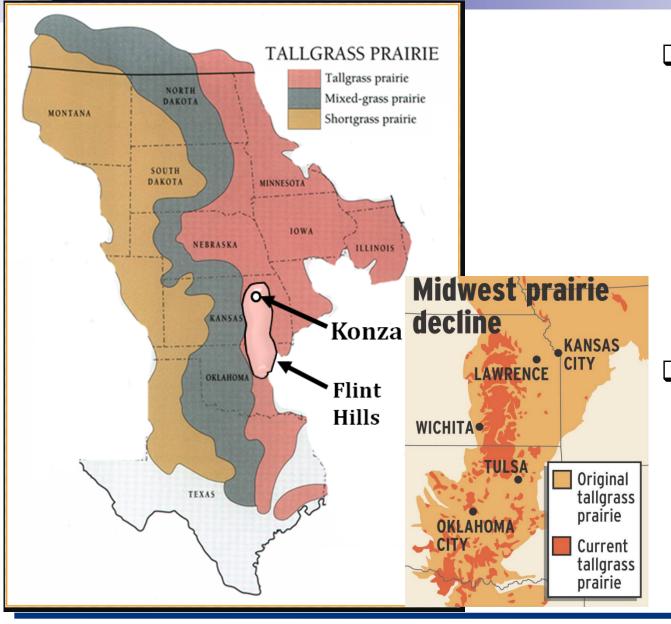


2017 Kansas Flint Hills Update

CenSARA Fall 2017 Business Meeting
St. Louis , MO
October 10, 2017

Douglas Watson, Meteorologist Chief, Monitoring and Planning Section Bureau of Air Kansas Department of Health and Environment

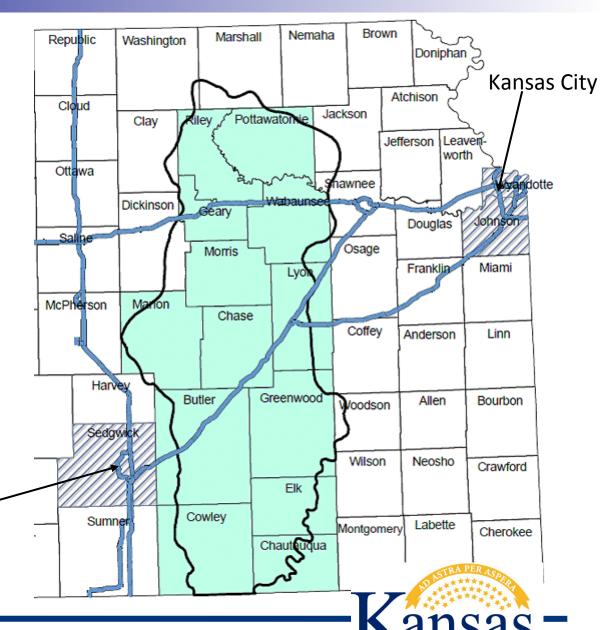


- ☐ Of the 170 million acres of historic tallgrass prairie that once covered N.
 America, less than 4% remain, primarily in the Flint Hills.
- ☐ One of the rarest and most endangered ecosystems in the world





Flint Hills ecosystem and SMP Counties



Department of Health and Environment

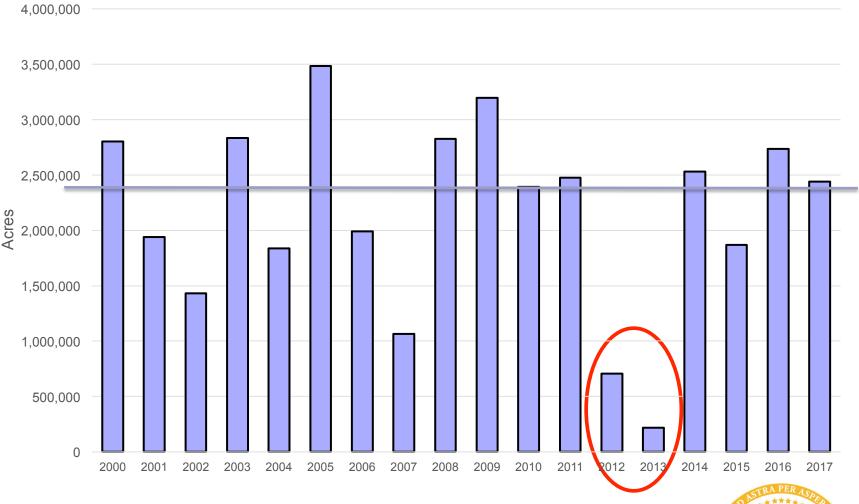
Wichita

Flint Hills Burning Background

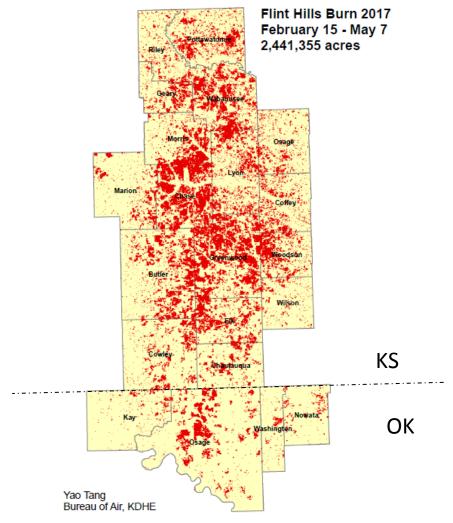
- Flint Hills ecosystem covers all or parts of 13 Kansas counties
- Prairie burned in March/April to preserve the ecosystem by controlling invasive trees, shrubs and plants and to improve cattle weight gain
- Safety conditions limit number of days that are suitable for burning
- 2,441,355 acres burned in 2017
- Burning caused ozone exceedances in 2003 2009, 2010, 2011, 2014, 2015 and 2016
- Burning caused PM_{2.5} exceedances in 2014, 2016 and 2017

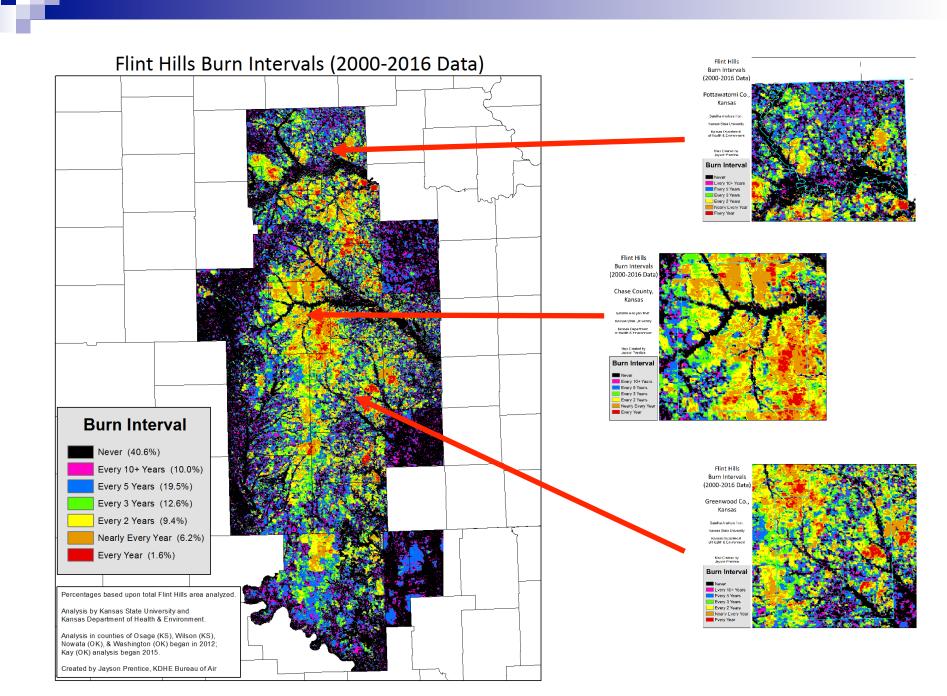
Department of Health and Environment

Flint Hills Prescribed Fire Total Acres Burned by Year



Satellite Derived Acres Burned in Flint Hills – (Feb. 15 – May 7, 2017)



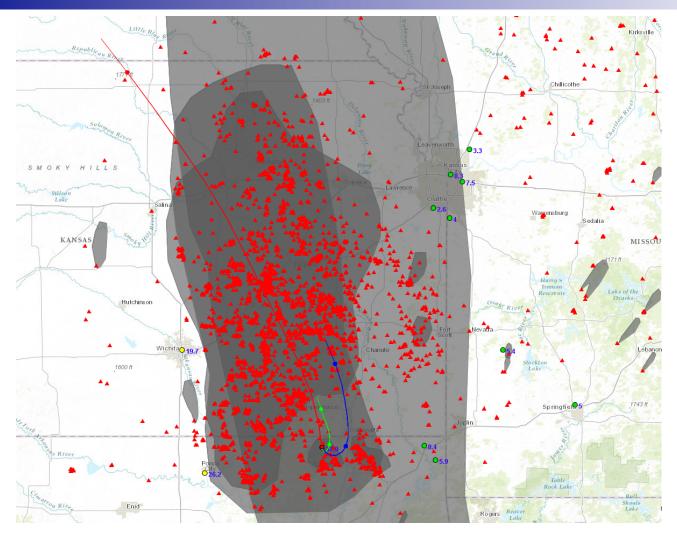


Flint Hills Prescribed Fire Acreage Burned by Year																	
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
																	220,221
	-	-	-				-	-	,	,	-					,	273,258
91,506	47,660	26,857	-	-	115,197	65,112	-	-	123,043	38,919	79,226		-	113,499		94,473	59,353
-	-	94,996		41,683	,	101,081			,	-	,			,			84,697
171,614	110,842	21,915	199,444	112,834	194,162	63,737	65,021	189,128	149,128	127,212	134,002	18,193	3,907	92,804	61,036	158,984	99,786
128,927	114,857	58,564	157,514	105,050	159,537	66,595	60,341	148,062	177,807	126,718	124,363	35,027	8,680	167,647	92,990	171,757	126,613
46,332	41,359	30,116	30,487	44,355	103,444	59,166	23,104	68,185	75,846	61,915	56,120	52,418	6,039	47,769	15,583	51,492	62,195
302,487	150,888	178,487	333,823	152,278	356,278	182,703	137,252	307,182	353,745	271,861	258,973	29,993	18,873	250,042	247,741	284,624	351,467
165,282	84,371	144,402	188,865	104,016	214,286	221,128	61,838	158,610	203,382	121,699	160,604	43,336	14,471	143,075	156,975	174,213	151,865
64,958	26,317	12,000	53,931	26,672	80,896	15,985	10,378	52,788	62,131	60,649	45,632	8,324	3,228	44,402	28,124	75,647	68,357
134,363	76,880	81,050	106,734	68,757	171,599	138,054	18,533	125,205	111,938	126,595	114,117	16,155	2,162	107,600	64,433	149,780	118,721
92,030	63,692	46,933	93,107	60,315	114,361	65,419	33,152	92,782	104,903	78,559	81,210	42,657	10,008	77,901	66,070	64,974	67,229
107,660	131,645	70,471	42,224	103,629	169,884	92,803	58,502	124,247	126,178	119,784	108,853	124,480	5,961	120,882	63,229	89,114	125,671
90,749	77,714	71,413	63,073	71,073	128,046	97,143	70,457	92,479	116,510	86,703	89,490	85,561	36,201	84,032	50,039	64,110	63,723
195,444	128,741	136,664	173,591	157,359	281,467	273,684	91,723	240,880	261,838	183,521	203,319	64,047	23,552	240,173	102,349	199,804	194,954
50,605	35,022	25,807	51,197	33,166	62,884	35,972	10,969	51,019	57,684	43,198	44,655	7,985	8,417	33,236	22,688	23,136	31,090
73,838	73,266	48,386	85,375	62,100	99,043	52,664	54,981	86,301	97,622	59,954	73,855	19,599	12,124	82,271	82,596	79,276	100,759
48,162	33,332	24,562	48,726	31,565	59,849	34,236	18,355	48,556	54,900	41,113	42,500	4,880	4,834	68,217	64,773	48,186	25,051
303,691	318,518	88,139	407,321	241,066	346,533	102,595	78,579	274,255	333,962	237,792	265,387	36,155	22,147	275,278	206,504	301,258	173,703
50,295	34,808	25,649	50,884	32,963	62,499	35,752	14,504	50,706	57,331	42,933	44,382	4,309	3,351	48,371	45,669	32,387	14,904
															32,711	32,526	27,738
2,802,963	1,939,859	1,429,438	2,835,778	1,837,021	3,483,101	1,992,477	1,066,809	2,825,876	3,195,053	2,392,693	2,473,423	706,016	217,377	2,529,468	1,870,018	2,736,791	2,441,355
		, ,			10.10.11												
ıılable; Estir	mated based	i on year's ov	erali average	e burn rate m	nultiplied by a	county's gras	sland acreag	e									
1 2000-2017	7																
1 2000-2017	7 w/o 2012-2	2013 drought	years														
			-														
b	68,649 171,614 128,927 46,332 302,487 165,282 64,958 134,363 92,030 107,660 73,838 48,162 303,691 50,295 ,802,963 2000-201	297,653 177,390 318,718 184,340 91,506 47,660 68,649 28,216 171,614 110,842 128,927 114,857 46,332 41,359 302,487 150,888 165,282 84,371 64,958 26,317 134,363 76,880 92,030 63,692 107,660 131,645 90,749 77,714 195,444 128,741 50,605 35,022 73,838 73,266 48,162 33,332 303,691 318,518 50,295 34,808	297,653 177,390 74,487 318,718 184,340 168,541 91,506 47,660 26,857 68,649 28,216 94,996 171,614 110,842 21,915 128,927 114,857 58,564 46,332 41,359 30,116 6302,487 150,888 178,487 165,282 84,371 124,402 64,958 26,317 12,000 134,363 76,880 81,050 92,030 63,692 46,933 107,660 131,645 70,471 90,749 77,714 71,413 195,444 128,741 136,664 50,605 35,022 25,807 73,838 73,266 48,386 48,162 33,332 24,562 303,691 318,518 88,139 50,295 34,808 25,649	297,653 177,390 74,487 259,012 318,718 184,340 168,541 278,487 91,506 47,660 26,857 123,460 68,649 28,216 94,996 88,525 171,614 110,842 21,915 199,444 128,927 114,857 58,564 157,514 46,332 41,359 30,116 30,487 302,487 150,888 178,487 333,823 165,282 84,371 144,402 188,865 64,958 26,317 12,000 53,931 134,363 76,880 81,050 106,734 92,030 63,692 46,933 93,107 107,660 131,645 70,471 42,224 90,749 77,714 71,413 63,073 195,444 128,741 136,664 173,591 50,605 35,022 25,807 51,197 73,838 73,266 48,386 85,375 48,162 33,332 24,562 48,726 303,691 318,518 88,139 407,321 50,295 34,808 25,649 50,884	297,653 177,390 74,487 259,012 126,162 318,718 184,340 168,541 278,487 186,857 91,506 47,660 26,857 123,460 75,120 68,649 28,216 94,996 88,525 41,683 171,614 110,842 21,915 199,444 112,834 128,927 114,857 58,564 157,514 105,050 46,332 41,359 30,116 30,487 44,355 302,487 150,888 178,487 333,823 152,278 165,282 84,371 144,402 188,865 104,016 64,958 26,317 12,000 53,931 26,672 134,363 76,880 81,050 106,734 68,757 92,030 63,692 46,933 93,107 60,315 107,660 131,645 70,471 42,224 103,629 90,749 77,714 71,413 63,073 71,073 195,444 128,741 136,664 173,591 157,359 50,605 35,022 25,807 51,197 33,166 73,838 73,266 48,386 85,375 62,100 48,162 33,332 24,562 48,726 31,565 303,691 318,518 88,139 407,321 241,066 50,295 34,808 25,649 50,884 32,963	2000 2001 2002 2003 2004 2005 297,653 177,390 74,487 259,012 126,162 309,962 318,718 184,340 168,541 278,487 186,857 340,772 91,506 47,660 26,857 123,460 75,120 115,197 68,649 28,216 94,996 88,525 41,683 112,402 171,614 110,842 21,915 199,444 112,834 194,162 128,927 114,857 58,564 157,514 105,050 159,537 46,332 41,359 30,116 30,487 44,355 104,016 214,286 64,958 150,888 178,487 333,823 152,278 356,278 165,282 84,371 12,000 53,931 26,672 80,896 134,363 76,880 81,050 106,734 68,757 171,599 92,030 63,692 46,933 93,107 60,315 114,361 107,660	2000 2001 2002 2003 2004 2005 2006 297,653 177,390 74,487 259,012 126,162 309,962 91,182 318,718 184,340 168,541 278,487 186,857 340,772 197,467 91,506 47,660 26,857 123,460 75,120 115,197 65,112 68,649 28,216 94,996 88,525 41,683 112,402 101,081 171,614 110,842 21,915 199,444 112,834 194,162 63,737 128,927 114,857 58,564 157,514 105,050 159,537 66,595 46,332 41,359 30,116 30,487 44,355 103,444 59,166 46,332 41,359 30,116 30,487 44,355 103,444 59,166 46,928 150,888 178,487 333,823 152,278 356,278 182,703 165,282 84,371 12,000 53,931 26,672 80,896	2000 2001 2002 2003 2004 2005 2006 2007 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 68,649 28,216 94,996 88,525 41,683 112,402 101,081 61,282 2171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 128,927 114,857 58,564 157,514 105,050 159,537 66,595 60,341 46,332 41,359 30,116 30,487 44,355 103,444 59,166 23,104 302,487 150,888 178,487 333,823 152,278 356,228 182,703 137,252 165,282 84,371 144,402 188,865 104,	2000 2001 2002 2003 2004 2005 2006 2007 2008 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 286,610 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 85,390 68,649 28,216 94,996 88,525 41,683 112,402 101,081 61,282 75,460 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 128,927 114,857 58,564 157,514 105,050 159,537 66,595 60,341 148,062 46,332 41,359 30,116 30,487 44,355 103,444 59,166 23,104 68,185 165,282 84,371 144,402 188,865 104,016 214,286 221,128 61,838 158,610 64,958 26,317 12,000 53,931 26,672 80,896 15,985 10,378 52,788 134,363 76,880 81,050 106,734 68,757 171,599 138,054 18,533 125,205 92,030 63,692 46,933 93,107 60,315 114,361 65,419 33,152 92,782 107,660 131,645 70,471 42,224 103,629 169,884 92,803 58,502 124,247 90,749 77,714 71,413 63,073 71,073 128,046 97,143 70,457 92,479 195,444 128,741 136,664 173,591 157,359 281,467 273,684 91,723 240,880 50,005 35,022 25,807 51,197 33,166 62,884 35,972 10,969 51,019 73,838 73,266 48,386 88,375 62,100 99,043 52,664 54,981 86,301 48,162 33,332 24,562 48,726 31,565 59,849 34,236 18,355 48,556 303,691 318,518 88,139 407,321 241,066 346,533 10,295 78,579 274,255 50,295 34,808 25,649 50,884 32,963 62,499 35,752 14,504 50,706 10ble; Estimated based on year's overall average burn rate multiplied by county's grassland acreage	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 286,610 310,487 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 85,390 123,043 68,649 28,216 94,996 88,525 41,683 112,402 101,081 61,282 75,460 122,857 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,128 128,927 114,857 58,564 157,514 105,050 159,537 66,595 60,341 148,062 177,807 46,332 41,359 30,116 30,487 44,355 103,444 59,166 23,104 68,185 75,846 302,487 150,888 178,487 333,823 152,278 356,278 182,703 137,252 307,182 353,745 165,282 84,371 144,402 188,865 104,016 214,286 221,128 61,838 158,610 203,382 64,958 26,331 12,000 53,931 26,672 80,896 15,985 10,378 52,788 62,131 134,363 76,880 81,050 106,734 68,757 171,599 138,054 18,533 125,205 111,938 92,030 63,692 46,933 93,107 60,315 114,361 65,419 33,152 92,782 104,903 107,660 131,645 70,471 42,224 103,629 169,884 92,803 58,502 124,247 126,178 90,749 77,714 71,413 63,073 71,073 128,046 97,143 70,457 92,479 116,510 195,444 128,741 136,664 173,591 157,359 281,467 273,684 91,723 240,880 261,838 50,605 35,022 25,807 51,197 33,166 62,884 35,972 10,969 51,019 57,684 73,838 73,266 48,386 85,375 62,100 99,043 52,664 54,981 86,301 97,622 48,162 33,332 24,562 48,726 31,565 59,849 34,236 18,355 48,556 54,900 303,691 318,518 88,139 407,321 241,066 346,533 102,595 78,579 274,255 333,962 50,295 34,808 25,649 50,884 32,965 62,499 35,572 14,504 50,076 57,331 140,66; Estimated based on year's overall average burn rate multiplied by county's grassland acreage	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 241,189 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 286,610 310,487 280,124 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 85,390 123,043 38,919 68,649 28,216 94,996 88,525 41,683 112,402 101,081 61,282 75,460 122,857 42,255 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,128 127,212 128,927 114,857 58,564 157,514 105,050 159,537 66,595 60,341 148,062 177,807 126,718 46,332 41,359 30,116 30,487 44,355 103,444 59,166 23,104 68,185 75,846 61,915 105,282 84,371 144,402 188,865 104,016 214,286 221,128 61,838 158,610 203,382 121,699 64,958 26,317 12,000 53,931 26,672 80,896 15,985 10,378 52,788 62,131 60,649 134,363 76,880 81,050 106,734 68,757 171,599 138,054 18,533 125,205 111,938 126,595 107,660 131,645 70,471 42,224 103,629 169,884 92,803 58,502 142,427 126,178 119,784 99,749 77,714 71,413 63,073 71,073 128,046 97,43 70,457 92,479 116,510 86,703 179,5444 128,741 136,664 173,591 157,359 281,467 273,684 91,723 240,880 261,838 138,510 197,622 59,954 48,162 33,332 24,562 48,726 31,565 59,849 35,575 14,504 50,000 25,835 1,8355 44,855 54,900 41,113 180,664 173,591 157,359 281,467 273,684 91,723 240,880 261,838 183,521 50,605 35,022 25,807 51,197 33,166 62,884 35,972 10,969 51,019 57,684 43,198 73,838 73,266 48,386 85,375 62,100 99,043 52,664 54,981 86,301 97,622 59,954 48,162 33,332 24,562 48,726 31,565 59,849 34,236 18,355 44,556 54,900 41,113 303,691 318,518 88,139 407,321 241,066 346,533 102,595 78,579 274,255 333,962 237,792 50,295 34,808 25,649 50,884 32,963 62,499 35,752 14,504 50,706 57,331 42,933 10abe; Estimated based on year's overall average burn rate multiplied by county's grassland acreage	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 241,189 213,883 45,004 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 286,610 310,487 280,124 255,240 28,912 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 85,390 123,043 38,919 79,226 12,819 140,966 85,252 41,683 112,402 101,081 61,1282 75,600 122,857 42,255 77,612 26,162 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,128 127,212 134,002 18,193 128,927 114,857 58,564 157,514 105,050 159,557 66,595 60,341 148,062 177,807 126,718 124,363 35,027 146,332 41,359 30,116 30,487 44,355 103,444 59,166 23,104 86,185 75,846 61,915 65,120 52,418 302,487 150,888 178,487 333,823 152,278 356,278 182,703 137,252 307,182 353,745 271,861 258,973 29,993 165,282 84,371 144,402 188,865 104,016 214,286 221,286 61,915 61,000 203,382 121,699 160,604 43,336 44,988 26,317 12,000 55,951 26,672 80,896 115,985 10,378 52,788 62,131 60,649 45,652 83,324 134,363 76,880 81,050 106,734 68,757 171,599 138,054 18,533 125,205 111,938 126,595 114,117 16,155 107,660 131,645 70,471 42,224 103,629 169,884 92,803 88,502 124,247 126,178 119,784 108,853 124,480 90,749 77,714 71,413 63,073 71,073 128,046 97,143 70,457 92,479 116,510 86,703 89,490 85,561 195,444 128,741 136,664 173,591 157,359 281,467 723,684 19,733 24,880 136,510 136,544 136,664 173,591 157,359 281,467 723,684 19,733 24,880 136,541 136,664 173,591 157,359 281,467 723,684 19,733 240,880 256,49 43,362 25,867 51,197 33,166 62,884 35,972 10,969 51,019 57,664 43,198 44,655 79,85 19,593 18,510 18,534 12,600 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40,947 13,555 14,500 40	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 241,189 213,883 45,004 13,097 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 286,610 310,487 280,124 255,240 28,912 5,174 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 85,390 123,043 38,919 79,226 12,819 3,985 86,649 82,216 94,996 88,525 41,683 112,402 101,081 61,282 75,460 122,857 42,255 77,612 26,162 11,166 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,128 127,212 134,002 18,193 3,907 128,927 114,857 58,564 157,514 105,050 159,537 65,955 60,341 148,062 177,807 126,718 124,363 35,027 8,680 46,332 41,359 30,116 30,487 44,355 103,444 59,166 23,104 68,185 75,846 61,915 56,102 52,418 6,039 302,487 150,888 178,487 333,823 152,278 36,278 182,703 137,252 307,182 353,745 277,861 26,604 43,336 165,282 84,371 144,402 188,865 104,016 214,286 221,128 61,838 158,610 203,382 121,699 160,604 43,336 14,471 40,988 26,317 12,000 53,931 26,672 80,896 15,985 10,378 52,788 62,131 60,649 45,632 8,324 3,228 134,363 76,880 81,050 106,734 68,757 171,599 138,054 18,533 125,205 111,938 126,595 114,117 16,155 2,162 92,030 63,692 46,933 93,107 60,315 114,361 65,419 33,152 92,789 110,510 86,703 89,490 85,561 36,201 195,444 128,741 174,143 63,073 71,073 128,046 97,143 70,457 92,479 116,510 86,703 89,490 85,561 36,201 195,444 128,741 136,654 77,774 42,224 103,629 169,884 97,23 684 97,732 40,880 183,521 203,339 64,047 23,552 30,665 35,022 25,807 51,197 33,166 62,884 33,977 10,966 95,109 57,684 43,139 84,655 79,985 84,120 42,657 10,008 100,660 131,645 70,471 42,224 103,629 169,884 97,232 40,880 183,521 203,339 64,047 23,552 30,665 35,022 25,807 51,197 33,166 62,884 33,977 10,966 95,109 57,684 43,139 44,655 7,985 84,120 42,657 10,008 100,660 131,645 70,471 42,224 103,629 169,884 93,989 13,989 13,989 14,685 7,985 84,120 42,657 10,008 100,660 131,645 70,471 42,224 103,629 169,884 93,989 14,988 138,989 14,883 126,595 144,141 11,14,14 11,14,14 11,14	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 241,189 213,883 45,004 13,097 166,442 318,718 184,340 168,541 278,487 136,887 340,772 197,467 54,425 286,610 310,487 280,124 255,240 28,912 5,174 288,529 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 88,539 123,043 38,919 79,226 12,819 3,985 113,499 91,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 88,539 123,043 38,919 79,226 12,819 3,985 113,499 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 13,915 199,444 112,834 194,162 63,737 65,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 21,915 199,444 112,834 194,162 63,737 165,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 21,915 199,444 112,834 194,162 63,737 165,021 189,128 149,126 127,212 134,002 18,193 3,907 92,804 171,614 110,842 21,915 199,444 112,834 194,162 63,737 165,021 189,128 149,128 127,212 134,002 18,193 3,907 92,804 171,614 110,842 12,916 190,144 112,820 121,145 11	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 297,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 241,189 213,883 45,004 13,097 166,442 94,349 318,718 184,340 168,541 278,487 186,857 340,772 197,467 54,425 286,610 310,487 280,124 255,240 28,912 51,74 288,529 218,860 91,506 47,660 26,587 123,460 75,120 115,97 65,112 21,575 85,390 123,043 38,919 79,226 12,919 3985 113,499 71,321 68,649 28,216 94,996 88,525 41,683 112,402 101,081 61,282 75,460 122,857 42,255 77,612 26,162 11,166 77,298 81,978 171,614 110,842 21,915 399,444 112,834 194,162 65,737 65,502 188,102 149,022 17,780 71,2712 140,002 18,193 3,907 92,804 61,036 46,332 41,359 30,116 30,487 185,551 105,503 159,537 66,595 60,341 41,867 38,564 157,544 61,915 33,482 133,883 132,289 135,278 85,627 812,703 137,252 307,182 35,745 271,861 28,973 29,993 18,873 250,042 247,761 165,282 84,371 144,402 188,865 104,016 214,286 221,128 61,838 158,610 203,382 114,699 160,604 43,336 14,471 143,075 156,973 66,973 67,888 178,880 106,504 50,674 68,757 171,599 186,054 18,533 125,205 114,117 16,155 21,62 10,7660 64,433 92,036 63,692 46,933 93,071 40,224 68,757 171,599 186,054 18,533 125,205 114,117 16,155 21,62 10,7660 64,433 92,036 63,692 46,933 93,071 40,224 68,757 171,599 186,054 18,533 125,205 114,247 114,361 68,573 77,047 42,224 103,693 15,695 10,378 52,788 62,131 10,464 70,471 42,224 103,693 156,988 97,994 171,414 13,645 70,471 42,224 103,693 15,985 10,378 52,788 18,793 126,595 114,117 16,155 21,62 107,660 64,433 92,036 63,692 46,933 93,071 40,234 68,757 171,599 186,054 18,335 125,205 114,119 38 125,595 114,117 16,155 21,62 107,660 64,433 92,036 63,692 46,933 93,071 40,224 46,895 61,398 49,90 85,561 10,369 173,393 126,595 114,411 16,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,414 18,415 65,419 30,4	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 227,653 177,390 74,487 259,012 126,162 309,962 91,182 121,838 268,031 293,761 241,189 213,883 45,004 13,097 166,442 94,349 245,921 318,181 184,340 168,541 278,4487 186,857 340,772 197,467 54,425 286,610 310,487 280,124 255,240 28,912 5,174 288,529 218,660 318,679 31,506 47,660 26,857 123,460 75,120 115,197 65,112 21,575 88,390 123,048 38,919 79,226 12,181 3,985 113,499 71,121 94,473 88,549 28,216 94,996 88,525 41,683 112,402 101,081 61,282 75,440 122,857 42,255 77,612 26,162 11,166 77,298 81,978 76,450 172,1614 110,842 21,915 199,444 112,834 194,162 63,737 65,021 189,128 149,128 149,128 147,121 194,473 145,353 30,007 92,804 61,036 158,984 128,837 30,161 30,447 44,355 103,444 59,166 23,104 68,185 75,846 61,915 56,120 52,418 6,039 47,769 15,583 51,492 165,282 84,371 144,402 188,865 104,016 214,286 221,128 61,283 118,610 203,882 178,879 33,982 152,278 36,5278 182,703 137,252 307,182 135,478 271,861 258,973 29,999 18,873 250,042 247,411 284,624 153,883 26,317 12,000 53,931 66,672 171,599 18,054 18,333 125,205 111,988 126,595 114,117 16,155 2,162 107,600 64,433 149,700 92,030 65,652 46,533 93,107 60,315 114,361 65,419 33,152 92,782 104,903 88,500 140,162 214,286 221,128 61,838 128,610 203,882 121,699 160,604 43,336 14,471 143,075 156,975 174,213 143,615 65,419 30,145 67,647 14,224 100,629 169,848 29,849 38,230 125,605 114,117 16,155 2,162 107,600 64,433 149,700 92,030 65,652 46,533 93,107 603,515 114,361 65,419 33,152 92,782 104,903 88,505 18,210 42,657 100,008 67,790 166,070 64,974 105,444 12,444 103,625 169,849 31,525 20,782 104,903 88,505 18,210 42,657 100,008 67,974 128,640 13,340 14,402 138,865 104,016 214,286 221,128 61,838 125,205 111,988 126,559 114,117 16,155 2,162 107,600 64,433 149,700 92,000 64

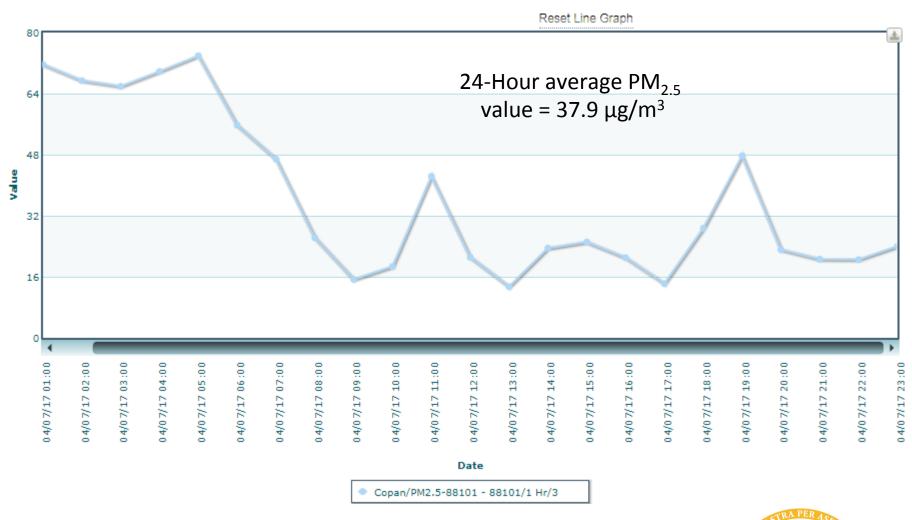


April 7, 2017 Copan, OK PM_{2.5} Exceedance





HYSPLIT backward air trajectories for previous 12 hours at heights of 10 meters (green), 100 meters (blue), and 1000 meters (red), valid at 6am CDT, April 7, 2017. Hourly PM_{2.5} values shown.



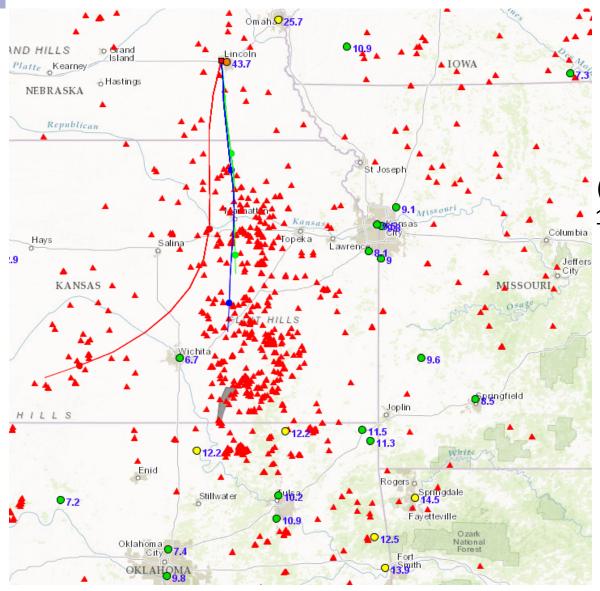
Hourly PM_{2.5} Values on April 7, 2017 at Copan, OK



April 8, 2017 Lincoln, NE PM_{2.5} Event*

* - PM_{2.5} continuous instrument in Lincoln is not used as reference or equivalent method monitor and has a known high bias





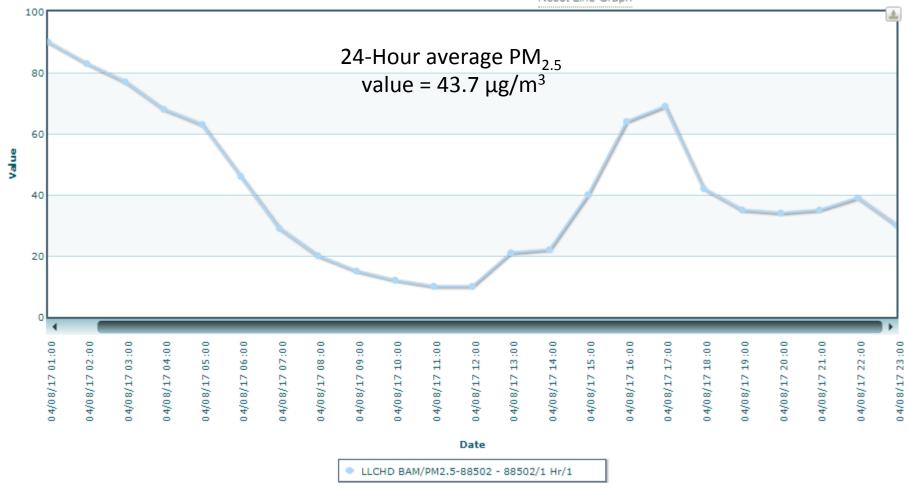
HYSPLIT backward air trajectories for previous 12 hours at heights of 10 meters (green), 100 meters (blue), and 1000 meters (red), valid at 5pm CDT, April 8, 2017.



Our vision is 'healthy Kansans living in safe and sustainable environments'.

The state belongs to all of us - "Kansas Don't Spoil It"





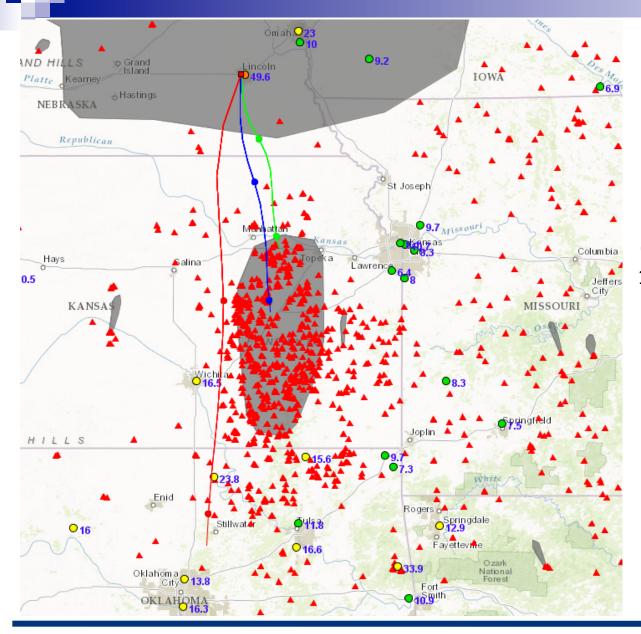
Hourly PM_{2.5} Values on April 8, 2017 at Lincoln-Lancaster County Health Department



April 12, 2017 Lincoln, NE PM_{2.5} Event*

* - PM_{2.5} continuous instrument in Lincoln is not used as reference or equivalent method monitor and has a known high bias





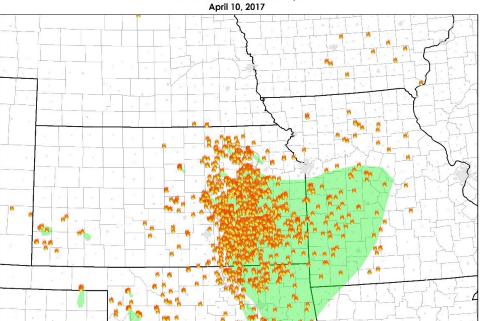
HYSPLIT backward air trajectories for previous 12 hours at heights of 10 meters (green), 100 meters (blue), and 1000 meters (red), valid at 8pm CDT, April 12, 2017.



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HMS Fire & Smoke Analysis April 10, 2017

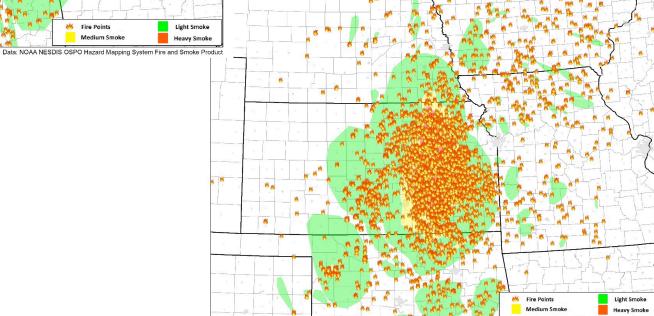


Map: Jayson Prentice, KDHE Bureau of Air

Fire Points

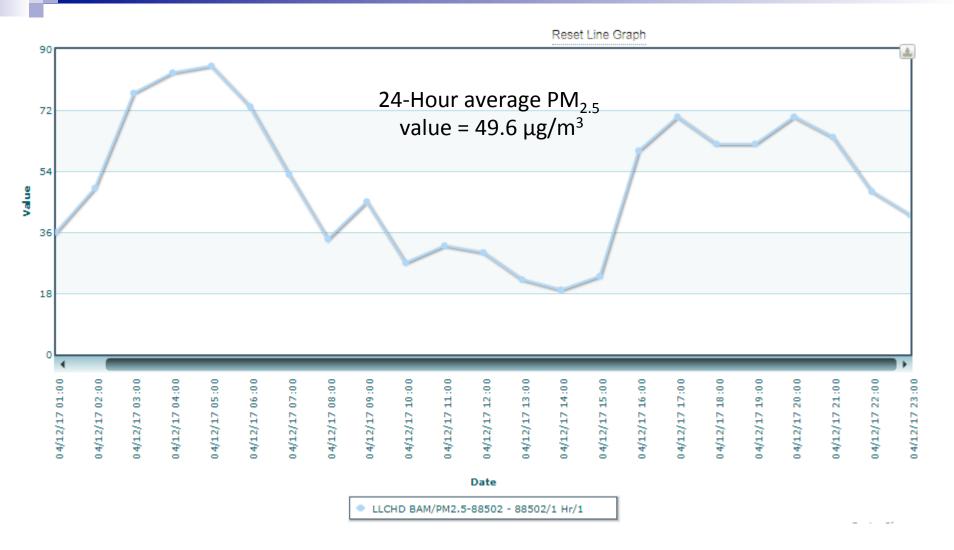
Medium Smoke

HMS Fire & Smoke Analysis April 11, 2017



Map: Jayson Prentice, KDHE Bureau of Air

Data: NOAA NESDIS OSPO Hazard Mapping System Fire and Smoke Product



Hourly PM_{2.5} Values on April 12, 2017 at Lincoln-Lancaster County Health Department



www.ksfire.org Website Home Page

- Developed as part of SMP
- One stop shop for land managers
- **Smoke Modeling tool**



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Smoke Model

Weather Smoke Models

*NEW SMOKE MODEL for mobile device

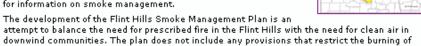


Kansas Flint Hills Smoke Management

grasslands in the Flint Hills.

Welcome to the Kansas Flint Hills Smoke Management Website, This site has been developed to provide one location for land managers. conducting prescribed burns in the Flint Hills to obtain information and access tools to assist them in making burn decisions.

The website is the result of the development of the Flint Hills Smoke Management Plan. It provides training, regulations, policies, publications, a modeling tool and other links to guide people looking for information on smoke management.



Instead, the plan takes a voluntary approach toward improving air quality during the burn season. The plan's voluntary approach leaves flexibility in the hands of the land manager but also puts the responsibility on him or her to make wise decisions.

The plan and website are cooperative efforts of countless persons with many perspectives on Flint Radio Broadcasts Hills burning. We encourage land managers to use the site and to provide us feedback on organization, content, ease of use, and ways in which the site can be improved for the next burn



AT A GLANCE

pril Burning Restrictions.pdf

Smoke Management Plan

ire Management Practices to Improve Air Quality.pdf

ounty Burn Permit Info

urrent Burn Bans

ire Management Practices

2013 Air Quality Health

Site Map

IN THE NEWS

Videos

- Preserving the Tallgrass
- Bibliography
- Through the Haze: Prescribed Fire and Smoke Management

Burn Advisories

2013 2012 2011

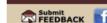
News/Media Archives

- Acreage Reporting
- · 2011 Pilot Programs

WEATHER



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KDHE Pre-burn/Burn Season Activities

- Meeting with SMP stakeholder group in January to discuss 2016 season and air quality impacts
- Newsletter briefings prior to burn seasons
- Numerous presentations to land managers
- Health alert press release to public prior to burn season and midseason as warranted
- Held a pre-season call with Flint Hills county extension agents to talk about potential air quality impacts and mitigation strategies.
- Held several calls/e-mails with NDEQ staff on development of their fire/smoke notification/education webpage
- Daily/Weekly discussions/notifications to downwind states/health departments in 2017 to potential downwind smoke effects
- Weekly updates to all stakeholders on season burn progression and any air quality impacts



KDHE Pre-burn/Burn Season Activities (con't)

- Daily radio announcements of modeling tool results for potential air quality impacts
- Reviewed, updated, reprinted and distributed smoke management brochure throughout the Flint Hills through county agents, other agency staff, and at burn workshops
- KSU participated and take lead on Biomass Estimation research project to determine the feasibility of estimating fuel loads with low altitude aerial imagery and software (drone flights) to improve modeling tool
- Continue great cooperation with KSU on education/outreach



Post 2017 Burn Season Activities

- Working with EPA on additional modeling tools to assist KDHE and ranchers to limit downwind impacts of smoke
- Collaborating with EPA on research project using balloon mounted instrumentation to better characterize smoke emissions and improve inputs to modeling tools
- Intensify outreach and education to Flint Hills Stakeholders on smoke impacts and existing tools and practices available to mitigate impacts including alternate burn seasons (i.e Summer/Fall Burns)
- Meeting with SMP Subcommittee November 27 to discuss season and path forward.
- Meeting with Kansas Farm Bureau to discuss KFB policy, AG-13 Controlled Prescribed Burning......

AND

Collaborating with KSU, T&B Systems and NASA to investigate the use of UASs (drones) and small instrumentation packages to characterize smoke emissions and improve inputs to modeling tools.

Goal is to be ready by Spring 2018 season to fly smoke plumes in Flint Hills.



Questions







www.kdheks.gov

Weather History & Observations Emporia, KS Municipal Airport

2017	Temp.	(°F)		Dew Point (°F)			Humid	Humidity (%)			Sea Level Press. (in)			Visibility (mi)			mph)		Precip. (in)	Events
Mar	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
20	86	72	58	60	54	46	100	65	30	30.01	29.91	29.85	10	10	6	22	10	29	0.00	
21	62	55	48	45	39	28	71	54	36	30.29	30.14	30.01	10	10	10	28	17	34	0.00	
22	57	49	41	39	29	25	61	47	32	30.34	30.24	30.12	10	10	10	26	15	31	0.00	
23	77	65	53	54	48	41	77	59	40	30.10	29.90	29.71	10	10	10	33	21	42	Т	
24	73	61	48	56	50	45	68	57	45	29.85	29.78	29.70	10	9	1	35	16	45	0.44	Rain , Thun
25	49	46	42	49	44	42	100	96	92	29.95	29.88	29.79	10	6	1	25	13	31	0.33	Rain
26	56	50	43	52	46	43	100	92	83	29.96	29.89	29.81	10	5	1	18	7	28	0.67	Rain , Thun
27	56	51	45	49	47	45	100	86	72	30.01	29.91	29.83	10	8	4	15	8	19	0.05	Rain
28	55	52	49	52	49	46	100	92	83	30.07	29.97	29.86	10	8	2	30	12	37	0.85	Rain
29	68	58	48	62	52	46	100	84	67	29.87	29.70	29.57	10	5	1	28	15	35	1.53	Rain , Thun
30	49	46	43	49	45	43	100	96	92	29.83	29.62	29.51	10	6	2	22	13	28	0.07	Rain
31	53	48	43	44	42	41	100	86	71	30.09	29.95	29.81	10	10	7	15	9	18	0.00	
2017	17 Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibil	Visibility (mi)			mph)		Precip. (in)	Events
Apr	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	55	50	44	47	44	40	100	86	71	30.17	30.11	30.05	10	8	2	23	13	29	0.14	Rain
2	62	55	47	57	52	47	100	92	84	30.06	29.87	29.67	10	5	0	13	5	15	0.19	Fog , Rain
3	67	60	53	56	53	49	100	78	56	29.72	29.57	29.50	10	6	2	20	11	25	1.06	Rain , Thun
4	53	49	44	49	46	41	100	92	83	29.86	29.74	29.65	10	7	2	26	13	31	0.73	Rain , Thun
5	61	51	40	46	42	35	100	72	43	30.08	29.83	29.66	10	8	2	31	16	42	0.65	Rain , Thur
6	61	50	38	40	35	31	92	62	32	30.27	30.20	30.09	10	10	10	18	9	30	0.00	
7	67	50	33	42	37	32	96	64	32	30.25	30.10	29.90	10	7	2	22	10	27	0.00	
8	80	66	52	59	52	42	83	63	43	29.88	29.70	29.61	10	9	6	28	19	38	0.00	