

4.0 NATURAL HAZARDS

FEMA defines a hazard as an act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing. All natural disasters pose hazards to property damage and loss of human life, and have the ability to limit access to electrical power, telecommunication services, potable water, wastewater collection/treatment and transportation. Downed trees and tree limbs may also limit emergency access and hinder cleanup efforts.

The Lake Cumberland Area Development (LCADD) Region must take steps to protect its infrastructure from natural disasters as much as possible, such that essential utilities and services continue when needed most.

Hazards associated with natural disasters typically encountered (e.g. flood events, ice storms, winter storms) in Lake Cumberland Region include high winds, heavy rains and regionalized flooding. Natural disasters occurring less frequently (e.g. tornadoes, earthquakes, and forest fires) may pose other hazards, presenting unique challenges to residents and community officials, as hazards may not have been encountered before in recent memory.

Table 4.0(1) and **Table 4.1(2)** depict major disaster declarations and emergency declarations, respectively, for the Lake Cumberland Region.

Table 4.0(1) – Major Disaster Declarations for the Lake Cumberland Region

Incident Description & Disaster Number	Date	LCADD Counties Included
<u>Kentucky Severe Storms, Tornadoes, Straight-line Winds, Flooding, Landslides, and Mudslides (DR-4239)</u>	Incident period: July 11, 2015 to July 20, 2015	Major Disaster Declaration declared on August 12, 2015, Cumberland – Public Assistance
<u>Kentucky Severe Winter Storm, Snowstorm, Flooding, Landslides, and Mudslides (DR-4218)</u>	Incident period: March 3, 2015 to March 9, 2015	Major Disaster Declaration declared on May 12, 2015, Casey – Public Assistance
<u>Kentucky Severe Winter Storms, Snowstorms, Flooding, Landslides, and Mudslides (DR-4216)</u>	Incident period: February 15, 2015 to February 22, 2015	Major Disaster Declaration declared on April 30, 2015, Adair, Taylor, Wayne – Public Assistance
<u>Kentucky Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4057)</u>	Incident period: February 29, 2012 to March 3, 2012	Major Disaster Declaration declared on March 6, 2012, Adair, Public Assistance; Russell, Individual Assistance

Incident Description & Disaster Number	Date	LCADD Counties Included
<u>Kentucky Severe Storms, Tornadoes, and Flooding (DR-1976)</u>	Incident period: April 12, 2011 to May 20, 2011	Major Disaster Declaration declared on May 4, 2011, Green – Public Assistance
<u>Kentucky Severe Storms, Flooding, Mudslides, and Tornadoes (DR-1912)</u>	Incident period: May 1, 2010 to June 1, 2010	Major Disaster Declaration declared on May 11, 2010, Casey, Individual Assistance
<u>Kentucky Severe Storms, Tornadoes, Flooding, and Mudslides (DR-1841)</u>	Incident period: May 3, 2009 to May 20, 2009	Major Disaster Declaration declared on May 29, 2009, Russell – Public Assistance
<u>Kentucky Severe Winter Storm and Flooding (DR-1818)</u>	Incident period: January 26, 2009 to February 13, 2009	Major Disaster Declaration declared on February 5, 2009, Green – Public Assistance
<u>Kentucky Severe Storms and Flooding (DR-1537)</u>	Incident period: July 13, 2004 to July 15, 2004	Major Disaster Declaration declared on August 6, 2004, Adair, Clinton, Cumberland, Green, Russell, Taylor, Wayne – Public Assistance
<u>Kentucky Severe Storms, Tornadoes, Flooding, and Mudslides (DR-1523)</u>	Incident period: May 26, 2004 to June 18, 2004	Major Disaster Declaration declared on June 10, 2004, Casey, Pulaski - Individual Assistance
<u>Kentucky Severe Winter Storms (DR-1454)</u>	Incident period: February 15, 2003 to February 26, 2003	Major Disaster Declaration declared on March 14, 2003, Green – Public Assistance
<u>Kentucky Severe Storms, Tornadoes and Flooding (DR-1414)</u>	Incident period: April 27, 2002 to May 10, 2002	Major Disaster Declaration declared on May 7, 2002, Casey, McCreary, Pulaski, Taylor - Individual Assistance
<u>Kentucky Storms and Flooding (DR-1407)</u>	Incident period: March 17, 2002 to March 21, 2002	Major Disaster Declaration declared on April 4, 2002, McCreary, Wayne - Public Assistance; McCreary - Individual Assistance
<u>Kentucky Severe Storms, Tornadoes and Flooding (DR-1216)</u>	Incident period: April 16, 1998 to May 10, 1998	Major Disaster Declaration declared on April 29, 1998, Adair, Pulaski - Public Assistance; Adair, Casey - Individual Assistance

Incident Description & Disaster Number	Date	LCADD Counties Included
<u>Kentucky Severe Winter Storm (DR-1207)</u>	Incident period: February 4, 1998 to February 6, 1998	Major Disaster Declaration declared on March 3, 1998, Adair, Casey, Clinton, McCreary, Pulaski, Russell, Wayne - Public Assistance
<u>Kentucky Severe Storms/Flooding (DR-1163)</u>	Incident period: March 1, 1997 to March 31, 1997	Major Disaster Declaration declared on March 4, 1997, All the Lake Cumberland Regional Counties - Public Assistance
<u>Kentucky Severe Storms/Tornadoes (DR-1117)</u>	May 28, 1996	Major Disaster Declaration declared on June 1, 1996, All the Lake Cumberland Regional Counties - Public Assistance
<u>Kentucky Blizzard (DR-1089)</u>	Incident period: January 5, 1996 to January 12, 1996	Major Disaster Declaration declared on January 13, 1996, All the Lake Cumberland Regional Counties - Public Assistance
<u>Kentucky Severe Storm, Tornadoes, Hail (DR-1055)</u>	Incident period: May 13, 1995 to May 19, 1995	Major Disaster Declaration declared on June 13, 1995, Adair, Casey, Cumberland, Green, Pulaski, Russell, Taylor - Public Assistance
<u>Kentucky Severe Storm, Freezing Rain, Sleet, Snow (DR-1018)</u>	Incident period: February 9, 1994 to February 11, 1994	Major Disaster Declaration declared on March 16, 1994, All the Lake Cumberland Regional Counties - Public Assistance
<u>Kentucky Flooding, Severe Storm (DR-893)</u>	Incident period: December 6, 1990 to February 2, 1991	Major Disaster Declaration declared on January 29, 1991, All the Lake Cumberland Regional Counties - allows the States to use a one-time effort to apply HMGP eligibility criteria statewide for all disasters declared before April 7, 1997. The notices for the indicated major disasters in the specified States are hereby amended to include among those areas determined to be eligible for HMGP: the counties and parishes on the list following this notice, “Retroactive Statewide Use of Hazard Mitigation Grant Program Funds”

Incident Description & Disaster Number

Date

LCADD Counties Included

[Kentucky Severe Storms, Mudslides, Flooding \(DR-846\)](#)

Incident period: October 16, 1989 to October 18, 1989

Major Disaster Declaration declared on October 30, 1989, All the Lake Cumberland Regional Counties - allows the States to use a one-time effort to apply HMGP eligibility criteria statewide for all disasters declared before April 7, 1997. The notices for the indicated major disasters in the specified States are hereby amended to include among those areas determined to be eligible for HMGP: the counties and parishes on the list following this notice, “Retroactive Statewide Use of Hazard Mitigation Grant Program Funds”

[Kentucky SEVERE STORMS, FLOODING \(DR-834\)](#)

Incident period: June 15, 1989 to July 6, 1989

Major Disaster Declaration declared on June 30, 1989, All the Lake Cumberland Regional Counties - allows the States to use a one-time effort to apply HMGP eligibility criteria statewide for all disasters declared before April 7, 1997. The notices for the indicated major disasters in the specified States are hereby amended to include among those areas determined to be eligible for HMGP: the counties and parishes on the list following this notice, “Retroactive Statewide Use of Hazard Mitigation Grant Program Funds”

Incident Description & Disaster Number	Date	LCADD Counties Included
<u>Kentucky SEVERE STORMS, FLOODING (DR-821)</u>	Incident period: January 13, 1989 to March 8, 1989	Major Disaster Declaration declared on February 24, 1989, All the Lake Cumberland Regional Counties - allows the States to use a one-time effort to apply HMGP eligibility criteria statewide for all disasters declared before April 7, 1997. The notices for the indicated major disasters in the specified States are hereby amended to include among those areas determined to be eligible for HMGP: the counties and parishes on the list following this notice, ‘‘Retroactive Statewide Use of Hazard Mitigation Grant Program Funds’’
<u>Kentucky High Winds, Tornadoes, Flooding (DR-705)</u>	May 15, 1984	Major Disaster Declaration declared on May 15, 1984, Casey, Pulaski, Wayne - Public Assistance; Adair, Casey, Green, Pulaski, Taylor, Wayne - Individual Assistance
<u>Kentucky SEVERE STORMS, FLOODING (DR-568)</u>	December 12, 1978	Major Disaster Declaration declared on December 12, 1978, Casey - Public Assistance; Casey - Individual Assistance
<u>Kentucky SEVERE STORMS, FLOODING (DR-461)</u>	March 29, 1975	Major Disaster Declaration declared on March 29, 1975, Pulaski - Public Assistance; Pulaski - Individual Assistance
<u>Kentucky TORNADOES (DR-420)</u>	April 4, 1974	Major Disaster Declaration declared on April 4, 1974, Casey, Clinton, Cumberland, Green, McCreary, Pulaski, Taylor, Wayne - Public Assistance; Casey, Clinton, Cumberland, Green, McCreary, Pulaski, Taylor, Wayne - Individual Assistance
<u>Kentucky Heavy Rains, Flooding (DR-332)</u>	May 15, 1972	Major Disaster Declaration declared on May 15, 1972, Wayne - Public Assistance; Wayne - Individual Assistance

Incident Description & Disaster Number	Date	LCADD Counties Included
<u>Kentucky TORNADO (DR-305)</u>	May 10, 1971	Major Disaster Declaration declared on May 10, 1971, Adair, Green, Pulaski, Russell - Public Assistance; Adair, Green, Pulaski, Russell - Individual Assistance
<u>Kentucky SEVERE STORMS, FLOODING (DR-288)</u>	June 5, 1970	Major Disaster Declaration declared on June 5, 1970, Casey - Public Assistance; Casey - Individual Assistance
<u>Kentucky SEVERE STORMS, FLOODING (DR-265)</u>	July 15, 1969	Major Disaster Declaration declared on July 15, 1969, Cumberland - Public Assistance; Cumberland - Individual Assistance
<u>Kentucky SEVERE STORMS, FLOODING (DR-163)</u>	March 17, 1964	Major Disaster Declaration declared on March 17, 1964, No notices have been issued for this disaster.
<u>Kentucky SEVERE STORMS, FLOODING (DR-148)</u>	March 13, 1963	Major Disaster Declaration declared on March 13, 1963, No notices have been issued for this disaster.
<u>Kentucky FLOODS (DR-128)</u>	March 12, 1962	Major Disaster Declaration declared on March 12, 1962, No notices have been issued for this disaster.

Table 4.0(2) – Emergency Disaster Declarations for the Lake Cumberland Region

<u>Kentucky Severe Winter Storm (EM-3302)</u>	Incident period: January 27, 2009 to February 5, 2009	Emergency Declaration declared on January 28, 2009, Casey, Green, Taylor - Public Assistance
<u>Kentucky Hurricane Katrina Evacuation (EM-3231)</u>	Incident period: August 29, 2005 to October 1, 2005	Emergency Declaration declared on September 10, 2005, All the Lake Cumberland Regional Counties - Public Assistance
<u>Kentucky Severe Snowfall and Winter Storm (EM-3104)</u>	Incident period: March 13, 1993 to March 17, 1993	Emergency Declaration declared on March 16, 1993, All the Lake Cumberland Regional Counties - Public Assistance
<u>Kentucky High Winds (EM-3009)</u>	March 19, 1975	Emergency Declaration declared on March 19, 1975, No notices have been issued for this disaster.

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In order to outline the natural disasters and associated hazards potentially afflicting the Lake Cumberland Region, the following sources were used:

- A review of the 2013 Kentucky State Hazard Mitigation Plan;
- A review of FEMA emergency declarations;
- A review of past events documented in news articles and internet sources; and
- Conversations with members of the LCHMRPC and other Regional stakeholders.

The Hazard Identification Risk Assessment (HIRA) provides a factual basis for developing mitigation strategies and prioritizing those jurisdictions that are most threatened by and vulnerable to hazards. This section details the risk assessment process and the methods used to rank hazards risks. Results from this process and accompanying methods will be presented in hazard-specific sections that follow. Based on information obtained from the sources described above, the following natural disasters and associated hazards have been identified as a threat to the Lake Cumberland Region as shown in **Table 4.0(4)**.

Natural disasters are described in detail in the following sections.

Specific hazards are assigned a point value for each of these items based on the expected severity of the hazard. Point values and descriptions for each category are shown in **Hazard Identification Criteria Table**. This information was then used to establish a Hazard Index for each type of natural hazard and associated risk level based on the total score as shown in **Risk Level Table**. Hazards associated with the highest index value were determined to have the greatest potential impact to the LCR. The entire scoring matrix is provided as Natural **Hazard Index Table**.

¹⁸ FEMA Data Obtained for Table 4.0(1) and 4.0(2), <http://www.fema.gov/disasters>

As discussed previously, the Lake Cumberland Region faces a number of potential natural disasters and hazards. A standardized methodology was developed from similar assessment tools from the Commonwealth of Massachusetts State Hazard Mitigation Plan, State of Rhode Island Hazard Mitigation Plan and other plans, which allows for greater flexibility and room for subject matter expertise, was revised to meet the needs of the LCHMRPC to compare different hazards’ risk on a county basis. This method prioritizes hazard risk based on a blend of quantitative factors extracted from NOAA’s National Centers for Environmental Information (NCEI) and other available data sources.

These factors include:

A Hazard Identification matrix was developed that rates natural hazards based on the following three items:

- Likelihood of Occurrence – the probability that a hazard will occur;
- Geographic Scale – location and/or size of the area affected; and
- Impacts – expected damage and disruptions to be expected.

All Components of this Risk Assessment were developed using the best available data available to the LCRMPC. Committee members and LCADD staff researched both national and local records for further documentation on initial subcommittee hazard analysis findings. Where data was limited or did not exist, subcommittee members provided personal knowledge of hazard events where possible. All Hazard Identification of risk levels were subjective as members from each county/city evaluated available data and personal knowledge to score each of the three factors listed as follows:

- Likelihood of Occurrence – the probability that a hazard will occur;
- Geographic Scale – location and/or size of the area affected; and
- Impacts – expected damage and disruptions to be expected.

Table 4.0(3a) - Hazard Identification Criteria

Score	Category	Description
Likelihood of Occurrence		
3	Highly Likely	50% to 100% probability in the next year
2	Likely	Between 10% and 50% probability in the next year
1	Possible	Between 1% and 10% probability in the next year
0	Unlikely	Less than 1% probability in the next year
Geographic Scale		
3	Large	More than 50% of the town affected
2	Medium	10% to 50% of the town affected
1	Small	Less than 10% of the town affected
Impacts		
3	Catastrophic	Multiple deaths & injuries possible, >50% property severely damaged Complete shutdown of facilities for 30 days or more
2	Critical	Multiple injuries possible, <50% to >25% property severely damaged Complete shutdown of critical facilities for at least 1 week

1	Limited	Minor injuries only, <25% to >10% property severely damaged Complete shutdown of critical facilities for more
0	Minor	Very few injuries, if any, only minor property damage Shutdown of critical facilities and services for 24 hours or

Table 4.0(3b) – Risk Level

Hazard Index Score	Risk Level
8-9	Extremely High
6-7	Very High
5	High
4	Moderate
3	Low
1-2	Very Low

Natural Disasters and Associated Hazards

Table 4.0(4) – Regional Natural Hazard Index

Natural Hazard	Hazard Index Score ¹	Risk Level
Floods		
Flash Flooding	5	High
Riverine Flooding	3	Low
Flooding from Storm Runoff	4	Moderate
Erosion	3	Low
Winter Storm Events		
Snowstorms and Blizzards	6	Very High
Ice Storm	5	High
Tornadoes and Thunderstorms		
Tornadoes	6	Very High
Thunderstorms/Lighting	5	High
Windstorm (Straight Line Winds)	5	High
Hailstorm	5	High
Geologic Hazards		
Earthquakes	4	Moderate
Land Subsidence (Landslides)	2	Very Low
Sinkholes	3	Low
Other Hazards		
Drought	4	Moderate
Forest Fires / Wildfires	4	Moderate
Dam/Levee Failures	3	Low

Natural Hazard	Hazard Index Score ¹	Risk Level
Expansive Soil	1	Very Low
Extreme Summer Weather	4	Moderate
Manmade Hazard	Hazard Index Score ¹	Risk Level
Technological and Other Hazards (Although not required by the FEMA manmade hazards such as hazardous materials release, nuclear materials release, and terrorism were also Disaster Mitigation Act of 2000, manmade hazards such as hazardous materials release, nuclear materials release, and terrorism were also reviewed by the Lake Cumberland Regional Hazard Mitigation Committee.)		
Natural Biohazard	3	Low
Nuclear Facilities	1	Very Low
Hazardous Material Sites	3	Low
Non-Regional Hazards (Determined not to be a hazard threat and therefore is not profiled.)		
Coastal Erosion	not profiled	not apply
Snow Avalanche	not profiled	not apply
Storm Surge	not profiled	not apply
Tsunami Event	not profiled	not apply
Volcano	not profiled	not apply
Hurricane (Tropical Cyclone)	not profiled	not apply

Committee members and LCADD staff researched both national and local records for further documentation on initial LCHMRC hazard analysis findings. Where data was limited or did not exist, committee members provided personal knowledge of hazard events where possible. This personal data was identified and incorporated into the maps and other available data in the plan where possible. This risk assessment hazard profile considers information on the history and extents of hazards in the Lake Cumberland Region.

The composite hazard index characterizes vulnerability in general terms of low, medium, or high hazard propensity. To determine overall risk, the scores for each of the parameters were added together for each hazard to estimate the total county risk due to that hazard. The overall or total hazard score for the Lake Cumberland Region was determined by calculating the average hazard risk for each of the counties. Tables 4.11(1a-c) show county level Risk Assessments with overall regional average.