

## Risk Assessment: Wildfire

*By: University of Kentucky Hazard Mitigation Grants Program Office (UK-HMGP)  
With: Kentucky Division of Forestry (KDF)*

### **Type**

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 non-native species of grasses, brush, and trees fuel wildfires.

A **Wildland Fire**<sup>1</sup> 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.

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<sup>1</sup> The following description derives from the Kentucky Division of Forestry (KDF). See: <http://forestry.ky.gov/wildlandfiremanagement/Pages/default.aspx> [Last Accessed 9/12/2018].

## Type + Extent

According to Kentucky Division of Forestry (KDF), wildfires are categorized into “Classes.” These “Classes,” then, represent types of wildfire and also represent an illustration of “extent,” i.e., a measurement of how bad a wildfire can get, preferably in terms of a scale. Below are “Class” distinctions between types of wildfires and the definition-cum-extent that determine each Class.

**Table F-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

From January 1, 2013 until August 2018, there have been the following number of wildfires in each Class. The number of wildfires is accompanied by the acreage burned and the percent of the total each Class comprised:

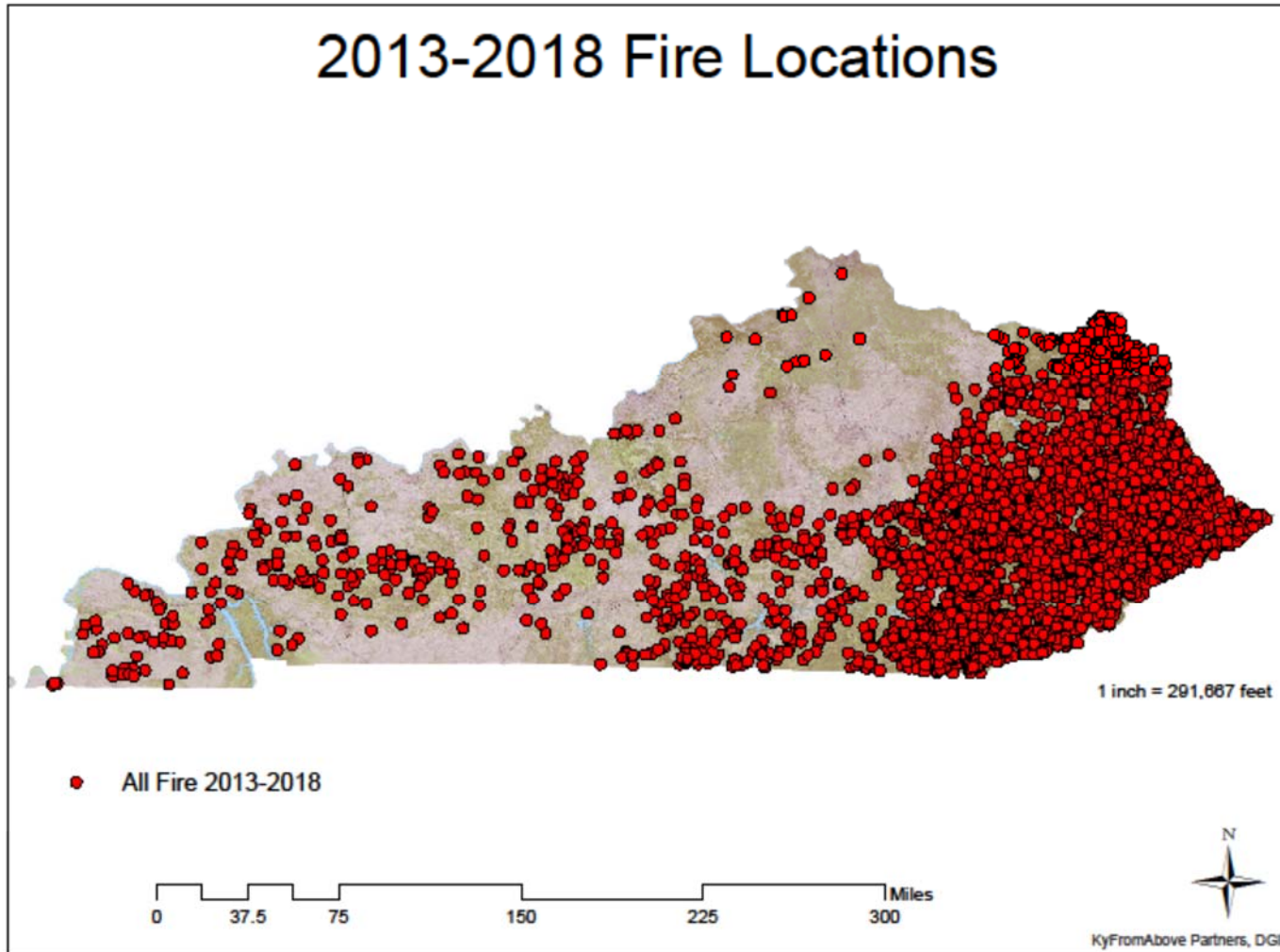
**Table F-2. Summary of Fire Occurrences, Extent, 2013 – August 2018**

Fire Class	Class Descriptor	# Fires	Acreage Burned	% of Total Fire Type
Class A	>0.25 Acres	92	12.3	1.7%
Class B	0.25 to 9 Acres	2,918	8,685.5	53.1%
Class C	10 to 99 Acres	2,172	77,954.4	39.6%
Class D	100 to 299 Acres	217	37,487.0	4.0%
Class E	300 to 999 Acres	81	37,620.0	1.5%
Class F	1,000 to 4,999 Acres	10	16,694.0	0.2%
Class G	5,000 or More Acres	1	7,400	0.0%

## Location and Previous Occurrences

Below is a map of the locations of all wildfire events to be recorded by Kentucky Division of Forestry (KDF) from January 1, 2013 – August 2018.

Map F-1. Wildfire Event Locations, 2013 - 2018



**Location, Previous Occurrences, Extent, Vulnerability**

The following tables summarizing locations, previous occurrences, extent, and vulnerability are organized by “Region.” “Regions” refer to Kentucky Division of Forestry (KDF) Regional Office locations. Below is a map for reference.

Map F-2. KDF Regions for Reference



**Kentucky Division of Forestry  
Regional Office Locations**

**West Region**  
P.O. Box 465  
Madisonville, KY 42431  
Phone: 270-824-7527  
Fax: 270-824-7593  
Seedlings: 270-247-3913

**North Central Region**  
P.O. Box 516  
Frankfort, KY 40601  
Phone: 502-573-1085  
Fax: 502-573-1088

**Northeast Region**  
255 Rodburn Hollow Rd.  
Morehead, KY 40351  
Phone: 606-783-8625  
Fax: 606-783-8628



**Central Region**  
120 Gaines Drive  
Campbellsville, KY 42718  
Phone: 270-465-5071  
Fax: 270-465-3575

**Southeast Region**  
154 Grand Vue Plaza  
Hazard, KY 41701  
Phone: 606-435-6073  
Fax: 606-435-6075

**Table F-3. Frankfort Region Wildfire Location, Occurrences, Extent, Vulnerability**

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
McCreary	2018	1	8.0	0

**Table F-4. Western Region Wildfire Location, Occurrences, Extent, Vulnerability**

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Butler	2013	1	7.0	134,390
	2014	1	4.0	
	2016	1	1.0	
	2017	3	25.0	
	2018	1	28.0	
Caldwell	2013	1	5.0	41,980
	2014	6	34.5	
	2015	3	26.0	
	2016	4	24.1	
	2017	3	17.0	
Calloway	2013	2	8.0	57,320
	2014	1	5.0	
Carlisle	2015	3	22.0	16,880
	2018	1	0.2	
Christian	2013	1	8.0	154,420
	2014	4	50.0	
	2015	1	16.0	
	2017	1	3.0	
Crittenden	2013	3	7.0	70,550
	2014	4	14.5	
	2017	4	67.5	
	2018	1	-	
Daviess	2013	1	3.5	46,880
	2014	1	4.0	
	2017	1	35.0	
Fulton	2014	1	6.0	27,150
	2017	2	2.0	
Graves	2013	1	0.5	74,020
	2014	2	9.0	
	2015	4	5.8	
	2016	4	22.0	
	2017	6	37.0	
Hancock	2013	2	15.0	34,130
	2014	1	8.0	
	2016	2	108.0	

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Henderson	2013	2	68.1	21,600
	2014	2	122.0	
	2015	1	25.0	
	2017	4	27.0	
Hickman	2014	3	23.0	42,010
	2015	3	22.1	
	2016	1	4.0	
	2017	1	1.0	
Hopkins	2013	1	30.0	142,640
	2014	8	17.6	
	2016	2	4.0	
	2017	6	238.0	
	2018	1	5.0	
Livingston	2015	2	32.0	90,740
	2016	2	26.0	
	2017	2	8.5	
Logan	2013	2	7.5	104,060
	2014	4	84.3	
	2016	1	1.0	
Lyon	2015	1	5.0	91,370
	2017	1	1.5	
McCracken	2013	2	1.2	36,500
	2014	1	0.5	
	2015	1	2.0	
	2016	1	95.0	
	2017	2	18.0	
	2018	1	2.0	
McLean	2013	1	30.0	33,460
Marshall	2014	1	4.0	52,300
	2015	1	10.0	
	2016	2	100.0	
	2017	2	42.0	
Muhlenberg	2013	4	91.3	119,400
	2014	6	17.2	
	2015	7	6.3	
	2016	8	13.5	
	2017	3	7.0	
	2018	1	0.3	
Ohio	2014	4	122.4	139,270
	2015	1	65.0	
	2016	1	5.0	
	2017	3	9.5	

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Todd	2016	1	1.0	51,890
Trigg	2013	1	1.0	140,020
	2015	1	30.0	
	2017	1	2.0	
	2018	1	2.0	
Union	2013	1	9.0	21,340
	2015	1	3.0	
	2017	2	24.0	
Webster	2013	2	29.0	43,290
	2014	1	25.0	
	2015	1	20.0	
	2016	2	2.1	

Table F-5. Central Region Wildfire Location, Occurrences, Extent, Vulnerability

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Adair	2013	2	9.2	112,480
	2014	9	88.5	
	2015	1	11.0	
	2016	6	42.7	
	2017	4	14.6	
Allen	2014	1	0.1	89,430
	2018	1	50.0	
Barren	2014	1	0.2	61,950
	2016	1	20.0	
Breckinridge	2013	2	15.0	144,000
	2014	10	105.9	
	2015	1	21.0	
	2016	4	74.0	
	2017	5	29.5	
	2018	1	17.0	
Casey	2013	12	313.0	172,900
	2014	12	309.6	
	2015	3	15.0	
	2016	4	50.0	
	2017	2	5.5	

<u>County</u>	<u>Year</u>	<u># of Fires</u>	<u># Acres Burned</u>	<u># Acres Vulnerable</u>
Clinton	2013	5	137.0	75,090
	2014	11	185.0	
	2015	2	2.1	
	2016	4	9.1	
	2017	3	63.0	
Cumberland	2013	4	57.0	148,400
	2014	11	139.3	
	2015	4	42.2	
	2016	8	67.5	
	2017	5	66.5	
	2018	1	7.0	
Edmonson	2013	2	27.0	122,990
	2014	4	93.0	
	2015	1	3.0	
	2016	1	7.0	
	2017	4	10.2	
	2018	2	65.0	
Grayson	2013	4	6.1	123,000
	2014	7	111.0	
	2015	2	2.5	
	2016	2	22.0	
	2017	8	35.8	
	2018	2	13.1	
Green	2013	1	10.0	54,280
	2014	5	28.4	
	2016	1	2.0	
	2017	6	43.3	
	2018	2	16.0	
Hardin	2013	2	9.0	134,890
	2014	7	139.5	
	2017	2	8.5	
	2018	1	20.0	
Hart	2014	6	51.5	105,010
	2015	2	2.5	
	2016	1	1.0	
	2017	1	20.0	
	2018	1	5.0	



<u>County</u>	<u>Year</u>	<u># of Fires</u>	<u># Acres Burned</u>	<u># Acres Vulnerable</u>
LaRue	2013	1	2.0	41,680
	2014	4	87.0	
	2017	1	6.0	
Lincoln	2013	4	49.0	55,180
	2014	8	81.2	
	2015	6	45.4	
	2016	1	17.0	
	2018	2	4.0	
McCreary	2013	6	119.0	217,750
	2014	7	371.1	
	2016	9	401.0	
	2017	2	151.0	
Marion	2013	1	20.0	79,650
	2014	1	5.0	
	2015	1	5.5	
	2016	3	84.0	
	2017	2	70.0	
	2018	2	20.0	
Meade	2014	3	29.0	59,230
Metcalfe	2013	8	63.4	82,240
	2014	3	3.3	
	2015	2	24.5	
	2016	4	22.3	
	2017	7	42.3	
	2018	1	0.5	
Monroe	2013	4	50.0	60,060
	2014	6	97.0	
	2015	1	17.0	
	2016	1	2.0	
	2017	3	4.5	
Pulaski	2013	2	25.1	216,590
	2014	11	233.0	
	2015	2	100.0	
	2016	3	180.0	
	2017	7	123.5	

<u>County</u>	<u>Year</u>	<u># of Fires</u>	<u># Acres Burned</u>	<u># Acres Vulnerable</u>
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	
Russell	2014	1	15.0	87,220
	2016	4	14.2	
	2017	1	30.0	
Taylor	2014	4	43.5	73,550
	2016	1	0.1	
	2017	2	1.2	
Warren	2013	1	4.2	84,010
	2014	2	78.0	
	2016	2	4.1	
Wayne	2013	9	240.3	209,230
	2014	10	384.0	
	2015	6	102.0	
	2016	16	562.0	
	2017	2	90.0	
	2018	1	10.0	

**Table F-6. North Central Region Wildfire Location, Occurrences, Extent, Vulnerability**

<u>County</u>	<u>Year</u>	<u># of Fires</u>	<u># Acres Burned</u>	<u># Acres Vulnerable</u>
Boone	2014	1	0.4	62,190
Boyle	2013	1	8.0	28,700
Bullitt	2013	6	39.0	86,410
	2014	1	5.0	
	2016	1	3.9	
Clark	2017	1	0.1	42,630
Fayette	2017	1	28.0	5,690
Franklin	2014	1	10.0	39,530
Gallatin	2014	2	6.0	31,320
	2017	1	45.0	

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Garrard	2013	2	5.0	36,400
	2014	2	34.0	
	2015	1	5.0	
	2016	1	2.0	
Henry	2014	1	25.0	63,760
Jefferson	2013	1	2.0	47,520
	2014	1	10.0	
Kenton	2018	1	20.0	57,350
Madison	2013	2	2.0	88,260
	2014	5	47.0	
	2015	3	23.0	
	2016	1	2.0	
	2017	4	25.5	
	2018	1	0.5	
Nelson	2013	2	77.5	78,780
	2014	3	10.0	
	2016	1	1.0	
	2017	1	5.0	
	2018	1	95.0	
Owen	2013	1	45.0	101,500
	2014	2	7.0	
	2016	2	6.0	
Pendleton	2014	1	15.0	88,710
Shelby	2013	1	0.2	27,320
Trimble	2014	1	18.0	52,120

Table F-7. Northeast Region Wildfire Location, Occurrences, Extent, Vulnerability

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Bath	2013	1	50.0	91,830
	2014	4	14.3	
	2015	3	3.8	
	2016	6	26.2	
	2017	4	12.0	
	2018	1	4.0	
Boyd	2013	3	8.0	51,890
	2014	8	129.2	
	2015	5	6.5	
	2016	5	194.0	
	2017	4	9.1	
	2018	4	6.5	
Carter	2013	33	658.0	169,850
	2014	46	788.6	
	2015	25	270.6	
	2016	18	343.5	
	2017	19	534.3	
	2018	7	229.0	
Elliott	2012	1	1.5	63,920
	2013	5	291.5	
	2014	11	330.5	
	2015	9	207.5	
	2016	9	173.0	
	2017	6	101.5	
Estill	2013	10	29.1	118,120
	2014	9	75.0	
	2015	5	55.0	
	2016	8	52.9	
	2017	5	56.0	
	2018	4	109.0	
Fleming	2013	1	3.5	74,000
	2014	3	98.8	
	2015	5	94.0	
	2016	4	132.0	
	2017	1	11.5	
	2018	2	18.0	

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Greenup	2013	26	637.5	135,520
	2014	31	942.0	
	2015	13	129.1	
	2016	23	1242.5	
	2017	18	327.5	
	2018	6	20.1	
Johnson	2013	18	80.8	111,970
	2014	30	366.0	
	2015	15	844.1	
	2016	18	323.5	
	2017	20	454.3	
	2018	13	260.2	
Lawrence	2013	27	624.5	214,790
	2014	15	236.0	
	2015	14	167.0	
	2016	22	286.9	
	2017	24	409.8	
	2018	15	318.6	
Lewis	2013	17	922.2	214,260
	2014	9	162.5	
	2015	7	440.0	
	2016	9	177.2	
	2017	4	117.0	
	2018	2	77.0	
Magoffin	2013	34	844.5	147,840
	2014	74	2054.8	
	2015	43	1290.6	
	2016	52	1734.0	
	2017	49	818.6	
	2018	17	301.5	
Martin	2013	19	767.6	85,210
	2014	25	1606.0	
	2015	9	280.6	
	2016	25	897.7	
	2017	24	704.5	
	2018	13	422.1	
Mason	2014	1	4.0	26,590

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Menifee	2013	1	1.0	88,790
	2014	4	44.5	
	2015	5	209.0	
	2016	4	15.3	
	2017	4	19.5	
	2018	1	5.0	
Montgomery	2013	3	12.0	29,840
	2014	2	4.0	
	2016	2	14.0	
	2017	3	28.0	
	2018	2	9.0	
Morgan	2013	22	352.2	189,170
	2014	21	260.0	
	2015	9	831.8	
	2016	13	99.2	
	2017	17	402.0	
	2018	8	61.5	
Powell	2013	2	4.0	76,180
	2014	6	126.1	
	2015	4	13.0	
	2016	6	9.4	
	2017	8	24.0	
	2018	3	45.0	
Rowan	2013	7	46.3	127,560
	2014	8	84.5	
	2015	5	7.4	
	2016	2	6.2	
	2017	7	36.3	
	2018	6	67.0	
Wolfe	2013	11	108.0	115,860
	2014	14	149.0	
	2015	11	38.5	
	2016	8	22.5	
	2017	11	81.2	
	2018	5	33.0	

Table F-8. Northeast Region Wildfire Location, Occurrences, Extent, Vulnerability

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Bell	2013	22	813.0	109,670
	2014	39	956.0	
	2015	17	184.0	
	2016	49	6,197.5	
	2017	18	379.0	
	2018	9	11.3	
Breathitt	2013	35	86.0	210,630
	2014	50	1,827.0	
	2015	30	741.0	
	2016	49	8,706.0	
	2017	15	557.0	
	2018	19	265.5	
Clay	2013	57	1,325.0	270,810
	2014	60	1,843.6	
	2015	60	1,341.5	
	2016	92	3,360.7	
	2017	44	1,006.0	
	2018	17	647.0	
Floyd	2013	58	1,536.9	190,270
	2014	78	2,297.0	
	2015	48	1,191.5	
	2016	87	2,999.9	
	2017	53	1,490.0	
	2018	14	344.0	
Harlan	2013	26	553.0	100,180
	2014	31	2,425.0	
	2015	22	1,186.0	
	2016	54	11,265.0	
	2017	23	837.5	
	2018	10	857.0	
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	

County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Knott	2013	65	1,410.0	105,890
	2014	80	2,986.0	
	2015	36	891.0	
	2016	48	1,840.0	
	2017	31	601.0	
	2018	19	276.0	
Knox	2013	52	1,517.0	177,910
	2014	96	2,834.8	
	2015	55	1,220.5	
	2016	61	4,474.1	
	2017	37	2,207.0	
	2018	13	225.0	
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	
Lee	2013	21	301.0	78,950
	2014	30	380.5	
	2015	6	47.0	
	2016	33	580.0	
	2017	17	257.0	
	2018	6	132.0	
Leslie	2013	18	235.0	199,940
	2014	34	1,514.5	
	2015	14	939.0	
	2016	29	1,539.0	
	2017	25	832.1	
	2018	9	287.0	
Letcher	2013	38	629.0	107,320
	2014	43	1,653.0	
	2015	33	448.0	
	2016	48	6,357.0	
	2017	31	791.0	
	2018	9	132.0	
Owsley	2013	24	504.0	102,820
	2014	27	397.0	
	2015	25	429.0	
	2016	25	448.0	
	2017	16	328.0	
	2018	8	798.0	



County	Year	# of Fires	# Acres Burned	# Acres Vulnerable
Perry	2013	63	2,278.0	108,950
	2014	109	2,607.0	
	2015	50	1,119.0	
	2016	107	3,649.0	
	2017	63	2,904.0	
	2018	34	486.5	
Pike	2013	51	2,304.2	285,940
	2014	85	6,071.3	
	2015	35	1,975.8	
	2016	70	6,989.0	
	2017	45	2,747.0	
	2018	24	532.0	
Whitley	2013	42	1,242.0	174,040
	2014	52	1,297.2	
	2015	17	1,732.0	
	2016	40	4,215.2	
	2017	12	1,039.0	
	2018	3	51.0	

## **Probability**

A cursory glance at the tables that have already been produced gives a clear picture of probability.

From Table F-2, we see that of all Classes of wildfire, Kentucky is most likely to have 0.25 to 99 acres burnt in a single event. (Ninety-two percent – 92.1% – of all wildfire events in the Commonwealth in the past five years burnt between 0.25 and 99 acres.)

From Tables F-3 through F-8, it is abundantly clear that there is far less probability for a wildfire event from within Kentucky Division of Forestry’s (KDF’s) North Central or Central regions than from within its Southeast region or Northeast regions.

The number of discreet wildfire events for all of Kentucky since 2013 have broken down as such<sup>2</sup>:

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<sup>2</sup> The following numbers come from a master spreadsheet of all wildfire events provided by KDF. Given its size, it was impossible to include the spreadsheet in this plan document (despite its usefulness and useful categories).

Table F-9. Number of Wildfire Events per Year

Year	Number of Wildfire Events Recorded by KDF
2013	980 Events
2014	1,424 Events
2015	732 Events
2016	1,184 Events
2017	831 Events
2018	340 Events
TOTAL	5,491 Events

Probability, then, expressed as an annual frequency of occurrence, the Commonwealth of Kentucky can prepare to experience on average about 915 or 916 (915.168) wildfire events per year. Considering that 2018 is not over yet and that the wildfire data used in this analysis truncated on August 13, 2018 (224 days into 2018), dividing 5,491 events by  $((365 \text{ days} * 5 \text{ years}) + 224 \text{ days in 2018}) = 2,049 \text{ days}$ . Using this  $(5,491/2,049 = 2.6798)$ , Kentucky as a whole can say that it experiences about 2 or 3 wildfire events per day. In other words, Kentucky as a whole is guaranteed (100%) to receive a wildfire event on any given day within a given year.

## **Impacts**

From January 1, 2013 to August 13, 2018, the Commonwealth of Kentucky suffered 5,491 wildfire events. From these 5,491 wildfire events, 185,853 acres were burned. The following impacts were suffered as a result of these 5,491 wildfire events:

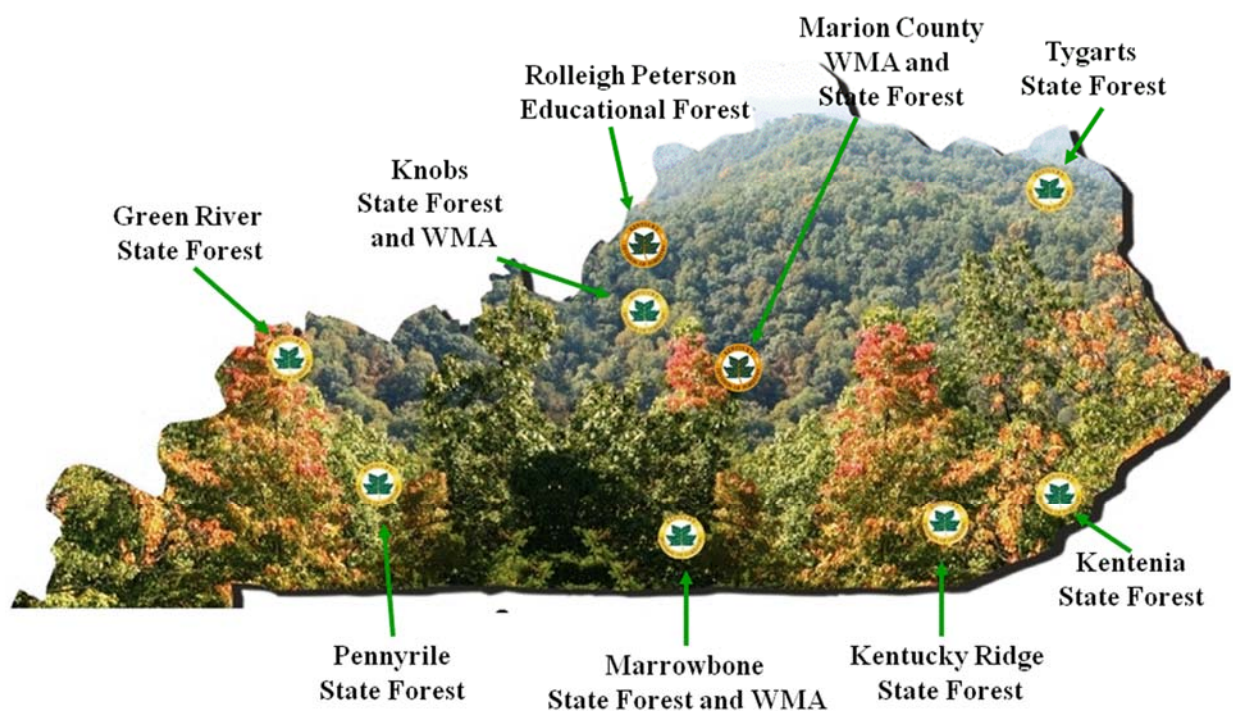
- Total Suppression Cost: \$4,766,014
- Average Cost Per Fire: \$867.97
- Average Cost Per Acre: \$25.64
- Number of Saved Structures: 1,349
- Value of Saved Structures: \$24,176,600
- Number of Lost Structures: 58
- Value of Lost Structures: \$370,150
- Improvements Saved: \$2,346,085
- Improvements Lost: \$291,950
- Number of Saved Houses: 2,211
- Value of Saved Houses: \$138,939,099
- Number of Lost Houses: 8
- Value of Lost Houses: \$303,000

## Vulnerability

The below graphic simply is intended to convey (illustratively) what the above tables (i.e., Tables F-3 through F-8) listed as one of its columns (i.e. “# Acres Vulnerable”): that Kentucky is heavily forested: There is a state forest in every region of Kentucky. Wildfire is a significant hazard toward which mitigation activity is important.

Map F-3. Graphic of Kentucky’s State Forests

## *Kentucky’s State Forests*



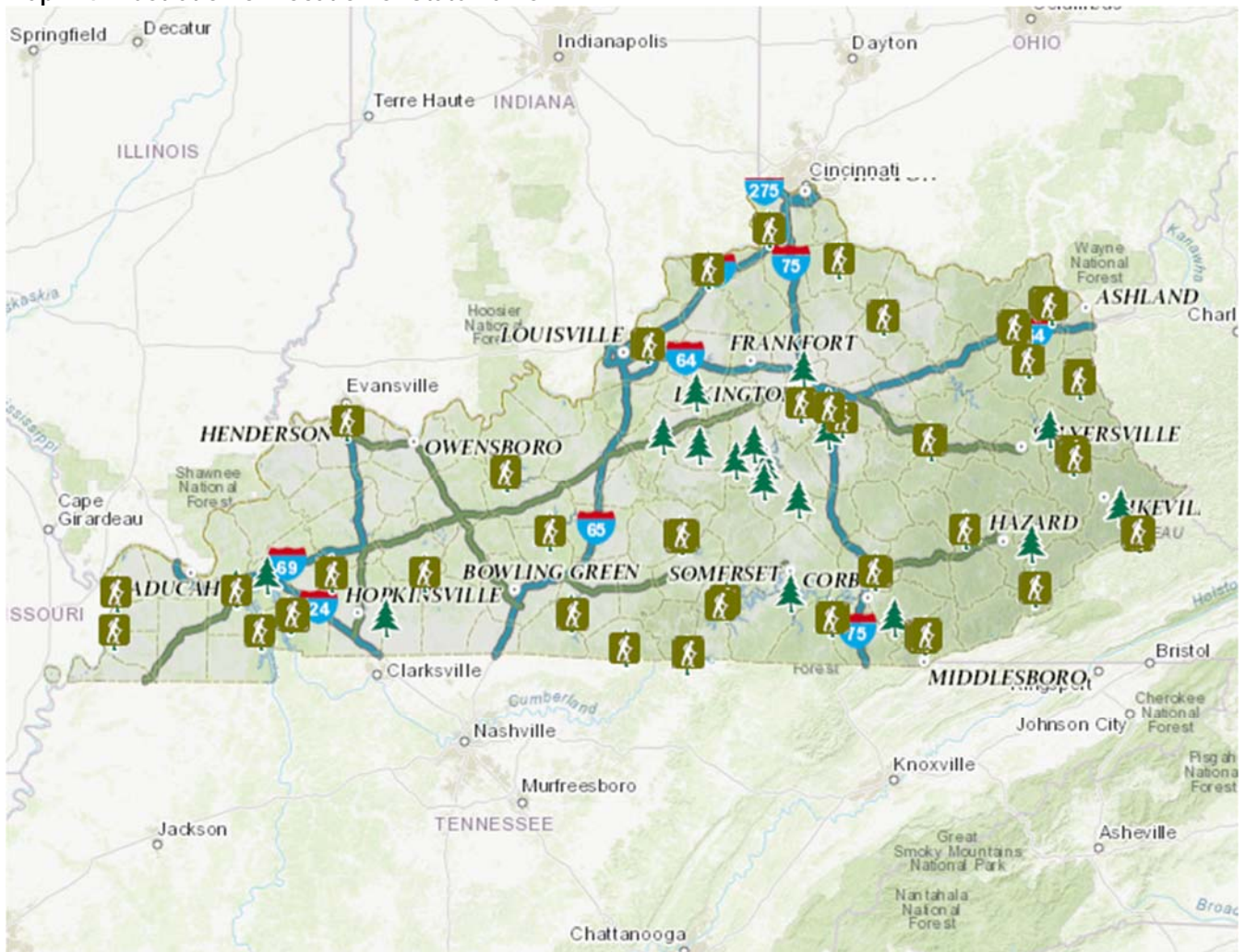
In Kentucky, there 17,645,986 acres that are protected; 11,456,500 acres of commercial forest; 258,900 acres of non-commercial forest; and 5,930,586 acres of non-forested watersheds.

However, when addressing the vulnerability in terms of the Commonwealth's assets, it is most illustrative and relevant to focus the discussion of vulnerability on Kentucky's state parks and 4-H camps and the losses potentially associated with each.

Below is a graphic illustrating the location of Kentucky's state parks. Note that the tree icon represents the park and the hiking person icon represents trail heads.

Below the graphic, this assessment will list each of Kentucky's state parks and 4-H camps in alphabetical order and within which county and city each resides and will identify the potential losses from each park. Loss estimates are based on the Replacement Cost Value (RCV) of each of the structures identified by Kentucky Finance and Administration Cabinet's Division of State Risk and Insurance Services (DSRI) as being part of the park. Recorded here are aggregate RCVs for all structures comprising each park and camp.

Map F-4. Illustration of Location of State Parks



**Table F-10. Replacement Cost Value of State Parks and State 4-H Camps**

State Park	County	City	Total Park Asset RCV
Barren River Lake State Resort Park	Barren	Lucas	\$ 17,213,735.87
Big Bone Lick State Historic Site	Boone	Union	\$ 3,118,895.47
Blue Licks Battlefield State Resort Park	Nicholas	Carlisle	\$ 8,364,682.01
Boone Station State Historic Site	Fayette	Lexington	\$ 290,364.00
Buckhorn Lake State Resort Park	Perry	Buckhorn	\$ 7,268,071.57
Carr Creek State Park	Knott	Sassafras	\$ 967,710.38
Carter Caves State Resort Park	Carter	Olive Hill	\$ 13,031,061.38
Columbus-Belmont State Park	Hickman	Columbus	\$ 2,648,436.79
Cumberland Falls State Resort Park	Knox	Corbin	\$ 19,402,976.69
Dale Hollow State Resort Park	Cumberland	Burkesville	\$ 17,642,295.26
Dr. Thomas Walker State Historic Site	Knox	Barbourville	\$ 671,747.27
E.P. "Tom" Sawyer State Park	Jefferson	Louisville	\$ 3,657,976.44
Fort Boonesborough State Park	Madison	Richmond	\$ 14,400,096.77
General Burnside Island State Park	Pulaski	Burnside	\$ 1,129,469.00
General Butler State Resort Park	Carroll	Carrollton	\$ 14,130,121.31
Grayson Lake State Park	Carter	Olive Hill	\$ 2,094,251.25
Green River Lake State Park	Taylor	Campbellsville	\$ 1,038,346.33
Greenbo Lake State Resort Park	Greenup	Greenup	\$ 10,172,357.92
Jefferson Davis State Historic Site	Christian	Fairview	\$ 1,111,623.11
Jenny Wiley State Resort Park	Floyd	Prestonsburg	\$ 15,640,769.48
John James Audubon State Park	Henderson	Henderson	\$ 2,996,204.81
Kenlake State Resort Park	Marshall	Hardin	\$ 15,690,101.95
Kentucky Dam Village State Resort Park	Marshall	Gilbertsville	\$ 18,952,174.20
Kincaid Lake State Park	Pendleton	Falmouth	\$ 2,836,715.19
Kingdom Come State Park	Harlan	Cumberland	\$ 611,505.73
Lake Barkley State Resort Park	Trigg	Cadiz	\$ 32,128,555.84
Lake Cumberland State Resort Park	Russell	Jamestown	\$ 24,666,110.72
Lake Malone State Park	Muhlenberg	Dunmor	\$ 595,364.59
Levi Jackson Wilderness Road State Park	Laurel	London	\$ 3,498,491.61
Lincoln Homestead State Park	Washington	Springfield	\$ 2,205,927.19
Mineral Mound State Park	Lyon	Eddyville	\$ 1,235,631.29
My Old Kentucky Home	Nelson	Bardstown	\$ 7,746,347.86
Natural Bridge State Resort Park	Powell	Slade	\$ 14,922,713.26
Nolin Lake State Park	Edmonson	Mammoth Cave	\$ 440,063.77
Old Fort Harrod State Park	Mercer	Harrodsburg	\$ 2,992,427.63
Old Mulkey Meetinghouse State Historic Site	Monroe	Tompkinsville	\$ 387,847.95
Paintsville Lake State Park	Johnson	Staffordsville	\$ 758,510.78
Pennyrile Forest State Resort Park	Caldwell	Dawson Springs	\$ 7,623,249.88
Perryville Battlefield State Historic Site	Boyle	Perryville	\$ 1,352,143.24
Pine Mountain State Resort Park	Bell	Pineville	\$ 12,068,691.93
Rough River Dam State Resort Park	Breckinridge	Falls of Rough	\$ 12,140,861.60

State Park	County	City	Total Park Asset RCV
Taylorsville Lake State Park	Spencer	Mount Eden	\$ 1,574,453.08
Waveland State Historic Site	Fayette	Lexington	\$ 1,478,899.85
White Hall State Historic Site	Madison	Richmond	\$ 3,452,839.47
Wickliffe Mounds State Historic Site	Ballard	Wickliffe	\$ 358,464.59
William Whitley House State Historic Site	Lincoln	Stanford	\$ 1,365,425.64
Yatesville Lake State Park	Lawrence	Louisa	\$ 946,316.19
J.M. Feltner 4-H Camp	Laurel	London	\$ 3,061,835.59
Lake Cumberland 4-H Camp	Russell	Jabez	\$ 10,384,333.65
North Central 4-H Camp	Nicholas	Carlisle	\$ 4,525,620.49
West Kentucky 4-H Camp	Caldwell	Dawson Springs	\$ 3,587,364.77

As far as a summary of the local jurisdictions most vulnerable to wildfire, the above map (Map F-1) depicting the locations of wildfire from 2013 through 2018 should make clear the locations where wildfire is the most common and troublesome.

Tables F-3 through F-8 also show relative jurisdictional vulnerability in terms of frequency and extent: Kentucky Division of Forestry's (KDF's) Western region sees frequent wildfires; but, these fires do not burn many acres. The North Central region sees the fewest wildfires with least amount of acreage burned. The Northeastern region sees substantial frequency of wildfires with typical extent. The Southeastern region sees both high frequency of wildfire and thousands of acres burned in an event.

The multi-jurisdictional, multi-hazard mitigation plans produced by Kentucky's Big Sandy Area Development District<sup>3</sup> and by FIVCO<sup>4</sup> provide a laudable and succinct summary<sup>5</sup> of vulnerability to the wildfire hazard that suggests why Map F-1 looks the way it does:

*“The physical characteristics of the [northeast, east, and southeast] region[s] [of Kentucky] make it at times vulnerable to wildfires. The topography consists of areas of extreme slope which allow fires to spread rapidly and make fighting them difficult. There is adequate fuel in the region[s], although there are no large uninterrupted tracts of forest land. The region is predominantly rural and tree-covered...The development pattern outside of the urban areas consists of extremely low-density spatially distributed houses and small farms. Such development often does not appear in land use data derived from remote sensing technologies and therefore appears as entirely forested. Because of this development pattern, the urban-wildland interface is very difficult to define.*

*During the Summer and Fall seasons, the weather conditions are occasionally dry for lengthy periods of time and make wildfires more likely...”*

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<sup>3</sup> The Big Sandy Area Development District provides regional planning, economic development, and grant management services to the following counties and their respective incorporated cities: Floyd, Johnson, Magoffin, Martin, and Pike Counties.

<sup>4</sup> FIVCO provides regional planning, economic development, and grant management services to the following counties and their respective incorporated cities: Boyd, Carter, Elliott, Greenup, and Lawrence Counties.

<sup>5</sup> The Big Sandy Area Development District and FIVCO Area Development District during their plan update development exemplified the kind of integration of which FEMA and the Commonwealth of Kentucky desire more: The counties and cities over which Big Sandy ADD and FIVCO perform their regional planning, economic development, and management functions are very similar in geography, in vulnerability to hazard types, in asset and population distribution, in demographics, etc. Consequently, both ADDs were intimately involved in each other's plan update development.



The local (multi-jurisdictional) hazard mitigation plans throughout Kentucky generally were not able to isolate properties and assets uniquely vulnerable to wildfire only. Consequently, the plans assumed estimated potential losses from wildfire as losses to all (to the aggregate) critical facilities and building stock replacement values available at the time of the respective plan development. See Table F-11 below.

**Table F-11. Summary of Potential Loss Estimates for Wildfires from Local Hazard Mitigation Plans**

Area Development District	County	Estimated Losses
Barren River ADD	Allen	\$ 9,670,842,041.00
	Barren	\$ 3,958,251,841.00
	Butler	\$ 1,024,039,685.00
	Edmonson	\$ 1,167,896,164.00
	Hart	\$ 3,747,649,200.00
	Logan	\$ 3,980,216,871.00
	Metcalfe	\$ 485,802,500.00
	Monroe	\$ 1,248,315,078.00
	Simpson	\$ 535,815,020.00
	Warren	\$ 2,867,998,265.00
Big Sandy ADD	Floyd	\$ 21,579,852.00
	Pike	\$ 43,104,934.00
	Johnson	\$ 14,295,283.00
	Magoffin	\$ 16,924,300.00
	Martin	\$ 12,597,376.00
Bluegrass ADD <sup>6</sup>	Anderson	High
	Bourbon	Low
	Boyle	Low
	Clark	Moderate
	Estill	Moderate
	Fayette <sup>7</sup>	\$ 1,111,500,539.00
	Franklin	Moderate
	Garrard	Moderate
	Harrison	Low
	Jessamine	Low
	Lincoln	Low
	Madison	Low
	Mercer	Moderate
	Nicholas	Low
	Powell	Moderate
Scott	Low	
Woodford	Low	

<sup>6</sup> Bluegrass ADD uniquely considered estimated potential losses in purely subjective terms. Its regional hazard risk assessment admits the weaknesses apparent in most local hazard mitigation plans that estimating potential losses for most hazard types usually require the unhelpful assumption that all assets are equally vulnerable. Bluegrass ADD defined a Calculated Vulnerability Risk methodology and surveyed its stakeholders persistently about how they would rank hazard types for their communities according to three variables, one of which was a subjective interpretation of losses that could occur from the hazard type.

<sup>7</sup> Fayette County writes its own multi-hazard mitigation plan independently of the Area Development District to which it belongs.

Area Development District	County	Estimated Losses
Buffalo Trace ADD	Bracken	\$ 1,500,857,120.00
	Fleming	\$ 1,870,756,500.00
	Lewis	\$ 2,125,877,600.00
	Mason	\$ 2,732,050,100.00
	Robertson	\$ 650,269,400.00
Cumberland Valley ADD	Bell	\$ 172,215,000.00
	Clay	\$ 648,626,000.00
	Harlan	\$ 551,164,345.00
	Jackson	\$ 42,510,000.00
	Knox	\$ 263,155,074.00
	Laurel	\$ 1,286,433,946.00
	Rockcastle	\$ 334,440,764.00
	Whitley	\$ 426,394,400.00
FIVCO	Boyd	\$3,373,238,000.00
	Carter	\$1,219,671,000.00
	Elliott	\$ 272,465,000.00
	Greenup	\$2,063,959,000.00
	Lawrence	\$ 684,745,000.00
Gateway ADD	Bath	\$ 838,500,000.00
	Menifee	\$ 522,656,000.00
	Montgomery	\$ 2,469,931,000.00
	Morgan	\$ 953,904,000.00
	Rowan	\$ 2,215,489,000.00
Green River ADD	Daviess	\$ 15,426,498,674.00
	Hancock	\$ 4,019,132,528.00
	Henderson	\$ 4,711,473,338.00
	McLean	\$ 2,090,997,652.00
	Ohio	\$ 1,733,482,044.00
	Union	\$ 2,990,835,384.00
	Webster	\$ 3,861,742,416.00
Kentucky River ADD	Breathitt	\$ 61,129,983.00
	Knott	\$ 216,264,573.00
	Lee	\$ 267,336,625.00
	Leslie	\$ 294,032,069.00
	Letcher	\$ 362,509,742.00
	Owsley	\$ 186,156,853.00
	Perry	\$ 452,788,163.00
	Wolfe	\$ 187,500,384.00

Area Development District	County	Estimated Losses
Kentuckiana Regional Planning and Development Agency (KIPDA) <sup>8</sup>	Bullitt	\$ -
	Henry	\$ -
	Jefferson <sup>9</sup>	\$ 32,261,350.00
	Oldham	\$ -
	Shelby	\$ -
	Spencer	\$ -
	Trimble	\$ -
Lake Cumberland ADD	Adair	\$ 2,448,567,780.00
	Casey	\$ 1,697,424,332.00
	Clinton	\$ 1,316,116,762.00
	Cumberland	\$ 967,288,669.00
	Green	\$ 1,348,920,110.00
	McCreary	\$ 1,139,879,571.00
	Pulaski	\$ 5,049,274,348.00
	Russell	\$ 1,613,920,706.00
	Taylor	\$ 2,694,903,118.00
	Wayne	\$ 1,668,379,353.00
Lincoln Trail ADD	Breckinridge	\$ 999,237,848.00
	Grayson	\$ 1,328,407,122.00
	Hardin	\$ 6,457,655,731.00
	LaRue	\$ 804,637,734.00
	Marion	\$ 971,747,221.00
	Meade	\$ 1,612,379,352.00
	Nelson	\$ 2,546,410,178.00
	Washington	\$ 622,977,057.00
Northern Kentucky ADD	Boone	\$ 15,011,357,000.00
	Campbell	\$ 11,032,354,000.00
	Carroll	\$ 1,122,982,000.00
	Gallatin	\$ 662,632,000.00
	Grant	\$ 2,231,669,280.00
	Kenton	\$ 29,879,599,815.00
	Owen	\$ 958,574,982.00
	Pendleton	\$ 1,212,853,158.00
Pennyrile ADD	Caldwell	\$ 596,494,200.00
	Christian	\$ 2,942,126,400.00
	Crittenden	\$ 321,089,600.00
	Hopkins	\$ 1,872,620,000.00
	Livingston	\$ 430,254,000.00
	Lyon	\$ 532,324,000.00
	Muhlenberg	\$ 1,063,050,000.00
	Todd	\$ 440,922,000.00
Trigg	\$ 953,316,000.00	

<sup>8</sup> KIPDA estimated potential losses only for government buildings.

<sup>9</sup> Louisville/Jefferson County writes its own multi-hazard mitigation plan independently of the Area Development District to which it belongs. Its loss estimate reflects the value of all of Jefferson County's assets.

Area Development District	County	Estimated Losses
Purchase ADD	Ballard	\$ 545,949,576.00
	Calloway	\$ 2,355,178,011.00
	Carlisle	\$ 234,857,047.00
	Fulton	\$ 277,810,192.00
	Graves	\$ 1,886,576,304.00
	Hickman	\$ 265,028,387.00
	Marshall	\$ 2,457,186,169.00
	McCracken	\$ 5,111,587,459.00
	Region CF <sup>10</sup>	\$ 3,187,950,000.00

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<sup>10</sup> The Purchase ADD did not disaggregate by county the estimated potential losses to its Critical Facilities (CF). So, the \$3.187 million dollar number reflects the additional losses for the whole region from vulnerable critical facilities.

## **A Note on Future Conditions**

The Commonwealth of Kentucky Enhanced Hazard Mitigation Plan for 2018 (CK-EHMP 2018) has relied on a recent study on climate conditions from modeling specific to Kentucky that was conducted by the United States Army Corps of Engineers (USACE) and the Ohio River Basin Alliance (ORB Alliance). This study is called *Ohio River Basin: Formulating Climate Change Mitigation/Adaptation Strategies through Regional Collaboration with the ORB Alliance*.

From this study, the Commonwealth of Kentucky assumes the following:

- There has been a gradual warming trend throughout the Ohio River Basin since the late 1970s.
- Precipitation has increased during the latter summer and early fall months since the late 1970s.
- Summer highs and winter lows between 2011 and 2040 will remain generally within what has been observed over that historic period. (But, record temperatures, rainfall, or drought cannot be ruled out.)
- The influence of the jet stream across the Ohio River Basin latitudes increases the *variability* of the weather (and further complicates forecasting future climatic conditions).
- Significant changes in river flow discharges and mean annual air temperatures will not be occurring before 2040. The climate will not vary substantially from what has been experienced between 1952 and 2001.

In other words, there has been gradual warming since the late 1970s. This gradual warming will continue without much significant change until 2040. (After 2040, the modeling in the study predicts temperatures may rise one (1) degree every decade through 2099.) Further, part of this gradual warming since the late 1970s involves precipitation increases. Precipitation increases affects nearly every hazard identified in this hazard mitigation plan: Landslides are triggered by precipitation; sinkholes flood with increased precipitation; flash flooding increases from severe storms; and winter storms either increase or become more severe.

The variability interpretation also is interesting and applicable to expected future conditions for Kentucky's identified hazards:

With gradual warming and its effects on summer highs and winter lows, with increased precipitation, and with increased variability of the weather, it is expected that the probability (or, rather, the frequency and/or severity) of wildfires will increase.