy Snow		0	0	0.00K	0.00K
23	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/17/2013	12:00	EST-5	Winter Weather		0	0	0.00K	0.00K
24	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/25/2013	6:00	EST-5	Ice Storm		0	0	0.00K	0.00K

	Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
25	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	11/26/2013	19:30	EST-5	Winter Weather		1	0	0.00K	0.00K
26	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/12/2014	16:30	EST-5	Heavy Snow		0	0	0.00K	0.00K

27	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	3/3/2014	2:00	EST-5	Winter Storm		0	0	0.00K	0.00K
28	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/16/2015	5:00	EST-5	Winter Storm		0	0	0.00K	0.00K
29	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/20/2015	22:30	EST-5	Winter Storm		0	0	0.00K	0.00K
30	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	3/5/2015	3:00	EST-5	Winter Storm		0	0	0.00K	0.00K
31	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/20/2016	5:30	EST-5	Winter Weather		0	0	0.00K	0.00K
32	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/22/2016	1:00	EST-5	Winter Storm		0	0	0.00K	0.00K
33	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	2/14/2016	15:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
34	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/5/2017	9:30	EST-5	Winter Weather		0	0	0.00K	0.00K
35	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/16/2018	7:15	EST-5	Winter Weather		0	0	0.00K	0.00K
36	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/8/2018	22:30	EST-5	Winter Weather		0	0	0.00K	0.00K
37	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/24/2020	14:00	EST-5	Heavy Snow		0	0	0.00K	0.00K
	Totals: 37 events								1	0	26.00K	0.00K

Whitley County Severe Winter Weather - Probability as Frequency of Event Occurrence
The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 1/6/1996. Therefore, the denominator is set at 25 years because those are the only years available for these weather events in the database.

That Whitley County experienced 37 severe winter weather events over 25 years yields that Whitley County experienced (and, thus, can expect to experience in the future) an average frequency of one severe winter weather event every eight months (i.e., 37/300). Specifically, Whitley County experienced an average of 1.5 severe winter weather events each year. Or, using December 31, 2020, as an endpoint, this is 0.1233 events per month. $1/0.1233 = 8.11 \approx 1$ severe winter storm event an average of every eight (8) months.

However, during the 25 years covered by the database, no severe winter weather events happened during the months from April through October. This indicates that the winter months for Whitley County are November through March, a total of 5 months. When the frequency is calculated using the five winter months only (37/125), it reveals that Whitley County experienced an average of 2.32 events per winter period, or 0.296 events per winter month. $1/0.296 = 3.38$ or about 1 severe winter storm events an average of every 3 1/3 winter months.

Whitley County Winter Storm Extent

"A paralyzing winter storm dumped up to 20 inches of snow across parts of eastern Kentucky from the early morning hours of Friday January 22nd through the day on Saturday January 23rd. The snowfall produced by the storm was the heaviest to fall across eastern Kentucky since the Blizzard of March 1993… Storm total snowfall amounts around the county ranged between 7 and 10 inches. The highest snowfall amount 10.3 inches was reported just northwest of Williamsburg. Up to a quarter inch of freezing rain also fell.[110]"

[110] "Storm Events Database Event Details – Whitley County, KY, 2016-01-22". NCEI. Retrieved on 4-7-22 from Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov).

Whitley County Severe Winter Weather Event Narratives to Satisfy Extent, 1996-2021

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
1	WHITLEY (ZONE)	1/6/1996	1/7/1996	Heavy Snow	
2	WHITLEY (ZONE)	2/3/1998	2/6/1998	Heavy Snow	
3	WHITLEY (ZONE)	12/23/1998	12/24/1998	Winter Storm	
4	WHITLEY (ZONE)	1/22/2000	1/22/2000	Winter Storm	
5	WHITLEY (ZONE)	12/2/2000	12/3/2000	Heavy Snow	
6	WHITLEY (ZONE)	1/6/2002	1/6/2002	Heavy Snow	
7	WHITLEY (ZONE)	1/19/2002	1/19/2002	Winter Storm	
8	WHITLEY (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
	WHITLEY (ZONE)	12/4/2002	12/5/2002	Heavy Snow	5 inches of snow was reported.
9	WHITLEY (ZONE)	1/16/2003	1/17/2003	Heavy Snow	A maximum of 6 inches of snow were reported.
10	WHITLEY (ZONE)	1/25/2004	1/25/2004	Ice Storm	
11	WHITLEY (ZONE)	3/7/2008	3/8/2008	Ice Storm	A quarter inch of ice was reported around Williamsburg.
12	WHITLEY (ZONE)	2/3/2009	2/4/2009	Winter Weather	One inch of snow reported on the ground in Williamsburg.
13	WHITLEY (ZONE)	12/5/2009	12/5/2009	Winter Weather	An inch of snow fell in Williamsburg.
14	WHITLEY (ZONE)	12/18/2009	12/18/2009	Winter Weather	An inch of snow was reported on the ground. A tree was downed by the heavy wet snow in Corbin and the snow had changed to rain and was turning the snow into slush.
	WHITLEY (ZONE)	12/18/2009	12/18/2009	Winter Weather	Two inches of snow were reported on the ground with numerous car accidents county wide.
	WHITLEY (ZONE)	12/18/2009	12/19/2009	Heavy Snow	Six inches of snow had fallen at the Williamsburg Airport with 3 inches on the ground in Williamsburg.
15	WHITLEY (ZONE)	1/29/2010	1/30/2010	Heavy Snow	A member of the public reported that 5.5 inches of snow had fallen in Rockholds.

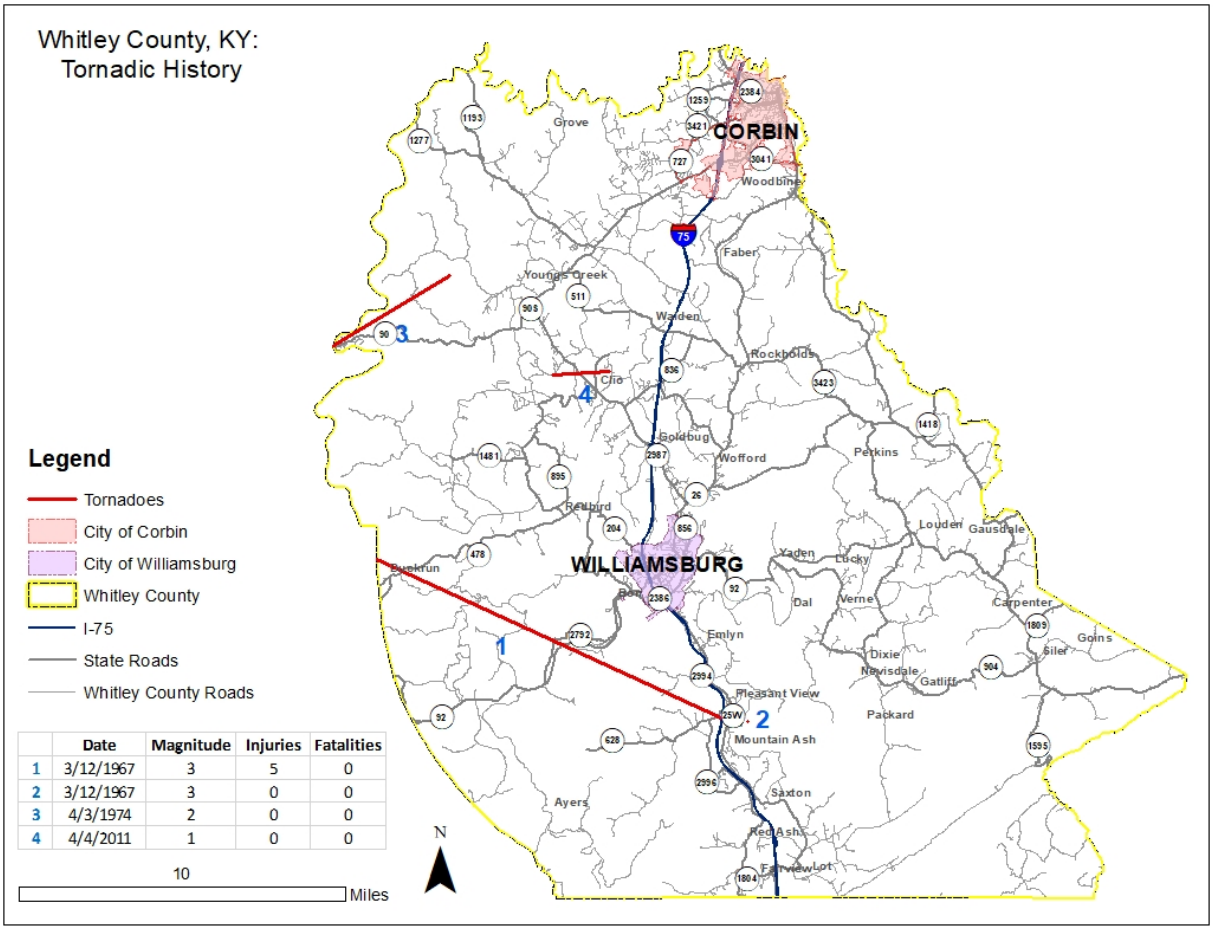
Count	County	Begin Date	End Date	Type	Extent: Event Narrative
	WHITLEY (ZONE)	1/29/2010	1/30/2010	Winter Weather	One inch of snow had fallen in Corbin and it was snowing heavily.
	WHITLEY (ZONE)	1/29/2010	1/30/2010	Winter Weather	A half inch of snow had fallen in Corbin.
	WHITLEY (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Williamsburg Fire Dept measured an average of 7 inches of snow at several locations around the firehouse.
	WHITLEY (ZONE)	1/29/2010	1/30/2010	Heavy Snow	The Highway Dept estimated an average snowfall of 5 inches across the county.
16	WHITLEY (ZONE)	2/15/2010	2/16/2010	Winter Weather	Emergency management dispatch reported about 2 inches of snow on the ground in Williamsburg. The snow started coming down hard around 6 am.
	WHITLEY (ZONE)	2/15/2010	2/16/2010	Winter Weather	Two inches of snow fell in Williamsburg.
	WHITLEY (ZONE)	2/15/2010	2/16/2010	Winter Weather	The storm total snowfall since early Monday morning 1 mile northwest of Williamsburg was 3.7 inches. One and seven tenths of an inch of snow fell during the past 24 hours with a total snow depth of 2 inches.
17	WHITLEY (ZONE)	12/12/2010	12/13/2010	Winter Weather	Three inches of snow fell in Corbin.
18	WHITLEY (ZONE)	12/15/2010	12/16/2010	Ice Storm	Three quarters of an inch of ice accumulated in Williamsburg.
	WHITLEY (ZONE)	12/15/2010	12/16/2010	Winter Weather	Twelve hundredths of an inch of ice accumulated in Corbin.
	WHITLEY (ZONE)	12/15/2010	12/16/2010	Winter Weather	Twelve hundredths of an inch of freezing rain had accumulated 1 mile north of Williamsburg.
19	WHITLEY (ZONE)	12/24/2010	12/24/2010	Winter Weather	An inch and a half of snow fell in Woodbine.
20	WHITLEY (ZONE)	1/20/2011	1/20/2011	Winter Weather	The county dispatch office estimated that one quarter to one half of an inch of snow had fallen in Williamsburg. Roads around the county were slick and hazardous.
21	WHITLEY (ZONE)	2/9/2011	2/9/2011	Winter Weather	Two inches of snow fell in Corbin between 2 and 530 pm.
	WHITLEY (ZONE)	2/9/2011	2/9/2011	Winter Weather	I-26 between Williamsburg and Corbin were closed between 5 and 6pm due to numerous accidents caused by slick roads.
22	WHITLEY (ZONE)	2/19/2012	2/19/2012	Winter Weather	Two inches of snow accumulated on grassy areas, with an inch of slushy snow on area roadways. The snow fell 1 mile east southeast of Williamsburg.
	WHITLEY (ZONE)	2/19/2012	2/19/2012	Winter Weather	An inch and a half of snow fell in Goldbug on I75 near exit 15.
	WHITLEY (ZONE)	2/19/2012	2/19/2012	Heavy Snow	Five and a half inches of snow fell in Williamsburg.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
23	WHITLEY (ZONE)	1/17/2013	1/17/2013	Winter Weather	Numerous accidents were reported on I-75 and US 25 south of Williamsburg due to snow covered roads. The highway deparment reported 2 of snow in Williamsburg.
24	WHITLEY (ZONE)	1/25/2013	1/25/2013	Ice Storm	Ice amounts ranged from 1/8 up to 1/4 in the town of Corbin. Multiple accidents were reported around Corbin during the morning due to the icy conditions.
25	WHITLEY (ZONE)	11/26/2013	11/27/2013	Winter Weather	Slick snow covered roads resulted in a fatal multiple vehicle accident on I-75 near Williamsburg and lead to the closure of all north and south bound lanes.
26	WHITLEY (ZONE)	2/12/2014	2/13/2014	Heavy Snow	Snowfall amounts ranged from two and a half inches near Williamsburg, up to near seven inches along the Tennessee border.
27	WHITLEY (ZONE)	3/3/2014	3/3/2014	Winter Storm	Snow, freezing rain, and some sleet occurred across Whitley county. Five trees were downed in the Rockholds area due to the weight of freezing rain on the limbs. An inch of snow and sleet accumulation was also reported.
28	WHITLEY (ZONE)	2/16/2015	2/16/2015	Winter Storm	Three inches of snow and sleet had accumulated in Corbin as of 200 pm. Three inches of sleet and snow had fallen in Williamsburg as of 215 pm. Williamsburg had picked up a total of 5 inches of sleet and snow as of 339 pm. The final storm total snow fall for Whitley county ended up being 4 to 6 inches with some sleet and freezing rain mixed in at times. Williamsburg had the highest snow and sleet total of six inches.
29	WHITLEY (ZONE)	2/20/2015	2/21/2015	Winter Storm	Quarter inch ice accumulations were reported 3 miles southwest of Frakes.
30	WHITLEY (ZONE)	3/5/2015	3/5/2015	Winter Storm	Three and a half to four inches of storm total snow fall was reported across portions of Whitley county.
31	WHITLEY (ZONE)	1/20/2016	1/20/2016	Winter Weather	Two to three inches of snow fell across the county.
32	WHITLEY (ZONE)	1/22/2016	1/23/2016	Winter Storm	Storm total snowfall amounts around the county ranged between 7 and 10 inches. The highest snowfall amount 10.3 inches was reported just northwest of Williamsburg. Up to a quarter inch of freezing rain also fell.
33	WHITLEY (ZONE)	2/14/2016	2/15/2016	Heavy Snow	Snowfall ranged from 4 to 7 inches across the county. Some freezing rain and sleet also mixed in but amounts were inconsequential.
34	WHITLEY (ZONE)	1/5/2017	1/5/2017	Winter Weather	
35	WHITLEY (ZONE)	1/16/2018	1/16/2018	Winter Weather	
36	WHITLEY (ZONE)	12/8/2018	12/9/2018	Winter Weather	
37	WHITLEY (ZONE)	12/24/2020	12/25/2020	Heavy Snow	Dispatch reported that 4.5 inches of snow fell as of noon on 12/25 in Williamsburg...but that the majority (around 4 inches) fell between 1pm and 10pm on the 24th.
38	WHITLEY (ZONE)	2/7/2021	2/7/2021	Winter Weather	A volunteer weather observer reported that 1.1 inches of snow had fallen near Deering.

Count	County	Begin Date	End Date	Type	Extent: Event Narrative
39	WHITLEY (ZONE)	2/17/2021	2/18/2021	Heavy Snow	An estimated 3.5 inches of snow fell in Corbin.
	WHITLEY (ZONE)	2/17/2021	2/18/2021	Winter Weather	An estimated 1.8 inches of snow fell near Williamsburg.

SEVERE THUNDERSTORM & TORNADO

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. There are many characteristics of a severe thunderstorm; hail, strong winds, lightning, rainfall, and the possibility of producing a tornado, that can be dangerous to the people living in the affected area. Strong straight-line winds can knock down trees and power lines which can cause power outages. Strong winds can also



	Date	Magnitude	Injuries	Fatalities
1	3/12/1967	3	5	0
2	3/12/1967	3	0	0
3	4/3/1974	2	0	0
4	4/4/2011	1	0	0

damage mobile homes and there are several mobile home communities within Whitley County. Rainfall from thunderstorms can cause flooding which is a major concern for Whitley County. Hail can damage property, crops, and even kill livestock caught out in the open. Tornados (with winds up to about 300 mph) can destroy all but the best-built man-made structures and currently, there are no storm shelters in the county. Thunderstorms can produce tornados, floods, lightning and damaging winds. They may occur individually, in clusters or in lines. Only about 10 percent of thunderstorms are classified as severe, however, it is important to be prepared for worse case scenarios. Through studying past severe thunderstorm events, the county and cities, can become better prepared for future disasters.

Severe Thunderstorms have at least one of the following:

- Wind gusts of at least 58 mph or higher, i.e. 50 knots;
- Tornado;

- Hail that is one inch or larger, i.e. at minimum the size of a quarter.

This analysis will focus on the wind profiles for each county; later sections will assess hail and tornados.[111]

Thunderstorms can be categorized by their physical characteristics, i.e., the presence or absence of rotation, the number or location of updrafts and downdrafts present. There is a continuous spectrum of storms in the sky and a storm may move from one category along this spectrum to another. The five (5) types are:

- **Ordinary or Single-Cell Storm:** Single cell storms are short-lived and usually not severe.
    - Short life, generally 30-45 minutes
    - Downdraft that forms within 15-20 minutes after cell initiation
    - Updraft that weakens in 25-30 minutes; outflow stabilizes
    - Gusty winds, usually not severe
- **Pulse Storm:** A Pulse Storm is a single-cell thunderstorm that is usually not strong; when it is of substantial intensity, it produces severe weather for short periods of time. Such a storm weakens and then generates another short burst or pulse.
    - Short life, generally 30-45 minutes
    - Usually not severe, but given the right environmental conditions, these storms can create:
        - Downburst winds, usually less than 70 mph
        - A weak tornado
    - Damage is isolated.
- **Multicellular Cluster:** This type is the most common storm, consisting of a group of ordinary cells at various stages of the thunderstorm life cycle.
    - Most common type of thunderstorm
    - May last for several hours
    - Consists of a group of cells moving as a single unit
    - Contains cells in different stage of the thunderstorm life cycle
    - Occasionally may contain supercells
    - Given the right conditions, the cells can become severe within the multicellular cluster producing:
        - Downburst winds;
        - Weak tornadoes; and
        - Heavy rainfall in a short time.
- **Multicellular Line:** This category is a long line of storms with a continuous, well developed gust front along the leading edge.
    - Frequently called squall line

[111] The TYPES section is adapted from the National Weather Service. (2011). "Weather Spotter's Field Guide." Department of Commerce. As presented in the Kentucky Hazard Mitigation Plan published by the University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP). (2018)

    - A long line of storms with individual storm outflows merging to produce a continuous, well-developed gust front marking the leading edge of rain-cooled air
    - Line of storms often oriented north-south or northeast-southwest and usually move toward the northeast, east, or southeast
    - May be embedded along the line
    - Given the right environmental conditions, multicell line storms can produce:
        - Strong downburst winds;
        - Heavy rainfall; and
        - Occasional tornadoes
- **Supercell:** A supercell is a highly organized thunderstorm with an extremely strong updraft. They exhibit persistent storm-scale rotation of the updraft-downdraft couplet or mesocyclone.
    - Classifying supercellular storms is subjective. Still, the following is generally acknowledged about supercells:
        - Highly organized storm with rotation inside
        - Updrafts can attain speeds more than 100 mph
        - Can produce strong, violent tornadoes
        - Rear-flank downdraft can produce damaging outflow winds in excess of 100 mph.
    - Supercells can produce the following elements:
        - Potentially torrential rainfall immediately adjacent to the storm updraft
        - Lighter rainfall at greater distances from the updraft
        - Rear-Flank Downdrafts (RFDs) producing strong, sometimes damaging outflows
        - Tornadoes

Damaging Winds: National Weather Service issues warnings when the winds from a thunderstorm are expected to be 58 mph (50 knots) or higher.

Downburst: This term refers to an area of strong, often damaging winds produced by air rapidly descending in a thunderstorm. Downbursts are sometimes described as a microburst when it covers an area of less than 2.5 square miles and lasts three to seven minutes. Downbursts can be referred to as microburst when they cover larger areas or last for more than seven (7) minutes. On rare occasions, downbursts can have wind speeds in excess of 150 mph.

Bow Echo: A bow-shaped line of convective cells – best seen on radar – is often associated with swaths of damaging straight-line winds and small tornadoes.

Derecho: A derecho is a widespread and usually fast-moving convectively-induced episode of damaging winds. Derechos can result from bow echoes, supercells, multicell clusters or lines, or a blend of any of these. They can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across. Due to the large area extent, an episode is usually not classified as a derecho until it is complete.

Note: When reviewing the types and impacts of thunderstorms and winds, it is important to realize that while tornadoes are typically more destructive when they occur, straightline winds can also be highly destructive and occur much more frequently. In the final analysis, straightline winds cause more damage in both injuries/deaths and property damage in the United States than do tornadoes.

Table 8-5: Whitley County Thunderstorm/Wind Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	3	903.20K	10.00K
1	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	4/23/1996	14:00	EST	High Wind	50 kts.	0	0	1.00K	0.00K
2	CORBIN	WHITLEY CO.	KY	5/27/1996	13:40	EST	Thunderstorm Wind	50 kts.	0	0	0.00K	0.00K
3	CORBIN	WHITLEY CO.	KY	6/22/1998	17:10	EST	Thunderstorm Wind	70 kts.	0	0	0.00K	0.00K
4	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	1/3/2000	21:00	EST	High Wind	58 kts. E	0	0	0.00K	0.00K
5	GOLDBUG	WHITLEY CO.	KY	5/15/2003	15:45	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	5/15/2003	15:50	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
6	RYE	WHITLEY CO.	KY	6/13/2003	17:20	EST	Thunderstorm Wind	70 kts. EG	0	0	1.00K	5.00K
7	WOODBINE	WHITLEY CO.	KY	7/10/2003	16:00	EST	Thunderstorm Wind	65 kts. EG	0	0	0.00K	0.00K
8	COUNTY WIDE	WHITLEY CO.	KY	7/13/2003	14:00	EST	Thunderstorm Wind	75 kts. EG	0	0	20.00K	0.00K
9	CORBIN	WHITLEY CO.	KY	7/16/2003	5:40	EST	Thunderstorm Wind	65 kts. EG	0	0	0.00K	0.00K
10	REDBIRD	WHITLEY CO.	KY	10/14/2003	13:45	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
11	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	11/24/2003	5:15	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
12	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/29/2003	23:30	EST	High Wind	60 kts. EG	0	0	5.00K	0.00K
13	CORBIN	WHITLEY CO.	KY	5/27/2004	1:38	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	COUNTY WIDE	WHITLEY CO.	KY	5/27/2004	1:45	EST	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
14	WILLIAMS- BURG	WHITLEY CO.	KY	5/31/2004	0:46	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
15	WILLIAMS- BURG	WHITLEY CO.	KY	5/19/2005	23:00	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
16	WILLIAMS- BURG	WHITLEY CO.	KY	7/27/2005	14:25	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	7/27/2005	14:50	EST	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
17	SILER	WHITLEY CO.	KY	8/5/2005	17:01	EST	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
18	WILLIAMSBURG	WHITLEY CO.	KY	8/13/2005	14:50	EST	Thunderstorm Wind	55 kts. EG	0	0	1.00K	0.00K
19	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	8/30/2005	11:45	EST	High Wind	50 kts. EG	0	0	0.00K	0.00K
20	WILLIAMS- BURG	WHITLEY CO.	KY	4/2/2006	19:08	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
21	CLIO	WHITLEY CO.	KY	5/31/2006	14:08	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	REDBIRD	WHITLEY CO.	KY	5/31/2006	14:08	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
22	WILLIAMS- BURG	WHITLEY CO.	KY	6/10/2006	16:43	EST	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	6/10/2006	20:33	EST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
23	CORBIN	WHITLEY CO.	KY	8/10/2006	17:58	EST	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
	CORBIN	WHITLEY CO.	KY	8/10/2006	18:03	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	WILLIAMS- BURG	WHITLEY CO.	KY	8/10/2006	18:13	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
	WOFFORD	WHITLEY CO.	KY	8/10/2006	18:18	EST	Thunderstorm Wind	53 kts. EG	0	0	5.00K	0.00K
24	GOLDBUG	WHITLEY CO.	KY	8/19/2006	13:13	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
25	WOODBINE	WHITLEY CO.	KY	8/29/2006	16:02	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	8/29/2006	17:03	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
26	EMLYN	WHITLEY CO.	KY	9/23/2006	17:43	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
27	WILLIAMS- BURG	WHITLEY CO.	KY	9/23/2006	17:58	EST	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
28	WHITLEY (ZONE)	WHITLEY (ZONE)	KY	12/1/2006	5:38	EST-5	High Wind	55 kts. EG	0	0	0.00K	0.00K
29	CORBIN	WHITLEY CO.	KY	4/3/2007	20:28	EST-5	Thunderstorm Wind	55 kts. EG	0	0	30.00K	0.00K
30	WILLIAMS- BURG	WHITLEY CO.	KY	1/29/2008	22:30	EST-5	Thunderstorm Wind	55 kts. EG	0	0	30.00K	0.00K
	CARPENTER	WHITLEY CO.	KY	1/29/2008	22:44	EST-5	Thunderstorm Wind	53 kts. EG	0	0	5.00K	0.00K
31	FAIRVIEW	WHITLEY CO.	KY	3/4/2008	14:50	EST-5	Thunderstorm Wind	53 kts. EG	0	0	1.00K	0.00K
32	CLIO	WHITLEY CO.	KY	5/11/2008	8:15	EST-5	Thunderstorm Wind	55 kts. EG	0	0	75.00K	0.00K
	CORBIN	WHITLEY CO.	KY	5/11/2008	8:29	EST-5	Thunderstorm Wind	53 kts. EG	0	0	10.00K	0.00K
33	KRUPP	WHITLEY CO.	KY	6/10/2008	23:15	EST-5	Thunderstorm Wind	60 kts. EG	0	0	35.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

34	JELLICO CREEK	WHITLEY CO.	KY	7/7/2008	15:45	EST -5	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K
35	WILLIAMS- BURG	WHITLEY CO.	KY	7/21/2008	14:35	EST -5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
36	WILLIAMS- BURG	WHITLEY CO.	KY	7/28/2008	13:40	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	7/28/2008	13:44	EST -5	Thunderstorm Wind	60 kts. EG	0	0	50.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	7/28/2008	14:00	EST -5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
37	WILLIAMS- BURG	WHITLEY CO.	KY	2/11/2009	15:25	EST -5	Thunderstorm Wind	60 kts. EG	0	0	100.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	2/11/2009	15:35	EST -5	Thunderstorm Wind	52 kts. EG	0	0	25.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	2/11/2009	15:45	EST -5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
38	WILLIAMS- BURG	WHITLEY CO.	KY	2/27/2009	7:05	EST -5	Thunderstorm Wind	51 kts. EG	0	0	1.00K	0.00K
	CORBIN	WHITLEY CO.	KY	2/27/2009	7:05	EST -5	Thunderstorm Wind	51 kts. EG	0	0	2.00K	0.00K
39	WOODBINE	WHITLEY CO.	KY	6/11/2009	13:01	EST -5	Thunderstorm Wind	54 kts. EG	0	0	5.00K	0.00K
40	WILLIAMS- BURG	WHITLEY CO.	KY	6/16/2009	16:25	EST -5	Thunderstorm Wind	60 kts. EG	0	0	75.00K	0.00K
	CORBIN	WHITLEY CO.	KY	6/16/2009	16:30	EST -5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
	CORBIN	WHITLEY CO.	KY	6/17/2009	17:55	EST -5	Thunderstorm Wind	51 kts. EG	0	0	2.00K	0.00K
50	ROCKHOLDS	WHITLEY CO.	KY	6/20/2009	18:22	EST -5	Thunderstorm Wind	55 kts. EG	0	0	8.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	6/20/2009	19:36	EST -5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

	CARPENTER	WHITLEY CO.	KY	6/20/2009	19:55	EST-5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
50	LOT	WHITLEY CO.	KY	7/12/2009	21:13	EST-5	Thunderstorm Wind	51 kts. EG	0	0	2.00K	0.00K
51	ROCKHOLDS	WHITLEY CO.	KY	8/5/2010	14:10	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
	ROCKHOLDS	WHITLEY CO.	KY	8/5/2010	14:25	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
52	ROCKHOLDS	WHITLEY CO.	KY	8/13/2010	14:15	EST-5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
	CORBIN	WHITLEY CO.	KY	8/13/2010	14:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
53	WILLIAMS- BURG	WHITLEY CO.	KY	2/25/2011	0:50	EST-5	Thunderstorm Wind	48 kts. EG	0	0	3.00K	0.00K
54	ROCKHOLDS	WHITLEY CO.	KY	3/23/2011	18:25	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	PEARL	WHITLEY CO.	KY	3/23/2011	18:50	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
55	RYE	WHITLEY CO.	KY	4/4/2011	15:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	8.00K	0.00K
	KRUPP	WHITLEY CO.	KY	4/4/2011	15:55	EST-5	Thunderstorm Wind	52 kts. EG	0	0	25.00K	0.00K
	FABER	WHITLEY CO.	KY	4/4/2011	15:57	EST-5	Thunderstorm Wind	52 kts. EG	0	1	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	4/4/2011	16:00	EST-5	Thunderstorm Wind	52 kts. EG	0	0	40.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/4/2011	16:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

	WILLIAMSBURG	WHITLEY CO.	KY	4/4/2011	16:02	EST-5	Thunderstorm Wind	55 kts. EG	0	0	15.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/4/2011	16:03	EST-5	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
	WILLIAMS- BURG ARPT	WHITLEY CO.	KY	4/4/2011	16:03	EST-5	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/4/2011	16:23	EST-5	Thunderstorm Wind	52 kts. EG	0	1	1.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/4/2011	16:52	EST-5	Thunderstorm Wind	55 kts. EG	0	0	10.00K	0.00K
56	KRUPP	WHITLEY CO.	KY	4/27/2011	8:48	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
	PLEASANT VIEW	WHITLEY CO.	KY	4/27/2011	17:41	EST-5	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
57	BARK CAMP	WHITLEY CO.	KY	5/24/2011	7:15	EST-5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
	CORBIN	WHITLEY CO.	KY	5/24/2011	7:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	5/24/2011	14:33	EST-5	Thunderstorm Wind	55 kts. EG	0	0	4.00K	0.00K
	EMLYN	WHITLEY CO.	KY	5/24/2011	14:40	EST-5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	5/24/2011	14:40	EST-5	Thunderstorm Wind	55 kts. EG	0	0	7.00K	0.00K
	GOINS	WHITLEY CO.	KY	5/24/2011	15:07	EST-5	Thunderstorm Wind	55 kts. EG	0	0	3.00K	0.00K
58	GOINS	WHITLEY CO.	KY	6/20/2011	4:02	EST-5	Thunderstorm Wind	65 kts. EG	0	0	75.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	6/21/2011	18:22	EST-5	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
	CLIO	WHITLEY CO.	KY	6/21/2011	18:27	EST-5	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

	WILLIAMS- BURG	WHITLEY CO.	KY	6/21/2011	18:27	EST-5	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
59	WILLIAMS- BURG	WHITLEY CO.	KY	7/21/2011	9:10	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
60	WILLIAMS- BURG ARPT	WHITLEY CO.	KY	9/3/2011	19:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
61	WILLIAMS- BURG	WHITLEY CO.	KY	2/29/2012	16:01	EST-5	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	2/29/2012	16:01	EST-5	Thunderstorm Wind	60 kts. EG	0	0	10.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	2/29/2012	16:18	EST-5	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
62	CORBIN	WHITLEY CO.	KY	7/5/2012	14:55	EST-5	Thunderstorm Wind	55 kts. EG	0	0	30.00K	0.00K
	CORBIN	WHITLEY CO.	KY	7/5/2012	15:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	7/5/2012	15:35	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
63	KENSEE	WHITLEY CO.	KY	7/19/2012	22:23	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
64	CORBIN	WHITLEY CO.	KY	9/5/2012	19:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	9/5/2012	19:00	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
65	REDBIRD	WHITLEY CO.	KY	1/30/2013	7:14	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	REDBIRD	WHITLEY CO.	KY	1/30/2013	7:14	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
66	CORBIN	WHITLEY CO.	KY	3/24/2013	17:45	EST-5	Thunderstorm Wind	70 kts. EG	0	0	50.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	4/11/2013	18:19	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

67	WILLIAMS- BURG	WHITLEY CO.	KY	5/21/2013	16:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	5/21/2013	16:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	5/21/2013	16:15	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
68	WILLIAMS- BURG	WHITLEY CO.	KY	7/4/2013	18:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	BARTON	WHITLEY CO.	KY	7/4/2013	19:09	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
69	KRUPP	WHITLEY CO.	KY	8/31/2013	18:10	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	HIGHLAND PARK	WHITLEY CO.	KY	8/31/2013	18:20	EST-5	Thunderstorm Wind	52 kts. EG	0	1	10.00K	0.00K
70	WOODBINE	WHITLEY CO.	KY	12/22/2013	1:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
71	PARKERS	WHITLEY CO.	KY	2/21/2014	0:07	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	SILER	WHITLEY CO.	KY	2/21/2014	0:45	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
72	BURK HOLLOW	WHITLEY CO.	KY	4/28/2014	13:20	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
	GATLIFF	WHITLEY CO.	KY	4/28/2014	13:30	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
73	LIBERTY	WHITLEY CO.	KY	6/10/2014	16:50	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	FABER	WHITLEY CO.	KY	6/10/2014	16:55	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	6/10/2014	16:58	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	WOODBINE	WHITLEY CO.	KY	6/10/2014	16:59	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

74	GOLDBUG	WHITLEY CO.	KY	7/27/2014	16:05	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	BURK HOLLOW	WHITLEY CO.	KY	7/27/2014	16:35	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	LOT	WHITLEY CO.	KY	7/27/2014	16:35	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	7/27/2014	21:00	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	SAXTON	WHITLEY CO.	KY	7/27/2014	21:20	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
75	LIBERTY	WHITLEY CO.	KY	8/20/2014	17:45	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	8/20/2014	17:50	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
76	GROVE	WHITLEY CO.	KY	9/2/2014	17:11	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
77	GOLDBUG	WHITLEY CO.	KY	4/10/2015	5:30	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
78	KRUPP	WHITLEY CO.	KY	4/25/2015	21:40	EST-5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	4/25/2015	21:48	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	4/25/2015	21:48	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
79	CORBIN	WHITLEY CO.	KY	7/14/2015	6:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
80	WILLIAMS- BURG	WHITLEY CO.	KY	8/5/2015	15:00	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
81	YOUNGS CREEK	WHITLEY CO.	KY	3/1/2016	15:18	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
82	CARPENTER	WHITLEY CO.	KY	4/27/2016	20:35	EST-5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

83	CORBIN	WHITLEY CO.	KY	5/7/2016	18:40	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
84	YOUNGS CREEK	WHITLEY CO.	KY	6/2/2016	17:14	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
85	GOLDBUG	WHITLEY CO.	KY	7/7/2016	17:18	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	SAXTON	WHITLEY CO.	KY	7/7/2016	17:18	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	WALDEN	WHITLEY CO.	KY	7/7/2016	17:21	EST -5	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	7/8/2016	15:40	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
86	VERNE	WHITLEY CO.	KY	7/27/2016	16:30	EST -5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
87	WOODBINE	WHITLEY CO.	KY	3/1/2017	9:45	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	SAVOY	WHITLEY CO.	KY	3/1/2017	10:13	EST -5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
88	GAUSDALE	WHITLEY CO.	KY	7/6/2017	17:25	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
89	CORBIN	WHITLEY CO.	KY	4/3/2018	23:28	EST -5	Thunderstorm Wind	54 kts. EG	0	0	0.00K	0.00K
90	FABER	WHITLEY CO.	KY	5/31/2018	16:30	EST -5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	5/31/2018	16:48	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
91	BARK CAMP	WHITLEY CO.	KY	6/11/2018	18:11	EST -5	Thunderstorm Wind	53 kts. EG	0	0	0.00K	0.00K
92	KRUPP	WHITLEY CO.	KY	6/25/2018	13:15	EST -5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	WILLIAMS- BURG	WHITLEY CO.	KY	6/25/2018	13:17	EST -5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD

	WOFFORD	WHITLEY CO.	KY	6/25/2018	13:20	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	JULIP	WHITLEY CO.	KY	6/26/2018	14:06	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
	WOFFORD	WHITLEY CO.	KY	6/26/2018	14:45	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
93	CLIO	WHITLEY CO.	KY	7/20/2018	19:44	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
	JULIP	WHITLEY CO.	KY	7/20/2018	19:57	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
94	FABER	WHITLEY CO.	KY	8/8/2018	13:58	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
95	FABER	WHITLEY CO.	KY	5/2/2019	16:09	EST-5	Thunderstorm Wind	51 kts. EG	0	0	0.00K	0.00K
96	SAVOY	WHITLEY CO.	KY	6/21/2019	22:01	EST-5	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
97	TEAGUE	WHITLEY CO.	KY	7/2/2019	13:42	EST-5	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
98	EMLYN	WHITLEY CO.	KY	3/29/2020	3:36	EST-5	Thunderstorm Wind	51 kts. EG	0	0	5.00K	5.00K
99	WILLIAMS- BURG	WHITLEY CO.	KY	6/29/2020	18:25	EST-5	Thunderstorm Wind	51 kts. EG	0	0	1.00K	0.00K
100	WOFFORD	WHITLEY CO.	KY	7/8/2020	16:10	EST-5	Thunderstorm Wind	41 kts. EG	0	0	0.20K	0.00K
	Totals:								0	3	903.20K	10.00K

Whitley County Thunderstorm/Wind - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus the blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 4/23/1996. The denominator is set at 20 years, keeping the denominator consistent to maintain comparability between counties.

That Whitley County experienced 100 severe thunderstorm/wind events over 20 years yields that Whitley County experienced (and, thus, can expect to experience in the future) an average frequency of one severe thunderstorm/wind event every two and a third months (i.e., 100/240). Specifically, Whitley County experienced an average of five (5) severe thunderstorm/wind events each year. Or, using December 31, 2020 as an endpoint, this is 0.42 events per month. $1/.42 = 2.38 \approx 1$ severe winter storm event on average every two and a third months.

Table 8-6: Whitley County Hailstorm Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	9.00K	0.00K
1	FAIRVIEW	WHITLEY CO.	KY	5/24/1996	22:35	EST	Hail	1.00 in.	0	0	0.00K	0.00K
2	GOLDBUG	WHITLEY CO.	KY	5/31/1998	21:05	EST	Hail	2.75 in.	0	0	5.00K	0.00K
3	GOLDBUG	WHITLEY CO.	KY	6/5/1998	18:39	EST	Hail	1.75 in.	0	0	0.00K	0.00K
4	SAXTON	WHITLEY CO.	KY	4/28/2002	15:05	EST	Hail	1.00 in.	0	0	0.00K	0.00K
5	CORBIN	WHITLEY CO.	KY	5/2/2002	13:35	EST	Hail	1.75 in.	0	0	0.00K	0.00K
6	WILLIAMSBURG	WHITLEY CO.	KY	5/6/2002	12:07	EST	Hail	1.00 in.	0	0	0.00K	0.00K
7	CORBIN	WHITLEY CO.	KY	7/13/2003	13:52	EST	Hail	1.00 in.	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	7/13/2003	13:54	EST	Hail	1.25 in.	0	0	0.00K	0.00K
	COUNTYWIDE	WHITLEY CO.	KY	7/13/2003	14:00	EST	Hail	1.25 in.	0	0	0.00K	0.00K
8	ROCKHOLDS	WHITLEY CO.	KY	6/2/2004	17:18	EST	Hail	1.00 in.	0	0	0.00K	0.00K
9	WILLIAMSBURG	WHITLEY CO.	KY	7/23/2007	16:33	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
10	WILLIAMSBURG	WHITLEY CO.	KY	6/16/2008	16:51	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	WILLIAMSBURG	WHITLEY CO.	KY	6/16/2008	16:51	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
11	ROCKHOLDS	WHITLEY CO.	KY	7/21/2008	15:55	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
12	CLIO	WHITLEY CO.	KY	6/16/2009	16:25	EST-5	Hail	1.25 in.	0	0	3.00K	0.00K
	CORBIN	WHITLEY CO.	KY	6/16/2009	16:31	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	WILLIAMSBURG	WHITLEY CO.	KY	6/17/2009	13:35	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	GOLDBUG	WHITLEY CO.	KY	6/17/2009	13:50	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	WILLIAMSBURG	WHITLEY CO.	KY	6/17/2009	13:59	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	WILLIAMSBURG	WHITLEY CO.	KY	6/17/2009	15:36	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
13	GROVE	WHITLEY CO.	KY	4/24/2010	23:05	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/24/2010	23:15	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
14	CORBIN	WHITLEY CO.	KY	5/14/2010	13:23	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	5/14/2010	13:45	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
15	WOODBINE	WHITLEY CO.	KY	4/1/2011	20:37	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
16	CORBIN	WHITLEY CO.	KY	4/9/2011	13:58	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
	CORBIN	WHITLEY CO.	KY	4/9/2011	14:02	EST-5	Hail	1.75 in.	0	0	0.00K	0.00K
17	BARTON	WHITLEY CO.	KY	5/10/2016	22:39	EST-5	Hail	1.00 in.	0	0	0.00K	0.00K
	Totals:								0	0	9.00K	0.00K

Whitley County - Probability as Frequency of Event Occurrence

The highlighted rows in the above table designate clusters of discrete events that comprise one event for the purpose of defining a denominator for illustrating frequency; typically this occurs when more than one location in a county reports the same activity in their area as is happening in other parts of the county from the same storm system. The yellow versus blue highlighting does not signify any difference save that clusters of discrete recordings are visually "next" to each other. While the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 5/24/1996. The last date recorded for a hailstorm in Whitley County is 5/10/2016; the denominator is set at 20 years to maintain comparability across counties.

That Whitley County experienced 17 events with hail 1" or larger over 20 years yields that Whitley County experienced (and, thus, can expect to experience in the future) an average frequency of one hailstorm event every 14 months (i.e., 17/240). Specifically, Whitley County experienced an average of 0.7 severe hailstorm events every year. Or, using December 31, 2020 as an endpoint, this is 0.07 events per month. $1/.07 = 14.29 \approx 1$ severe hailstorm event an average of every 14 months.

Table 8-7: Whitley County Tornado Events, 1996-2020

No.	Location	County/ Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
	Totals:								0	0	300.00K	0.00K
1	KRUPP	WHITLEY CO.	KY	5/11/2008	8:15	EST-5	Tornado	EF1	0	0	100.00K	0.00K
2	CLIO	WHITLEY CO.	KY	4/4/2011	16:03	EST-5	Tornado	EF1	0	0	200.00K	0.00K
	Totals:								0	0	300.00K	0.00K

Whitley County - Probability as Frequency of Event Occurrence

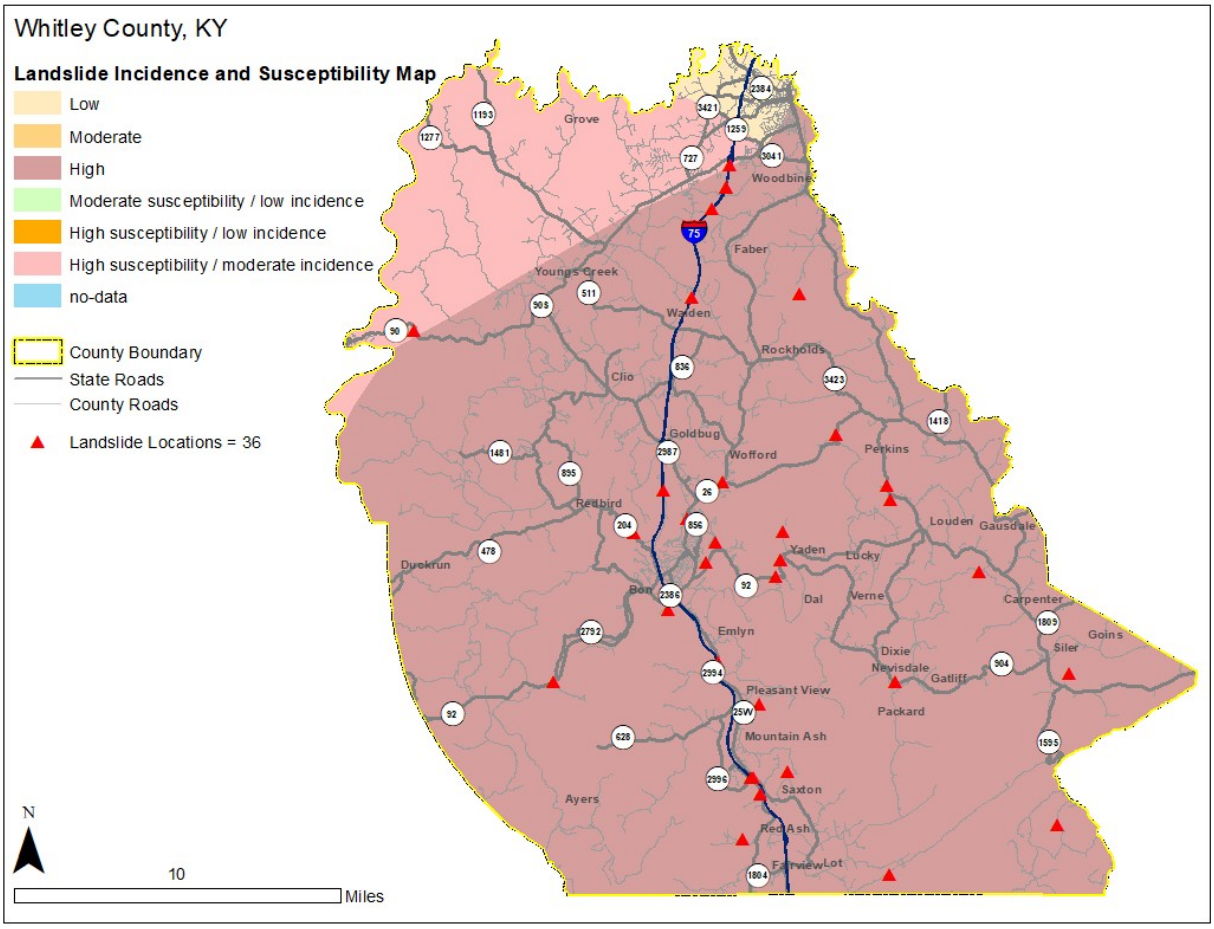
Although the entire timeline of the database, from 1950 through 2020, was searched, the earliest event in the search was 5/11/2008. The last date recorded for a tornado in Rockcastle County is 4/4/2011. Knowing that many years passed with no tornadoes is as valuable for EMS planners as recording when one does happen. Thus, the denominator is set at 20 years to maintain comparability across counties.

That Whitley County experienced 2 tornado events over 20 years yields that Whitley County experienced (and, thus, can expect to experience in the future) an average frequency of one tornado every 10 years (i.e., 2/240). Or, using December 31, 2020 as an endpoint, this is 0.008 events per month. 1/.008 = 125 ≈ 1 tornado event every 125 months or approximately every 10 years.

(Whitley County) LANDSLIDES

Landslides occur when gravity and other driving forces exceed the strength of the rocks and soil, destabilizing the slope. Triggers such as intense rainfall, water-level change, erosion, human activities, and earthquakes can create potential for slope failure. Landslides occur in all regions of Kentucky and are prominent in the Eastern Kentucky Coal Field. Areas generally prone to landslides include preexisting landslides, poorly compacted artificial fill slopes, and step drainage hollows or concave slopes with moderate to thick soils. Whitley County experiences a landslide at least once a year. These landslides have closed roads creating transportation issues until they can be cleaned up.

The best method for avoiding damages from landslides and having to mitigate the hazard is to avoid construction on steep slopes. As this is not always a possibility, consulting soil and geologic maps in the early investigation for development of property is important.



All jurisdiction-specific data derives from the state-maintained database of landslides. All available information is represented; empty cells in the charts indicate that the indicated information is missing from the database.

Count	County	City	Location	Fail-ure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Whit-ley	Woff-ord	KY 26		3/4/2009	Mud-slide	Sandstone; Shale							Yes	
2	Whit-ley	Woff-ord	KY 25W		2/6/2010	Mud-slide	Sandy Shale; Shaly Sandstone							Yes	
3	Whit-ley	Woff-ord	I 75	Above Road	4/17/2011	Rock-fall	Sandy Shale; Shaly Sandstone								
4	Whit-ley	Woff-ord	I 75		4/17/2011	Rock-fall	Sandstone; Interbedded Shale								
5	Whit-ley	Vox	I 75	Above Road	10/19/2011	Rock-fall	Sandstone; Siltstone; Limestone; Coal							Yes	
6	Whit-ley	Sax-ton	KY 92	Above Road	12/27/2011	Slide	Siltstone; Sandstone; Coal							Yes	
7	Whit-ley	Vox	I 75	Road Cut	9/9/2012	Rock-fall	Sandstone; Siltstone; Shale; Limestone; Coal	150 feet	30 feet					Yes	
8	Whit-ley	Vox	I 75	Above Road	12/23/2012		Sandstone; Siltstone; Shale; Limestone; Coal							Yes	

9	Whit-ley	Vox	I 75	Above Road	1/28/2013		Sandstone; Siltstone; Shale; Limestone; Coal							Yes	
10	Whit-ley	Sax-ton	KY 92		3/12/2013		Siltstone; Sandstone; Coal							Yes	
11	Whit-ley	Cum-ber-land Falls	KY 90	Below Road	3/18/2013	Land-slide	Sandstone							Yes	
12	Whit-ley	Eagan	Tiny Branch Rd	Above Road; Stream at Botto m	5/7/2013	Slide	Siltstone; Shale; Sandstone; Coal							Yes	
13	Whit-ley	Rock-holds	Bunches Creek Rd	Above Road	5/7/2013	Slide	Sandstone; Shale; Siltstone; Coal							Yes	
14	Whit-ley	Sax-ton	I 75	Below Road	1/13/2014	Land-slide	Shale; Sandstone; Coal								
15	Whit-ley	Sax-ton	KY 2996	Above Road	2014	Rock-fall	Siltstone; Sandstone; Coal								
16	Whit-ley	Sax-ton	I 75	Below Road	2014	Land-slide	Siltstone; Sandstone; Coal								
17	Whit-ley	Sax-ton	KY 92	Above Road	2/25/2018		Siltstone; Sandstone; Coal								

18	Whit-ley	Rock-holds	68 Bunches Creek Rd		2/9/2019		Sandstone; Siltstone; Carbona-ceous Shale; Coal							Road Blocked	
19	Whit-ley	Rock-holds	Bunches Creek Road		2/12/2019	Slide	Sandstone; Siltstone; Carbonace ous Shale; Coal							Road Blocked	
20	Whit-ley	Sax-ton	KY 92		2/6/2020		Siltstone; Sandstone; Coal								
21	Whit-ley	Frakes	(36.6875, -83.948333)												
22	Whit-ley	Frakes	(36.733333, -83.996666)												
23	Whit-ley	Jelli-co East	(36.599444, -84.049444)												
24	Whit-ley	Jelli-co West	(36.616388, -84.129444)												
25	Whit-ley	Rock-holds	(36.772222, -84.046388)												
26	Whit-ley	Rock-holds	(36.766111, -84.045)												
27	Whit-ley	Rock-holds	(36.857777, -84.092777)												
28	Whit-ley	Rock-holds	KY 779			Land-slide	Sandstone; Shale; Siltstone; Coal								

29	Whit-ley	Sax-ton	KY 92												
30	Whit-ley	Sax-ton	Tackett Creek Rd	Above and Below Road; Stream at Botto m		Land-slide	Siltstone; Sandstone; Coal		357 feet					Yes	$ 150,000
31	Whit-ley	Sax-ton	(36.645833, -84.104166)												
32	Whit-ley	Sax-ton	KY 904				Siltstone; Sandstone; Coal							Road Closure	
33	Whit-ley	Woff-ord	KY 204												
34	Whit-ley	Woff-ord	(36.759166, -84.156944)												

Whitley County Landslides - Probability as Frequency of Event Occurrence

Whitley County, unincorporated (and its unincorporated cities) independently experienced 34 landslide events over 30 years. Thus, Whitley County, unincorporated and its unincorporated cities experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event every eight months (i.e., 34/30). Specifically, Whitley County, unincorporated and its unincorporated cities experienced an average of 1.1 landslide events each year. Or, using December 31, 2021, as an endpoint, 34/360 months is 0.0944 events per month. $1/0.0944 = 10.6 \approx 1$ landslide event an average of every 10 months.

Count	County	City	Location	Failure Loca-tion	Failure or Obser-ved Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Knox/ Whitley	Corbin	(36.894444, -84.004444)												
2	Knox/ Whitley	Corbin	Prewitt Rd			Land-slide	Shale; Siltstone; Sandstone; Coal; Clay								
3	Laurel/ Knox/ Whitley	Corbin	KY 2392	Above Road	2/5/2014	Rock-fall	Shale; Siltstone; Sandstone; Clay; Coal					Yes			

Corbin Landslides - Probability as Frequency of Event Occurrence

Incorporated Corbin independently experienced 3 landslide events within its city limits over 30 years. Therefore, Corbin experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 10 years (i.e., 3/30). Specifically, Corbin experienced an average of 0.1 landslide events each year. Or, using December 31, 2021, as an endpoint, 3/360 months is 0.0083 events per month. $1/0.0083 = 120 \approx 1$ landslide event an average of every 120 months, or one every 10 years.

Count	County	City	Location	Failure Loca-tion	Failure or Observed Date	Type	Type: Lithology	Extent: Track Length	Extent: Width	Extent: Head Scarp Height	Extent: Slip Surface Depth	Extent: Slope Angle	Extent: Move-ment Rate	Impact: Damage Narra-tive	Impact: Cost
1	Whitley	Williams-burg	KY 92		2018		Shale; Sandstone; Coal								
2	Whitley	Williams-burg	KY 92		2018		Shale; Sandstone; Coal								
3	Whitley	Williams-burg	KY 90		2/23/2019		Shale; Sandstone; Coal								
4	Whitley	Williams-burg	US 25W				Shale; Sandstone; Coal	250 feet	150 feet		44-915 feet				
5	Whitley	Williams-burg	US 92												
6	Whitley	Williams-burg	(36.718978, -84.168353)												
7	Whitley	Williams-burg	(36.739444, -84.146944)												
8	Whitley	Williams-burg	(36.748333, -84.141666)												

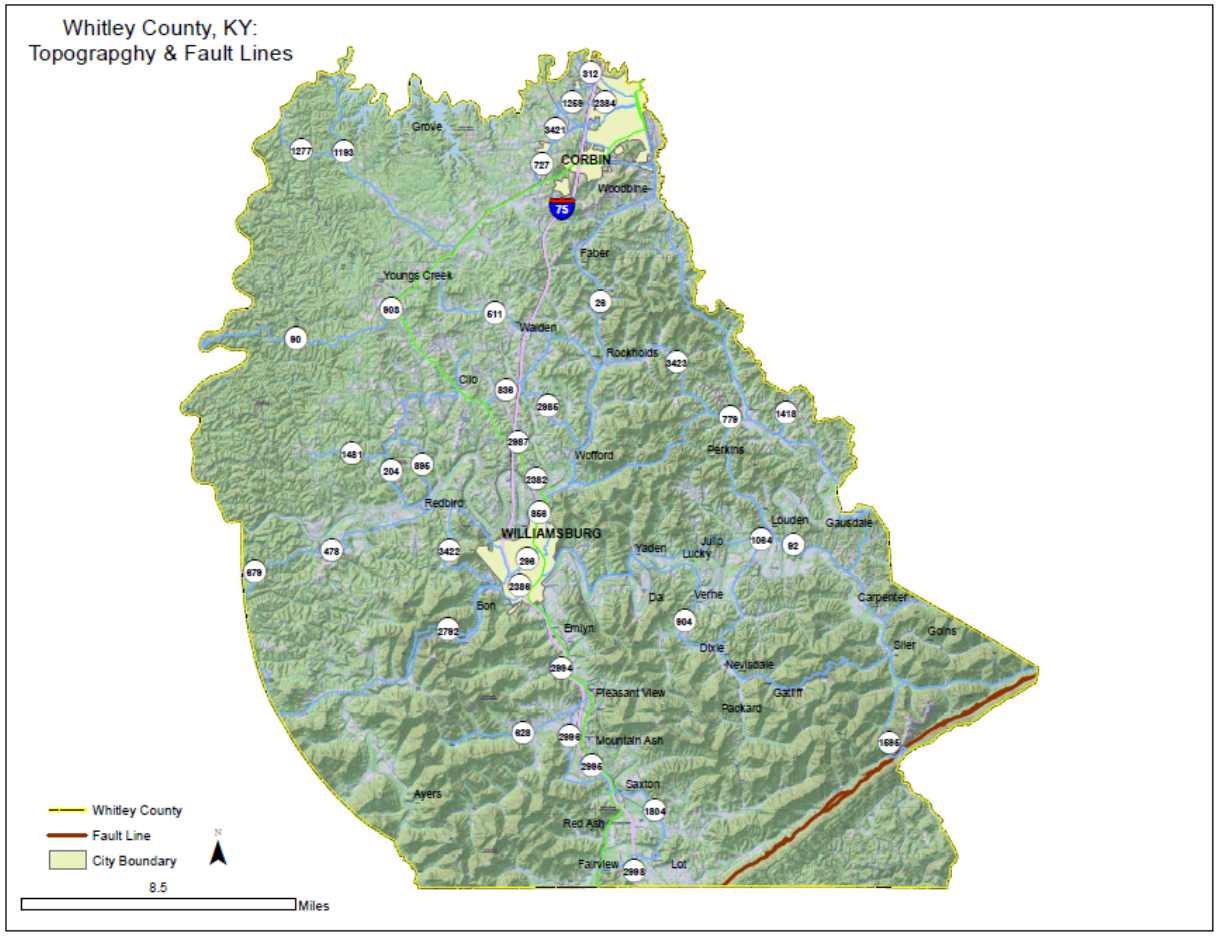
Williamsburg Landslides - Probability as Frequency of Event Occurrence

Incorporated Williamsburg independently experienced 8 landslide events within its city limits over 30 years. Therefore, Williamsburg experienced (and, thus, can expect to experience in the future) an average frequency of one landslide event approximately every 3.75 years (i.e., 8/30). Specifically, Williamsburg experienced an average of 0.27 landslide events each year. Or, using December 31, 2021, as an endpoint, 8/360 months is 0.0222 events per month. $1/0.0222 = 45 \approx 1$ landslide event an average of every 45 months, or one every 3.75 years.

EARTHQUAKES

Earthquakes can happen anytime of the year and without warning. The risk in Kentucky is higher in identified seismic zones such as the New Madrid Fault Zone in the western part of the state. However, no earthquakes have been recorded in Rockcastle County since 1/1/1900 according to the records available through the United States Geological Survey (USGS).

Whitley County Historical Earthquakes 1/1/1900 - 6/30/2019				
Location (Lat/Long)	**Magnitude**	**Depth**	**Date**	**Time**
36.624/-84.081	2.2	7km	10/18/2002	15:55:34
36.814/-84.0323	2.1	8.39km	5/10/2006	11:06:44
36.77333/-84.1312	3.2	26.08km	1/27/2009	11:20:13
36.59667/-83.9475	1.1	25.4km	5/10/2009	17:03:16
36.69767/-83.9377	2.2	27.82km	3/19/2014	7:47:06
36.8095/-84.0032	2.2	9.5km	10/5/2014	1:23:22
36.67033/-84.118	2.77	9.06km	3/8/2015	17:35:01
36.594/-84.039	1.5	6km	11/2/2017	10:49:28
36.703/-84.097	1.8	17.4km	5/11/2019	4:06:27



This narrative from the US Geological Survey website explains how the magnitude of an earthquake is determined and how that magnitude translates into an approximation of damage a specific earthquake may cause. The level of damage is dependent to a degree on the density of population and structures in the affected area; more people and more buildings mean there is more potential for harm as a result of an earthquake. According to the US Census, the population density per square mile in Whitley County was about 81.4 persons in 2010 (the latest data available in Census Quickfacts[34]). This small population size and commensurate low density of structures would indicate that the impact of an earthquake would be on the lower damage level estimated for that point on the Richter Scale. The US Geological Survey states[35]:

"Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, location, and magnitude of an earthquake can be determined from the data recorded by seismograph stations…
"Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater--there are several thousand such shocks annually--are strong

enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year. Although the Richter Scale has no upper limit, the largest known shocks have had magnitudes in the 8.8 to 8.9 range…"
Michigan Technological University's Earthquake Magnitude Scale[36] puts a number to the potential for damage:

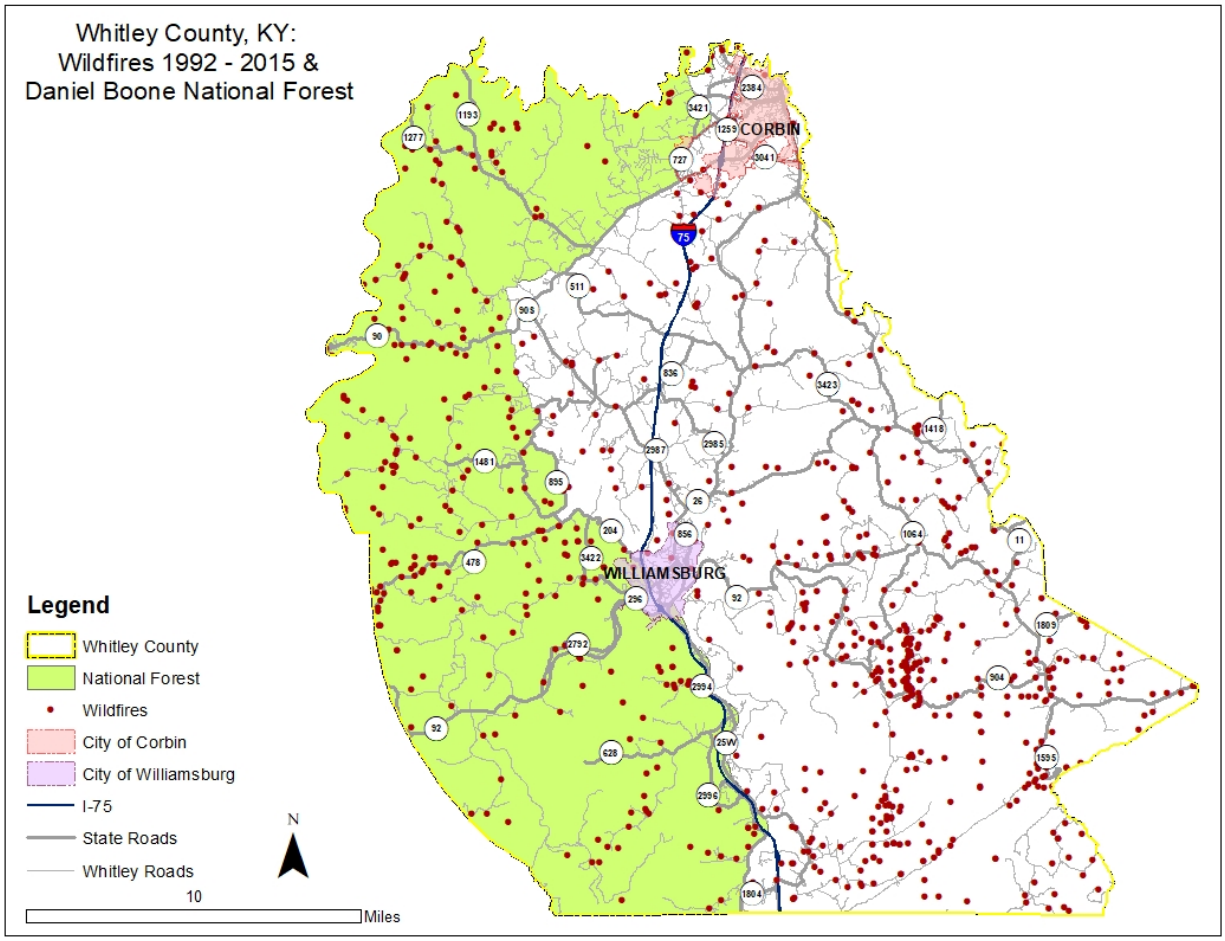
Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

Whitley County has only had nine earthquakes recorded in the USGS Earthquake Hazard Program database. Only one of the nine, at 3.2 magnitude, was severe enough to fall in the 2.5 to 5.4 magnitude on the Earthquake Magnitude Scale, which identifies the extent as "Often felt, but only causes minor damage". Given the history of earthquakes in Whitley County, it is safe to say that the probability of an earthquake of 5.5 or above in magnitude, where damage to structures begins, would be very rare.[37],[38] There have been no recorded events at 5.5 or above on the Earthquake Magnitude Scale and thus there are no recorded past damages and impacts from earthquakes for Whitley County and its incorporated cities.

(Whitley County) WILDFIRES

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and nonnative species of grasses, brush, and trees fuel wildfires. A Wildland Fire1 is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. Wildland fires have been occurring in Kentucky for thousands of years. Unfortunately, these fires began to threaten homes and communities prompting the need to suppress wildfires and establish forest protection laws. The first forest protection laws were enacted in 1831 in a few specific counties with heavily wooded areas. The fine and penalty for setting a fire was $20.



Today, Kentucky's forest protection laws include much stiffer penalties for intentionally setting a fire on land owned by another (Kentucky Revised Statute, Chapter 149, Section 380). Penalties for violating KRS 149.380 include a fine of not less than $1,000 or more than $10,000, imprisonment for not more than five years, or both fine and imprisonment. An Urban Wildland Interface Fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels. Areas that have experienced prolonged droughts, or are excessively dry, are at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next

leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

This plan uses/integrates the Kentucky Division of Forestry "Forest Action Plan 2020".[112]

Table 1-1: Classes of Wildfire as Distinguished by Acres Burned	
Class A	Less than 0.25 Acres Burned
Class B	0.25 to 9 Acres Burned
Class C	10 to 99 Acres Burned
Class D	100 to 299 Acres Burned
Class E	300 to 999 Acres Burned
Class F	1,000 to 4,999 Acres Burned
Class G	5,000 or More Acres Burned

Summary of Fire Occurrences in Whitley County by Class Descriptor, 2019 - 2020				
Fire Class	**Class Descriptor**	**# Fires**	**Acreage Burned**	**% Total Fire Type**
Class A	< 0.25 Acres	1	0.2	5.263%
Class B	0.25 to 9 Acres	10	18.7	52.632%
Class C	10 to 99 Acres	7	295.0	36.842%
Class D	100 to 299 Acres	1	153.0	5.263%
Class E	300 to 999 Acres	0	0.0	0.000%
Class F	1,000 to 4,999 Acres	0	0.0	0.000%
Class G	5,000 or More Acres	0	0.0	0.000%

[112] Retrieved on 1-26-2022 from 2020 Kentucky Forest Action Plan.pdf

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Whitley	2013	42	1242.0	174,040
	2014	52	1297.0	
	2015	17	1732.0	
	2016	40	4215.2	
	2017	12	1039.0	
	2018	3	51.0	
	2019	12	411.9	
	2020	7	55.0	

Table 1-4 Whitley County Summary of Impacts From Wildfires, 2019-2020		
# of Fires		10
Injuries		0
Fatalities		0
Suppression Costs	$	26,474
# Houses Saved		13
Value of Houses Saved	$	1,060,000
# Houses Lost		0
Value of Houses Lost	$	-
# Structures Saved		2
Value of Structures Saved	$	20,000
# Structures Lost		0
Value of Structures Lost	$	-

In 2019-2020 (the last years for which data is available), Whitley County suffered 19 wildfires of all class types. Two years equals 730 days. Thus, there were 19/730 fires per day, or 0.0260 fires per day, or 1 wildfire of all class types every 38.46 days (1/0.0260). Within particular wildfire classes, there was one (1) Class A wildfire between 2019-2020. This translates to 1/730 fires where less than 0.25 acres were burned, or 0.0014 Class A fires per day, or 1 Class A wildfire about every 714.28 days (1/0.0014). There were 10 Class B wildfires between 2019-2020. This translate to 10/730 fires per day, or 0.0137 fires per day, or 1 Class B wildfire every 72.99 days (1/0.0137). There were 7 Class C wildfires between 2019-2020. This translates to 7/730 fires where between 10 to 99 acres were burned, or 0.0096 Class C fires per day, or one (1) Class C wildfire about every 104.17 days (1/0.0096). There was 1 Class D wildfire between 2019-2020. This translates to 1/730 fires where between 100 to 299 acres were burned, or 0.0014 Class D fires per day, or one (1) Class D wildfire about every 714.28 days (1/0.0014). There were no Class E to Class G wildfires – fires where 300 to 5,000 or more acres were burned – in 2019-2020 in Whitley County.

All data used for wildfire tables and calculations come from the Kentucky Division of Forestry; 2020 data is the most current. The DOF does not collect data about wildfires in incorporated areas; therefore, there is no information available regarding wildfires in Williamsburg and Corbin.

ADDITIONAL HAZARDS

There are a variety of natural hazards that are risks in other parts of the country but not in Whitley County:

Tsunami: This is a massive wave that can inundate shorelines, usually created by earthquakes in the ocean. It can only happen on coastlines, and Whitley County is not on or near an ocean coastline.

Volcano: This is a point on the earth's crusts where a buildup of melted rock, or magma, explodes into the atmosphere. It causes landslides, sends up vast quantities of debris, and also sends magma as lava down the sides of the mountain cone formed by previous eruptions. Whitley County does not have a volcano within its borders, nor is it close to one.

Avalanche: This is when snow slips down a mountainside, often in massive quantities. It is similar to a landslide, only it is snow causing the destruction. An avalanche can only occur where there are thick layers of snow. Whitley County does not receive sufficient snow to produce avalanches.

Hurricane: These are huge storms with maximum sustained winds of 74 mph or greater. They originate over open water in the ocean or large gulfs, and on occasion make landfall, bringing great harm to life and property. Whitley County is not on a coastline nor close enough to be affected by storms when they are still hurricanes. However, at times the remnants of a hurricane may reach Whitley County with enough remaining force to cause strong winds and thunderstorms.

HAZARD MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective action needs to be taken now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). Disasters can happen any time and any place. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage.

MITIGATION STRATEGY

Mitigation goals were derived through public participation in the planning process. Significant hazards and risks were evaluated during community meetings. Mitigation projects and strategies were created to alleviate the effects of flooding, severe storms, tornados, winter storms, and landslides. To mitigate widespread problems comprehensive solutions/goals were used from the previous regional hazard mitigation plan and updated. The following section details the goals and objectives to achieve widespread hazard mitigation.

Goal #1 *Enhance existing or design new policies that will reduce the potential effects of hazards without hindering other community goals.*

- Review budgets for mitigation projects and allot funds for such projects.
- Prevent future flood losses by stronger enforcement of NFIP ordinances.
- Designate someone other than Judge Executive/Mayor for the floodplain coordinator position.
- Regulate tree maintenance by ensuring proper trimming especially before winter storm season.

Objective(s):

1. Increase control over development in the floodplain to ensure lives and property are not at-risk due to future flood conditions and discourage growth in environmentally-sensitive areas.

Goal #2 *Protect Whitley County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*

- Implement projects to correct and prevent landslides.
- Projects for warning citizens during severe storms through ring down systems.
- Projects to mitigate flooding include creating/widening channels so waters have a more direct outlet into streams from cities and communities.
- Other flooding projects include acquisition/relocation of designated repetitive loss properties and other flood prone properties.

Objective(s):

2.1 Maximize the use of available hazard mitigation grant programs and other funding sources to protect Whitley County's most vulnerable populations and structures.

2.2 Decrease the number of FEMA-identified "repetitive loss properties."

Goal #3 *Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.*

- Provide education materials on landslides when citizens apply for building permits.
- Provide community education upon installation of siren systems and routinely afterwards.
- Provide information on the need for flood insurance and benefits of NFIP participation.

Objective(s):

3.1 Increase the level of knowledge and awareness for Whitley County residents on hazards that routinely threaten the area and educate property owners on the affordable, individual mitigation and preparedness measures.

3.2 Increase effectiveness of and participation in NFIP/CRS through enhanced floodplain management activities.

UPDATE ON PREVIOUS HAZARD MITIGATION PROJECTS

During the planning process community members revisited mitigation projects from the previous Regional Hazard Mitigation Plan. Updates on these projects are listed below.

Hazard Mitigation Projects - Update					
	Project Status				
Project Description	Completed	Cancelled	In Progress	Delayed	**Project Follow-up**
Purchase 2 generators for courthouse and ambulance base.				✓	
Build safe room at courthouse.				✓	
Build safe room at airport.				✓	
Property acquisition, demolition, and or relocation at Old Corbin Pike Rd.				✓	

Bridge replacement on Verne Rd.	✓				State built new bridge.
Generators for 19 shelter sites.				✓	
Soil Stabilization on Mountain Ash Tackett Creek Rd.	✓				Funding provided by HMGP.
Reverse 911 calling system for weather warnings.			✓		Currently using a ring down system.
Purchase generator for Whitley County Health Department's Williamsburg office.	✓				Built a new building.
Purchase generator for Whitley County Health Department's Corbin office.					
Build safe room at Whitley County Health Department's Williamsburg Office.	✓				Basement is used as safe room.
Build safe room at Whitley County Health Department's Corbin Office.				✓	
Provide severe weather education.			✓		Schools complete emergency drills.
Purchase generator for KY State Department Maintenance Garage & Engineer's Office.				✓	
Soil stabilization at KY92E.			✓		There has been some work completed on this project
Soil stabilization for state roads.					
Purchase generator for Williamsburg City Hall.				✓	
Purchase generator for Briar Creek pump station.				✓	
Purchase generator for Williamsburg Fire Department.				✓	
Purchase generator fire Corbin City Hall & Fire Department.	✓				City paid for generator.
Restore stream at Moore Branch, 5th Street, and Stamper Street.				✓	
Right-a-way acquisition on Stamper St. & Steele St.				✓	
Upgrade current siren system in the City of Williamsburg. Install 3 poles.					

PRIORITIZATION OF MITIGATION PROJECTS

After completing the risk assessment, community members created mitigation projects to better protect the people, structures, facilities, and systems from future hazards. Projects were prioritized based on the county and/or city's capabilities to implement and administer projects/strategies. The criteria used to prioritize each action:

1. The overall effect on risk to life and property.
2. The ease of implementation.
3. Whether the benefit outweighs the cost.
4. The potential for funding availability.
5. Cost effectiveness.

Each action was rated using a scale of 1 through 5, 1 being high and 5 being low. Mitigation projects and strategies were assigned to the appropriate agency that would be most knowledgeable and capable of implementing the actions. The projects were also given an implementation timeline. As funding becomes available, these mitigation projects will be pursued. However, this list is not a commitment by the county and/or city to pursue each project. Some projects may be cost prohibitive or not as desirable as initially though after further study. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

IMPLEMENTATION OF MITIGATION PROJECTS

This plan is a great resource for communities to use when pursing mitigation projects and strategies. It can be incorporated into existing ordinances, new ordinances, other plans, authorities, polices, and programs that address community planning and land use regulations. The following chart lists the mitigation projects, responsible party, timeline, possible funding sources, and ranking.

WHITLEY COUNTY HAZARD MITIGATION PROJECTS												
Project Description	**Natural Hazard Mitigated**	**Responsible Party**	**Project Type**				**Estimated Timetable**	**Implementation** 1 (High/Difficult) 5(Low/Easy)			**Funding Source**	**Ranking** 1 (High) 5(Low)
			Structural	Nonstructural	Regulatory	Educational	**Short Term** (0 – 2 years) **Long Term** (3 – 10 years) **Continuous**	Effect on Risk	Difficulty of Project	Cost/Benefit		
Acquisition of homes at the Old Corbin Pike Area in Williamsburg.	Flood	City of Williamsburg	X				Long Term	1	3	1	Grants	3
Complete an engineering study at Newman Campbell RD.	Flood	County		X			Long Term	3	1	5	Grants	5
Replace wooden bridge at Bethel off KY-904.	All Hazards	County	X				Long Term	3	5	1	Grants	5
Replace Perkins Street bridge at Woodbine.	All Hazards	County	X				Long Term	5	1	5	Grants	5
Replace CMP culverts with plastic as a standard practice.	Flood	City/County	X				Continuous	1	5	1	County/City & Grants	2
Replace the Foley Bend bridge. Emergency vehicles are unable to cross the bridge and access to the community is limited to only one road.	All Hazards	County	X				Long Term	1	5	1	Grants	1
Place shutoff valves on water tanks.	All Hazards	City/County	X				Long Term	1	5	1	County/City & Grants	1
Purchase bypass pump for raw water intake at the City of Williamsburg Water Plant.	All Hazards	City		X			Short Term	1	5	1	City & Grants	1
Upsize culverts as needed.	Flood	County/City	X				Continuous	1	5	1	Count/City & Grants	1
Place concrete headers as needed.	Flood	County/City	X				Continuous	1	5	1	County/City & Grants	1

Purchase portable generators for all 10 fire departments within the County.	All Hazards	County/City		X			Long Term	1	5	1	County/City & Grants	1
Purchase generator for Williamsburg City Hall.	All Hazards	City		X			Long Term	1	5	1	County/City & Grants	1
Purchase backup generator for 911 radio tower.	All Hazards	County		X			Long Term	1	5	1	County/City & Grants	1
Purchase generator for EMS building.	All Hazards	County		X			Long Term	1	5	1	County/City & Grants	1

XIII. PLAN MAINTENANCE

PLAN MONITORING: The Emergency Managers (EM) will oversee responsibility of the plan upon adoption. They will be responsible for coordinating with their Local Emergency Planning Committees (LEPC), Disaster and Emergency Services (DES), or other regularly scheduled committee meetings to monitor plan activities at the County and or City level. Periodically, the Emergency Manager will review the mitigation projects listed in The Cumberland Valley Multi-Jurisdictional, Multi-Hazard Mitigation plan to determine their progress to date.

PLAN EVALUATING: The Emergency Manager, LEPC and/or DES will evaluate the Cumberland Valley Multi-Jurisdictional, Multi-Hazard Mitigation Plan annually to coincide with FEMA's annual grant cycle. The Emergency Manager, LEPC and/or DES members will evaluate the relevance and effectiveness of the plan's goals and objectives. They will assess:

4. Whether the planned actions address current and expected conditions.
5. Whether the nature/magnitude of risks has changed.
6. Availability of current and expected resources for implementing the actions.

The EM, LEPC, and/or DES will make recommendations to CVADD for any necessary changes to the plan.

PLAN UPDATE: The Cumberland Valley Area Development District in collaboration with Emergency Managers and Local Emergency Planning Committees will review and revise the plan at least once every 5 years to show progress in local mitigation efforts as well as changes in development and priorities. The plan update will be in conjunction with FEMA's Hazard Mitigation Grant Program.

PLAN IMPLEMENTATION: A hard copy of the plan has been distributed to each County EM. A hard copy of the plan is also available at the CVADD office. A digital copy of the plan is available online at the CVADD's website. Upon completion/approval, the updated plan should be more widely adopted into the emergency planning efforts of the CVADD region.

CVADD's CONTINUED INVOLVEMENT: CVADD will offer their facilities for meetings and assistance with the plan. Cumberland Valley ADD staff will be available to the County Emergency Managers and local committees on an as needed basis. CVADD staff will be proactive in soliciting funding for administrative activities as well as funding for mitigation actions as outlined in the plan.

ADOPTION BY LOCAL GOVERNING BODIES

After review of the plan, each jurisdiction within the District was notified that it must adopt or not adopt the Regional Hazard Mitigation Plan Update. By adopting the plan, that jurisdiction agreed with the findings and agreed to implement mitigation projects when funds became available. All jurisdictions were advised that they would not receive mitigation funding during future disaster events if they failed to adopt the Plan.

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ATTACHMENT 1: Planning Process and Participants

CVADD Staff Participation

The planning meetings and initial draft of the new Hazard Mitigation Plan document were completed by Kelsey Adams, Public Administration Specialist at CVADD. Ms. Adams left to work with a different agency in 2018. Primary responsibility for the Plan was given to Susanna Cornett, an Economic Development Specialist who began with CVADD in March 2019. Other staff members who assisted with the development and completion of the plan include Caitlin Mason, Public Administration Specialist; Jessica Blankenship, Transportation Planner; Jason Hawkins, GIS Specialist; Dan Mullins, Water Planner; Katelyn Baker, at the time a Public Administration Specialist; and Whitney Chesnut, Executive Director.

Multi-jurisdictional planning participation

To begin the hazard mitigation plan update, a regional kick off meeting was held at the Cumberland Valley Area Development District's office in London, KY, on August 3, 2017, at 10:00 a.m. A notification of this meeting was posted on the CVADD's website and Facebook page. An email containing information about the regional meeting was also sent out to county and city officials. Individual phone calls were made, as well, to the Judge Executives and Mayors within the Cumberland Valley region detailing information about the meeting. This meeting was open to the public. There were 18 members from the CVADD region in attendance for the regional kick off meeting.

Attendance at the opening meeting of the regional Hazard Mitigation Planning Group:

1. Andrea Sea	Emergency Management Department – Laurel Co. EMA
2. Albert Hale	Emergency Management Director – Laurel Co. EMA
3. Ben Barnett	Emergency Management Director – Bell Co. EMA
4. David McGill	Emergency Management Director Harlan County – Harlan Co. EMA
5. Doug Bishop	Judge Executive - Rockcastle County
6. Greg Hayes	Emergency Management Director – Jackson Co.
7. Jamie Strong	Emergency Management Director – Jackson Co.
8. Kelly Sutton	Administration Assistant – Laurel County
9. David Westerfield	Judge Executive - Laurel County
10. Marlon Sams	City Manager – Whitley County
11. Mike Mahan	Building Inspector – Whitley County
12. Gail Timperio	Healthcare Preparedness Coordinator, Region 12 and 13 –Kentucky Department of Public Health
13. David Watson	Emergency Management Director – Clay County
14. Rick Cochrane	Public Safety Director – City of London
15. Johnny Johnson	Judge Executive – Clay County
16. Whitney Chesnut	Executive Director – Cumberland Valley Area Development District
17. Rebecca Patton	Regional Preparedness Coordinator – Region 13
18. Ann Harris	GIS Assistant - CVADD

Summary: Kelsey Adams, CVADD Public Administration Specialist, discussed the importance of hazard mitigation and described the process of updating the 2012 Hazard Mitigation Plan. She also

discussed the importance of recruiting community members to attend the hazard mitigation meetings. Nick Grinstead, HMA Planning Manager from the University of Kentucky, informed the regional committee about FEMA grants requirements.

Another email was sent out on August 9, 2017, encouraging county and city officials to begin planning and preparing for the county specific hazard mitigation meetings. During the planning process of the hazard mitigation plan each county held three separate community meetings.

From June 2019 through June 2020, CVADD Economic Development Specialist Susanna Cornett updated elements of the HMP.

Bell County Planning Process

The first meeting of the Bell County Local Emergency Planning Committee (LEPC) and Hazard Mitigation meeting was scheduled October 4, 2017 at 10:00 a.m. at the Old Pineville Courthouse. Emergency Manager Ben Barnett recruited some community members to attend, and invitation letters were mailed out inviting other community members.

Attendance: The following is a list of those who attended the meeting.

1. Emergency Management Director – Bell County
2. Healthcare Preparedness Coordinator-Kentucky Department of Public Health – Region 12 & 13
3. Lonnie Saylor — Region 13 Health Care Preparedness Coordinator – Bell Co. Health Dept.
4. Rebecca Patton — Regional Preparedness Coordinator – Region 13
5. Jason Bapp — Chief Nursing Officer – Pineville Community Hospital
6. Eric Fuson — Director of Facilities – Pineville Community Hospital
7. Joy Williams — Middlesboro High School Crisis Management
8. Chris Wassen — DPP Bell County Schools – Board of Education
9. Jerry Rains — Area 9 Manager – Kentucky Emergency Management
10. Steven Barton — Bell County Rescue Squad
11. Richard Evans — Lt. Middlesboro Fire/EMS
12. Troy Perry — Lt. Middlesboro Fire/EMS
13. Robert England — Chief Lt. Middlesboro Fire Department
14. Melissa Robbins — Middlesboro Nursing & Rehab
15. Josh Peters — Emergency Medical Services – Bell County
16. Jessica Smith
17. James Miracle — Chief – Pineville Fire Department
18. Kyle Dunn — Assistant Chief of Police, Pineville
19. Keith Baker — Kentucky State Police
20. Janice Lemaster — Middlesboro ARH Hospital EP
21. Dorothy Anglin — EDV & Safety Coordinator - Smithfield Foods

Summary: Ben Barnett explained the LEPC meetings as well as the new EMA website and upcoming trainings. Afterwards, Kelsey Adams, CVADD Public Administration Specialist, discussed the hazard mitigation plan and why it is important to Bell County. Kelsey reviewed past mitigation projects from

the 2012 plan and updated their progress. Afterwards, the group discussed various weather events that impacted the county. They also reviewed the county's Threat and Hazard Identification and Risk Assessment (THIRA) plan in three areas: 1. Flood, 2. Tornados, 3. Winter Storm. It was decided to use the THIRA hazard ranking and to add wildfire to the list. The group reviewed critical infrastructure for the county and discussed new mitigation projects. The next meeting was scheduled for November 6, 2017 at 10:00 am. The meeting was adjourned.

The second hazard mitigation meeting was held November 6, 2017, at 10:00 a.m. at the Old Pineville Courthouse.
Attendance: There were 22 community members in attendance.

1. Emergency Management Director – Bell County
2. Jerry Rains — Area 9 Manager – Kentucky Emergency Management
3. Teresa Cox-Mink — Program Director – Air Evac Lifeteam
4. Janice Lemaster — Emergency Manager – Middlesboro ARH Hospital
5. Michelle Barnett — EM – Middlesboro ARH Hospital
6. Eric Fuson — EM – PCH
7. Lonnie Saylor — Region 13 Health Care Coalition Coordinator – Bell Co. Health Dept.
8. Dorothy Anglin — EMS/PSM Coordinator – Smithfield
9. Chris Wassen — DPP – Bell County Schools
10. Charles Matthews — Chief of Police – Pineville PD
11. Rob Cinks — Special Projects Admin. – Bell Fiscal Court
12. Linda Wyatt — Supervisor
13. Mitch Williams — Sheriff
14. Doug Jordan — Sgt. BCSD
15. Gail Timperio — Healthcare Preparedness Coordinator, Region 12 and 13 –Kentucky Department of Public Health
16. Josh Peters — Bell Co. EMS
17. Steven Barton — Bell Co. Rescue Squad
18. Robert England — Middlesboro Fire Department
19. Troy Perry — Middlesboro Fire Department
20. Richard Evans — Middlesboro Fire Department
21. Jessica Smith — Bell Co. Emergency Management
22. Melissa Robbins — Administrator – Middlesboro Nursing & Rehab Facility

Summary: During this meeting the ranking of natural hazards from the previous meeting were reviewed. After a brief discussion, it was decided to change the rankings and to add drought to the list. The group revised the goals and objectives from the 2012 plan for the new hazard mitigation plan. They discussed critical infrastructure and vulnerabilities within the county and brainstormed new mitigation projects and strategies to be incorporated into the plan. After a great discussion the meeting was adjourned.

The last community hazard mitigation meeting for Bell County was held May 30, 2018 at 10:00 a.m. at the Bell County Courthouse.

Attendance: There were 7 community members in attendance.

1.	Ben Barnett	Emergency Management Director – Bell County
2.	Teresa Cox-Mink	Senior Program Director – Air Evac
3.	Melissa Ramsey	Middlesboro ARH Hospital
4.	Dawn Gibson	Social Services Director – Middlesboro Nursing Home
5.	Charles Matthews	Chief – Pineville Police Department
6.	Charles Miler	Assistant Supervisor – 911 Dispatch
7.	Rob Lincks	Special Projects – Bell County Fiscal Court

Summary: During this meeting mitigation projects were reviewed, probability of future events discussed, community capabilities updated, and plan maintenance revised. After a great discussion the meeting was adjourned.

Clay County Planning Process

The first meeting for Clay County was held September 21, 2017, at 1:00 pm at the EKU Manchester Campus. This meeting was held in conjunction with the Clay County LEPC/Disaster & Emergency Services (DES) meeting. David Watson recruited community members to attend.

Attendance: Following is a list of those who participated with the meeting.

1.	Sheila Asher	Office Manager – Manchester Memorial Hospital
2.	April Hubbard	Clinic Ops. Director – Manchester Memorial Hospital
3.	Garry Ball	EM Safety Manger – Manchester Memorial Hospital
4.	Jerry Rains	Area 9 Manager – Kentucky Emergency Management
5.	Amanda Shotton	Disaster Program Manager – American Red Cross
6.	Hilroy Williams	Prepare Programs – American Red Cross
7.	Brian Claypool	EM/Public Safety – Kentucky Utilities
8.	Michelle Hoskins	Administrator – Memorial Home Health
9.	Jeffrey Culver	Security Supervisor - Manchester Memorial Hospital
10.	Terry Gray	Director East Region – Eastern Kentucky University
11.	James Bowling	Environmental Police Officer Lieutenant – Federal Correctional Institution Manchester
12.	Tracy Nolan	Community Outreach Director – Red Bird Mission
13.	Roy Rice	Chief – Fogertown Fire/Rescue
14.	James Garrison	Mayor – City of Manchester
15.	Tina Cloud	Emergency Room Manager – Manchester Memorial Hospital
16.	Patrick Robinson	Assistant Chief – Manchester Police
17.	Randy Craft	Manchester Memorial Hospital Community Outreach - Manchester Memorial
18.	David Watson	Emergency Management Director – Clay Co.

Summary: Kelsey Adams, CVADD Public Administration Specialist, spoke briefly about what the Hazard Mitigation Plan is and how everyone can be a part of the development of the plan. Critical

infrastructure and past mitigation projects were reviewed. Clay County's vulnerabilities and new mitigation strategies were discussed.

On February 7, 2018 **a second hazard mitigation meeting** was held. This meeting coincided with the Clay County LEPC meeting.

Attendance: There were eight community members in attendance.

1. Claude May	Assistant Director- Chad's Hope
2. Letch Day	Paramedic – Air Evac
3. Danny Jackson	Nurse – Air Evac
4. Brian Jackson	Assistant Director – Clay Co. Emergency Management
5. Jeff Culver	Security Supervisor – Manchester Memorial Hospital
6. Michelle Hoskins	Administrator – Memorial Home Health
7. Tracy Nolan	Community Outreach Director – Red Bird Mission
8. Terry Gray	Director East Region – Eastern Kentucky University

Summary: During this meeting, natural hazards impacting Clay County were reviewed and ranked. Community members discussed vulnerabilities within the county and created mitigation strategies/projects to resolve issues that were mentioned. The group also reviewed and updated goals & objectives from previous plan. The meeting was then adjourned.

Harlan County Planning Process

Public officials in each jurisdiction of Harlan County were notified of each meeting, were provided with information on the planning process, and were asked for their input. Several did not participate but were kept informed and invited to do so. These officials included Mayor Eddie Manning of the City of Evarts (606-837-2477; cityofevarts@windstream.net); Rodrick Major, Mayor of Loyall (606-573-6396; Major.mayor2019@gmail.com); and John Adams, Mayor of Lynch (606-848-2873; lynchcityhall@gmail.com).

The first meeting for Harlan County was scheduled September 5, 2017, at 1:00 pm at the Harlan County Old Courthouse. David McGill, EMA Director for Harlan County, recruited community members to attend the meeting. In total, 13 people attended the hazard mitigation meeting.

Attendance: The following is a list of attendees.

1. Robert Perkins	Kentucky Transportation Cabinet
2. Kessley Baker	Firewise Coordinator – Kentucky Division of Forestry
3. Rhonda Pacholewski	Deputy Director – Harlan EMA
4. Otis Lewis	Supt. Harlan Waterworks – HMWW
5. Edward Bush	Chief - Cumberland Fire Department
6. Ryan Creech	Treasurer – Harlan County Fiscal Court
7. Derek Middleton	Distribution Boss – Cawood Water District
8. James Billings	Assistant Fire Chief - Harlan City Fire
9. Jim Middleton	Assistant Superintendent – Harlan County Schools

10. Chad Brock	County Road Foreman – Harlan County
11. David McGill	Emergency Management Director – Harlan County
12. Colby Goss	Deputy Judge Executive – Harlan County Fiscal Court
13. David Robinson	Park Ranger – US Army Corps of Engineers

Summary: During this meeting, which was led by Kelsey Adams and David McGill, hazards impacting Harlan County were discussed. Adams reviewed the mitigation projects in the last plan and encouraged planning ahead to develop new mitigation projects/strategies. Problem areas within Harlan County were reviewed and discussed as well. The meeting was adjourned with the next meeting scheduled for September 26th at 1:00 pm.

Harlan County's second community meeting took place September 26, 2017, at 1:00 pm at the Harlan County Old Courthouse.

Attendance: The following is a list of those who participated with the meeting.

1. Michael Cox	Transportation Director – Harlan County Schools
2. Doyle Baker Jr.	Public Works – City of Harlan
3. Mack Miniard	Public Works – City of Harlan
4. Linette Hutchinson	Fire Chief – City of Harlan
5. David McGill	Emergency Management Director – Harlan County
6. James Billings	Harlan Fire Asst. Fire – City of Harlan
7. Matthew Lane	Harlan Fire Department
8. Rhonda Racholewski	Deputy Director – Harlan County EMA
9. Ryan Creech	Treasurer – Harlan County Fiscal Court
10. Matthew Goss	Deputy CJE Harlan Co. – Harlan County Fiscal Court
11. Kessley Baker	Firewise Coordinator – Kentucky Division of Forestry

Summary: During this meeting natural hazards that impact Harlan County were discussed and ranked. Critical facilities within the County were reviewed and updated. New mitigation projects/strategies were created and added to the plan. Community capabilities were updated. After a great discussion the meeting was adjourned.

Harlan County's third community meeting occurred August 12, 2018, at 1:30 p.m. at the Harlan County Courthouse.

Attendance: There were eight community members in attendance.

1. David McGill	Emergency Management Director – Harlan County
2. Linette Hutchison	Fire Chief – Harlan Fire Department
3. Mike Cox	Transportation Director – Harlan County Schools
4. Rhonda Pacholewski	Deputy Emergency Management Director – Harlan County
5. Ryan Creech	Treasurer – Harlan County Fiscal Court
6. Spencer Bailey	Safety Officer – Wallins Volunteer Fire Department
7. Chad Brock	Road Foreman – Harlan County Fiscal Court
8. Matthew Goss	Deputy Judge Executive – Harlan County Fiscal Court

Summary: During this meeting mitigation projects were discussed and ranked. New projects were added to the list and ranked. The probability of future events was reviewed and added to the plan. A rough draft of the plan was reviewed, and changes were made. The meeting was adjourned.

Jackson County Planning Process

The first meeting for Jackson County was held September 22, 2017, at 10:00 a.m. at the EOC building. Jamie Strong, EMA/CSEPP, recruited community members to the hazard mitigation meeting. Kelsey Adams, CVADD Public Administration Specialist, discussed the hazard mitigation plan.

Attendance: The following is a list of attendees.

1. James Welch	Fire Chief – McKee Fire Department
2. Jody Britton	IT Director – Jackson County
3. Shane Rose	Dispatcher – Daniel Boone Transit
4. Tim Farmer	Jackson County Water Association
5. Oscar McQueen	Training Coordinator – Jackson Co. EMS
6. Jamie Strong	Jackson County EMA/CSEPP
7. Kenneth Wilder	Phoenix Products Manager – Phoenix Products
8. Greg Hayes	Jackson Co. EMA
9. Larry Bowling	Dispatcher
10. Kathy Spurlock	Director, Transportation
11. Richard Lakes	Driver Trainer
12. Lonnie Madden	Sandgap Fire Chief
13. Robbie Belt	Road Supervisor

Summary: During the meeting previous mitigation projects were reviewed and updated. Problem areas within the county were discussed and mitigation projects/strategies were developed to resolve issues. The meeting was adjourned.

The second county meeting was held October 13, 2017, at 10:00 a.m. at the Jackson County Emergency Operation Center. There were eight community members in attendance.

Attendance: Following is a list of attendees.

1. Kenneth Wilder	Project Manager – Phoenix Products Inc.
2. Robbie Belt	Road Supervisor – Jackson Co. Road Dept.
3. Oscar McQueen	Training Coordinator – Jackson Co. EMS
4. Cleon Bingham	Fire Chief - Gray Hawk Fire Depart.
5. Tim Cornett	Jackson Energy
6. Jamie Strong	Deputy Director – Jackson County Emergency Management
7. Lonnie Madden	Fire Chief - Sand Gap Fire Dept.
8. Larry Bowling	Fire/Rescue Chief – Pond Creek Fire & Rescue

Summary: During this meeting natural hazards impacting the County were discussed and ranked. Man-made events were also discussed and ranked. Past and new mitigation projects were discussed. Goals and objectives were reviewed with no changes made. The meeting was adjourned.

The third and final hazard mitigation meeting for Jackson County occurred on June 13, 2018, at 10:00 a.m. at the EOC building. To notify people of the upcoming meeting the emergency manager sent out an email blast. The meeting notification was also placed on CVADD's Facebook and website.

Attendance: There were 12 community members in attendance.

1. Craig Bowles	911/EMS Director – Jackson County 911
2. Jody Britton	911/IT Director – Jackson County 911
3. Oscar McQueen	EMS Training Coordinator
4. Jamie Strong	Deputy EM Director – Jackson Co. EMA
5. James Welch	Chief – McKee Fire & Rescue
6. Zachary Bryant	Deputy Sheriff – Jackson County Sheriff Department
7. Brody Keck	911/Gray Hawk Fire Department
8. Shane Gabbard	Judge Executive – Jackson County Fiscal Court
9. Robbie Belt	Road Supervisor – Jackson County Road Department
10. Kathy Spurlock	Director of Transportation – Jackson County BOE
11. Richard Lakes	School Bus Driver Trainer – Jackson County BOE
12. John Tompkins	Mayor – City of McKee

Summary: During this meeting mitigation projects were reviewed and ranked. The probability of future events as well as community capabilities were updated. Plan maintenance was also reviewed and updated. There was a lot of great discussion on hazard mitigation during this meeting and after two hours of discussion the meeting was adjourned.

Knox County Planning Process

Knox County held their first hazard mitigation meeting November 29, 2017, at 10:00 am at the Knox County Courthouse. Kelsey Adams, CVADD Public Administration Specialist, lead the meeting. There were 17 community members in attendance.

Attendance: The following is a list of attendees.

1. Mike Mitchell	Emergency Management Director
2. Donnie Johnson	Maintenance Director – Christian Care Communities
3. Kim Merida	Facilities Coordinator – Knox County Schools
4. Rich Prewitt	Director Member Services – Cumberland Valley Electric
5. Doug Dozier	Fire Chief – Barbourville Fire Department
6. Brian Carey	Principal – Barbourville Ind. Schools
7. Claudia Greenwood	Knox County Chamber Director
8. Brenda Graham	Barbourville ARH CCNO – Barbourville ARH Hospital
9. Gail Timperio	Healthcare Preparedness Coordinator, Region 12 and 13 –Kentucky Department of Public Health

10. Gerald Baker	KCEMS Asst. Director – Knox County EMS
11. J.M. Hall	Judge Executive
12. Bill Oxendine	PVA – Knox County
13. Steve Warren	Deputy Judge Executive
14. John Tye	Knox County Treasurer – Knox County Fiscal Court
15. Jack Ketcham	Knox County Asst. Treasurer – Knox County Fiscal Court
16. Brendia Moses	Resource Director – KCEOC CAP
17. Jerry Rains	Area 9 Manager – Kentucky Emergency Management

Summary: Several items were discussed during the meeting such as the natural hazards impacting the County. Various weather events were discussed and ranked. Mitigation projects from the 2012 hazard mitigation plan were reviewed and updated. Problem areas within the County were discussed and new mitigation projects/strategies were created. The 2012 critical infrastructure list was reviewed and updated as well. The meeting was then adjourned.

The second hazard mitigation meeting was held February 23, 2018, at 10:00 am at the Knox County Courthouse. There were 10 community members in attendance.

Attendance: The following is a list of attendees.

1. Mike Mitchell	Solid Waste Coordinator
2. Marlon Sams	City Manager – Corbin
3. Mike Mahen	Building Inspector – Corbin
4. Bill Oxedine	PVA – Knox County
5. Doug Dozier	Fire Chief – Barbourville Fire Department
6. Gail Timperio	Healthcare Preparedness Coordinator, Region 12 and 13 –Kentucky Department of Public Health
7. Rich Prewitt	Member Services – Cumberland Valley Electric
8. Brenda Moses	PR Director – KCEOC CAP
9. Claudia Greenwood	Ex. Director – Knox Co. Chamber
10. Todd Owens	Knox Emergency Manager

Summary: Mitigation projects were a focus point during this meeting. Kelsey Adams from CVADD reviewed and updated the mitigation projects from the previous meeting. Afterwards, community members discussed new projects such as addressing the flooding issues at Master Street in Corbin and Warren Loop in Barbourville. After a great discussion on new mitigation strategies, the community members reviewed and updated the goals and objectives for the new mitigation plan. The meeting was adjourned.

The last meeting for Knox County was held on June 21, 2018, at 2:00 p.m. at the Knox County Courthouse. Notification was placed on CVADD's website and Facebook. The Emergency Manager sent out text messages to community members as well.

Attendance: There were five community members in attendance.

1. Todd Owens	Knox County Emergency Manager

2. Mike Mitchell — Solid Waste Coordinator
3. Doug Dozier — Chief – City of Barbourville Fire Department
4. Paula Niccum — Preparedness Coordinator – Knox Co. Health Department
5. Mike Mahan — Building Inspector – City of Corbin

Summary: During this meeting the mitigation projects were discussed and ranked. Community capabilities were reviewed, and the probability of future events were updated. The Knox County portion of the hazard mitigation plan was reviewed and after a great discussion the meeting was adjourned.

Laurel County Planning Process

Public officials in each jurisdiction of Laurel County were notified of each meeting, were provided with information on the planning process, and were asked for their input. At least one jurisdiction did not have officials participate but were kept informed and invited to do so. The local official notified of the meetings and asked to respond was Livingston Mayor Jason Medley, who has since left office. The current mayor and contact is Dwane King (606-453-2061; cityoflivingston@windstream.net). The Laurel County EMA director Albert Hale was in attendance and familiar with the issues Livingston faces.

Laurel County held their first hazard mitigation meeting November 7, 2017, at 9:00 am at the EOC building in London, KY. Kelsey Adams, CVADD Public Administration Specialist, lead the meeting.

Attendance: There were eight community members in attendance for the meeting.

1. Andrea Sea — Office Coordinator – Laurel County EMA/CSEPP
2. Rebecca Patton — Regional Preparedness Coordinator – Region 13
3. Kelly Sutton — Exec. Adm. Assistant – Laurel County Fiscal Court
4. Albert Hale — EM Director – Laurel County EMA/CSEPP
5. Rick Cochrane — Public Safety Director – City of London
6. Jerry Rains — Area 9 Manager – Kentucky Emergency Management
7. Shaun Cowden — Radio/Weather – Laurel
8. David Westerfield — Judge Executive – Laurel County Fiscal Court

Summary: During the meeting the hazard mitigation goals and objectives from the 2012 plan were reviewed and updated. Various natural hazards impacting Laurel County were discussed and ranked. The critical facilities within Laurel County were reviewed and updated. The group reviewed the mitigation projects from the previous mitigation plan and updated project statuses. Vulnerabilities within the county were discussed, and new mitigation projects were created. Afterwards the meeting was adjourned.

The second Laurel County hazard mitigation meeting was held on January 30, 2018, at 9:00 a.m. at the Laurel County EOC building.

Attendance: There were seven community members in attendance.

1. Denver Mays — EH&S Manager – Hearthside

2.	Rebecca Patton	Regional Preparedness Coordinator – Region 13
3.	Andrea B. Sea	Deputy EMA
4.	Shawn Cowden	Radio/Weather
5.	Albert Hale	EM Director
6.	Roy Pearce, Jr.	Incident Management Coordinator – KYTC
7.	Rick Cochrane	Public Safety Director – London

Summary: During this meeting the natural hazards impacting Laurel County were reviewed and revised. The updated critical facilities list was reviewed as well. Community members discussed the need for warning sirens in areas with little to no cell phone service such as Levi Jackson, KOA, Bee Rock, Cranks Creek, and Holly Bay. Currently there is only one siren in the county. Laurel County Emergency Management uses Alert Sense to notify residents of weather hazards. Several of the community members in attendance were concerned for man-made threats such as hazardous chemicals being used in factories around the county as well as being transported up and down the interstate by trucks. New mitigations projects were discussed, and the meeting was adjourned.

The last community hazard mitigation meeting for Laurel County was held on May 15, 2018, at 10:00 a.m. at the EOC building. There were 10 community members in attendance.

1.	Matthew Singer	Airport Manager – London-Corbin Airport
2.	Rebecca Patton	Regional Preparedness Coordinator – Region 13
3.	Andrea Sea	Deputy EM/Office Coordinator
4.	Darrel Kilburn	London Police Department
5.	Brian Claypool	Public Safety – L.G&E/KU
6.	Rick Cochrane	Public Safety Director
7.	Brad Smith	CSEPP/EMA Director
8.	Michael Mitchum	Walmart Distribution Center
9.	Jerry Rains	Area 9 Manager – Kentucky Emergency Management
10.	Larry Sawyer	Campground Fire Department

Summary: During this meeting mitigation projects were reviewed, probability of future events discussed, community capabilities updated, and plan maintenance revised. After a great discussion the meeting was adjourned.

Rockcastle County Planning Process

Public officials in each jurisdiction of Rockcastle County were notified of each meeting, were provided with information on the planning process, and were asked for their input. Some did not participate but were kept informed and invited to do so. These officials included Jason Medley, Mayor of Livingston (606-453-2061; cityoflivingston@windstream.net). A new mayor, Dwane King, succeeded Mayor Medley in 2020. The same telephone number and email address are valid for Mayor King as well.

The first meeting for Rockcastle County was scheduled August 22, 2017, at 2:00 p.m. at the Rockcastle County Courthouse. The notification for the meeting was placed on CVADD's website, Facebook, and individual phone calls were made to the cities' mayors. Word of mouth also played a

large part in informing community members of the event. There were nine people in attendance from the county.

1.	Tony Bullock	Fire Chief – Pongo Volunteer Fire Department
2.	Bryan Bussell	EMA Brodhead
3.	Howell Holbrook	CSEPP
4.	Walter Cash	Brodhead Mayor
5.	Andrew Pensol	EMS
6.	David Colson	EMA
7.	William Sheene	Plant Ops Director
8.	Alicia Bullock	Administrator – Rockcastle Health & Rehabilitation Center
9.	John Dyehouse	Fire Chief – Brodhead Volunteer Fire Department

Summary: During this meeting, which was led by Kelsey Adams, the CVADD PAS, the importance of hazard mitigation was discussed along with how the community will develop their county's hazard mitigation plan. The goals and objectives from the 2012 plan were reviewed and edited. The critical infrastructure list and map from the 2012 plan were also reviewed and edited. Hazards were to be ranked during this meeting, however, it was brought up that a THIRA plan has already been developed. Rockcastle will use their THIRA plan for ranking hazards that impact Rockcastle County. The 2012 mitigation project was reviewed. Several of these projects have not been completed. New mitigation project ideas were briefly discussed. The next community meeting was scheduled for September 11, 2017.

The second hazard mitigation meeting was held September 11, 2017, at the Rockcastle County Courthouse.

Attendance: In attendance was

1.	Bryan Bussell	Brodhead EMA
2.	Doug Bishop	Judge Executive
3.	Hal Holbrook	CSEPP
4.	Andrew Pensol	EMS
5.	Frank Baker	Superintendent, City of Mt. Vernon

Summary: During this meeting, the critical facilities were reviewed and discussed. Previous mitigation projects from the last plan were reviewed and updated. Natural hazards impacting Rockcastle were ranked and Rockcastle's THIRA plan was reviewed. Mitigation strategies were created.

The last hazard mitigation meeting for Rockcastle County was held on June 15, 2018, at 10:00 a.m. at the Rockcastle County Courthouse. The meeting announcement was placed on CVADD's Facebook and an email blast was sent out. There were five community members in attendance.

1.	David Colson	Rockcastle Emergency Manager
2.	Don Franklin	KYEM
3.	Bryan Bussell	Brodhead EMA
4.	Johnny Benge	Western Rockcastle VFD

5. Alicia Bullock — Administrator – Rockcastle Health & Rehabilitation Center

Summary: During this meeting community capabilities and probability of future events were reviewed and updated. Mitigation projects from previous meetings were reviewed and ranked. The meeting was adjourned.

Whitley County Planning Process

Whitley County had their first hazard mitigation meeting January 10, 2018. at 1:00 p.m. at the Whitley County Emergency Management Office in Williamsburg. CVADD PAS Kelsey Adams lead the meeting. There were 4 community members in attendance.

Attendance: The following is a list of attendees.

1. Danny Moses — Emergency Management Director – Whitley County
2. Jason Wilson — E911 Director – Whitley County
3. Felicia Fore — 911 Supervisor – Whitley County
4. Amber Owens — Project Director – Whitley County

Summary: During this meeting several important items were reviewed and discussed. Everyone in attendance reviewed the critical facilities within Whitley County and ranked the natural hazards impacting the County. They reviewed previous hazard mitigation goals and made updates to them. The 2012 hazard mitigation projects were reviewed and planning began for the new hazard mitigation projects. After a great discussion the meeting was adjourned with plans to schedule another meeting in the future.

The last hazard mitigation meeting for Whitley County took place on July 19, 2018, at 10:00 a.m. The Emergency Management Director sent notification regarding the meeting to community members.

Attendance: There were 7 attendees.

1. Jason Wilson — 911 Director – Whitley County
2. Jerry Rains — Area 9 Manager – Kentucky Emergency Management
3. Amber Owens — Project Director – Whitley County
4. Paul Lawson — Whitley County Health Department
5. Danny Moses — EM Director – Whitley County
6. Roddy Harrison — City of Williamsburg Mayor
7. Larry Todd — Fire Chief – City of Williamsburg

Summary: During this meeting the probability of future events were discussed, and community capabilities updated. Problem areas within the county were examined and mitigation projects were created to resolve these issues. The mitigation projects were then ranked. After a very productive discussion the meeting was adjourned.

Regional Plan Completion Meeting

After receiving FEMA approval, a regional hazard mitigation meeting will be held at the Cumberland Valley Area Development District to review the finished plan.

ATTACHMENT 2: Existing Materials/Reports Consulted

EXISTING PLANS

CVADD Comprehensive Economic Development Strategy (CEDS)

This is a regional plan with analysis of economic and community development strengths and weaknesses. This plan builds upon past and current initiatives of the District, as well as other planning processes, and is intended to impact program policy and administration as it is formed and implemented. This planning document serves as a tool to assist all federal, state, and local financial and policy decisions being focused on the local grassroots level.
http://www.cvadd.org/comprehensive-economic-development-strategy.html

CVADD Water Management Plan

This is a regional plan that covers water usage for the region's water utility companies. Implemented through Kentucky Infrastructure Authority (KIA) and utilizing the Water Resource Information System (WRIS), the plan lists locations of water treatment plants, water tanks, water sources and water supplies in drought conditions.
https://kia.ky.gov/WRIS/Pages/Management-Plans.aspx

Emergency Operation Plans (EOP)

Each of the eight counites in the Cumberland Valley region has an EOP to utilize in the event of an emergency. This plan is located at the Judge Executive's office in each county. The plan summarizes various hazards and includes the direction, control and operation of the emergency management personnel in case of a disaster. The county's EOP complement the regional mitigation plan; however, they do not cover the same material.

ATTACHMENT 3: Multi-Jurisdictional Plan Adoption

Jurisdictional Resolutions

MULTI-JURISDICTIONAL PLAN ADOPTION

The following chart will summarize the decision of each jurisdiction to formally adopt/not adopt this plan as the jurisdiction's official hazard mitigation plan. This chart will be completed on adoption and sent to each jurisdiction as a replacement attachment.

Location	Jurisdiction	Adoption	Date Adopted
Bell	County		
Middlesboro	City		
Pineville	City		
Clay	County		
Manchester	City		
Harlan	County		
Benham	City		
Cumberland	City		
Evarts	City		
Harlan	City		
Loyall	City		
Lynch	City		
Jackson	County		
McKee	City		
Knox	County		
Barbourville	City		
Corbin*	City		
Laurel	County		
London	City		
Rockcastle	County		
Brodhead	City		
Livingston	City		
Mt. Vernon	City		
Whitley	County		
Williamsburg	City		
*Corbin is in both Knox and Whitley Counties			

Resolutions for the adoption of the Regional Hazard Mitigation Plan Update will appear on the following pages following adoption. The resolution adopted by CVADD appears first, followed by those of the eight county fiscal courts and the seventeen cities.

ATTACHMENT 4: CVADD Board

2021 Board of Directors

Executive Board:

Harlan Judge Executive Dan Mosley, Chairman
Jackson Judge Executive Shane Gabbard, Vice-Chairman
Ms. Maureen "Cookie" Henson, 2nd Vice-Chairman (Clay County citizen)
Pineville Mayor Scott Madon, Secretary
Mr. John Ed Pennington, Treasurer (Clay County citizen)

Board:

All judge executives and mayors in the eight-county CVADD are members of the Board, from whom the Executive Board is selected on an annual basis.