

# The Kansas Flint Hills Smoke Management Plan



# Kansas SMP

1. Introduction- Flint Hills Ecosystem
2. Why a Plan Is Needed
3. Reducing Impacts of Prescribed Burning
4. Non-ecological Burn Ban
5. Outreach, Education and Notification Plan
6. Surveillance and Enforcement
7. Data Collection and Research Needs
8. Evaluation and Contingency Measures

# What is prescribed burning?

- Fire used under specific conditions to accomplish defined goals.
- Prescription (set of conditions) is used in order to achieve the intended effect.
- Fire is confined to intended area.

# Historical Frequency of Fire

A landscape photograph showing a grassy plain with a prominent rocky outcrop in the foreground. The sky is clear and blue. The text is overlaid on the image.

Kansas climate is conducive to fire.

- Frequent, persistent, high winds
- Low humidity
- High temperatures
- Lightning strikes

# Historical Frequency of Fire

- Used by Native Americans
  - More deliberately set fires than lightning fires
- Frequency in Great Plains 2-3 times/5 years
  - Interval unpredictable, based on weather, vegetative growth, lightning potential

# Reasons for Prescribed Burning

**Increase desirable vegetation**

**Decrease undesirable vegetation**

**Improve grazing distribution**

**Enhance livestock performance**

**Improve plant vigor: litter and thatch removal**

**Manipulate wildlife habitat**

**Maintain prairie ecosystem**

**Reduce wildfire severity**

**Comply with CRP contract requirements**

**Prepare seedbed**

# Extent of Burning in the Flint Hills

- About 60,000 acres have been burned all of the past 7 years (2003-2009).
- Chase, Wabaunsee, and Greenwood counties each had 10,000+ acres that burned all 7 years.
- **Frequent burning is necessary in the tallgrass region of Kansas to maintain prairie vegetation.**

# Reasons for a SMP

- High ozone readings in 2003 in Kansas City area partially attributable to smoke from prescribed burns.
- Concerns about health.
- Concerns about non-attainment of air quality standards.
- Required by EPA to write a plan to mitigate the effects of smoke from prescribed burning.

# Air Monitoring Locations

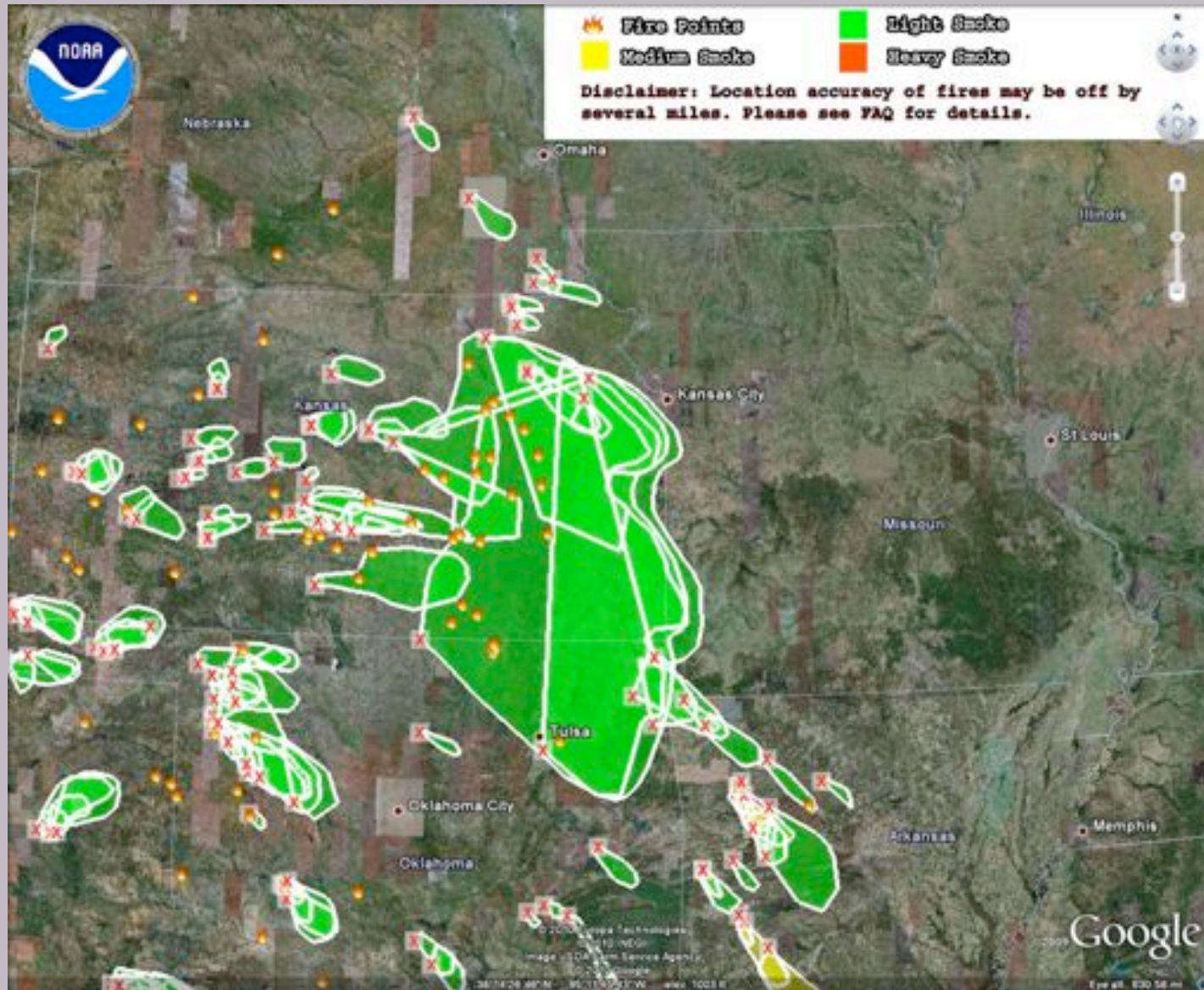
- Air quality is monitored Apr. 1- Oct. 31.
- Kansas City, Wichita, and Topeka currently have continual monitoring.
- Smoke from prescribed burning adds to existing air quality problems.
- Ozone standards are expected to be lowered in the very near future.

# Kansas Current O3 Monitoring Sites, 2010



	O3 Monitor		Interstate
	County		US

Thursday, April 8, 2010



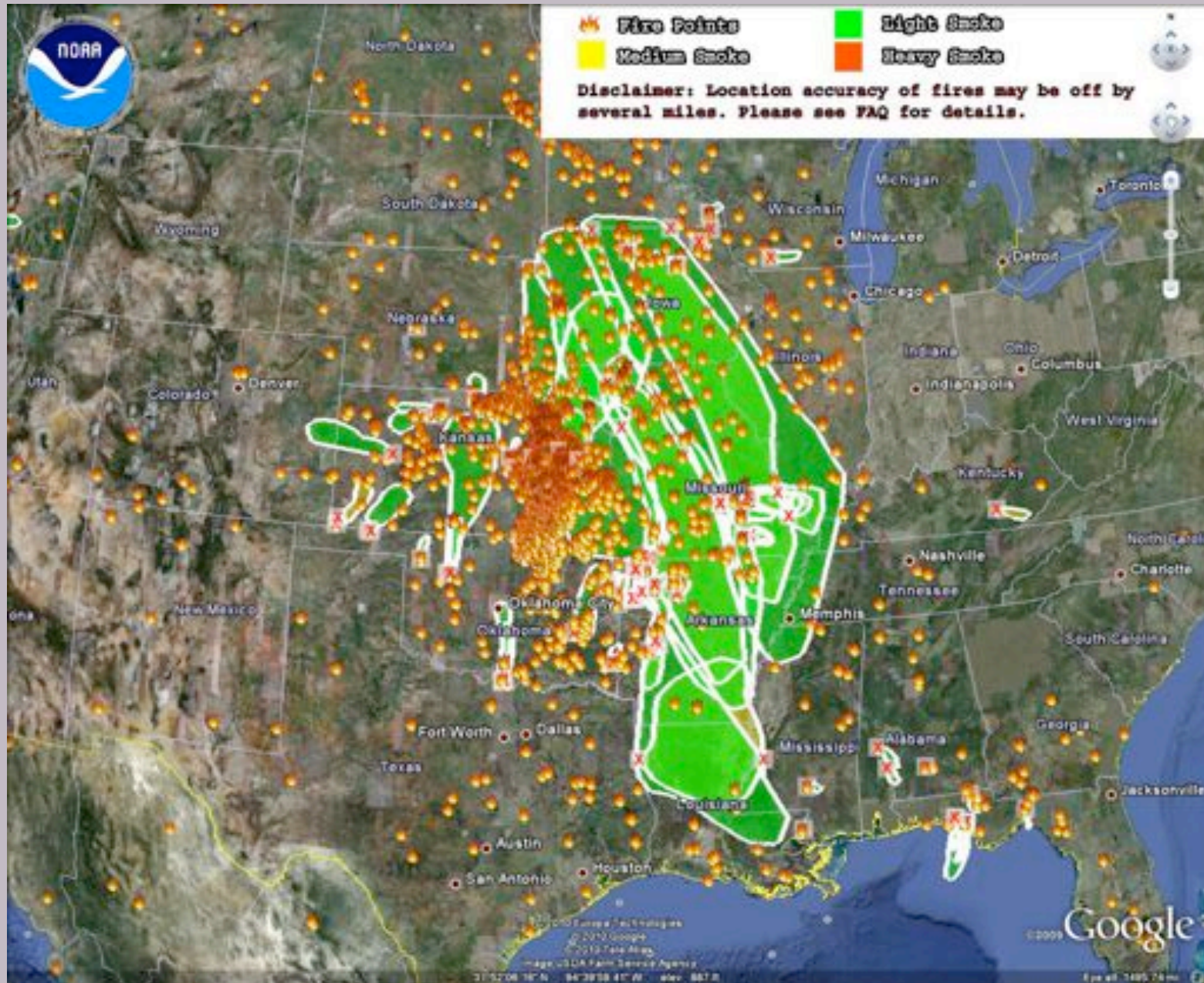
April 8, 2010 – After a spring of strong winds and periods of rain, conditions finally improved for burning in the Flint Hills during the period from April 8-11. This NOAA Hazard Mapping System graphic depicts satellite identified fire and analyzed smoke locations for April 8<sup>th</sup>. Red Xs depict the point of origin of distinct smoke plumes. Analyzed smoke concentrations are color coded as can be seen in the legend.

**Our Vision – Healthy Kansans living in safe and sustainable environments.**



Slide: Doug Watson

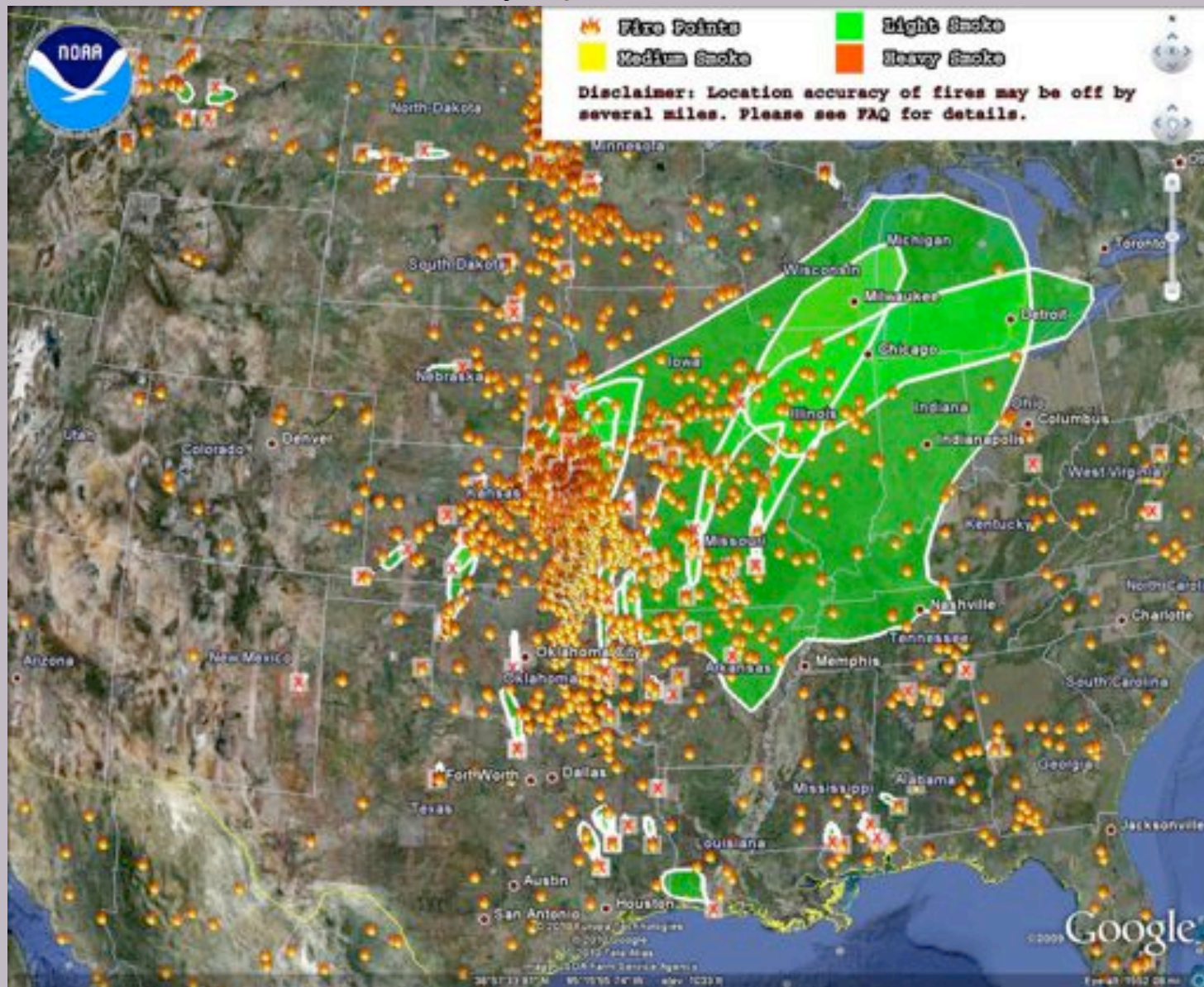
Friday, April 9, 2010



April 9, 2010 – This NOAA Hazard Mapping System graphic depicts satellite identified fire and analyzed smoke locations for April 9<sup>th</sup>. As can be seen, there has been a tremendous increase in the number of fires over the Flint Hills.

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Saturday, April 10, 2010



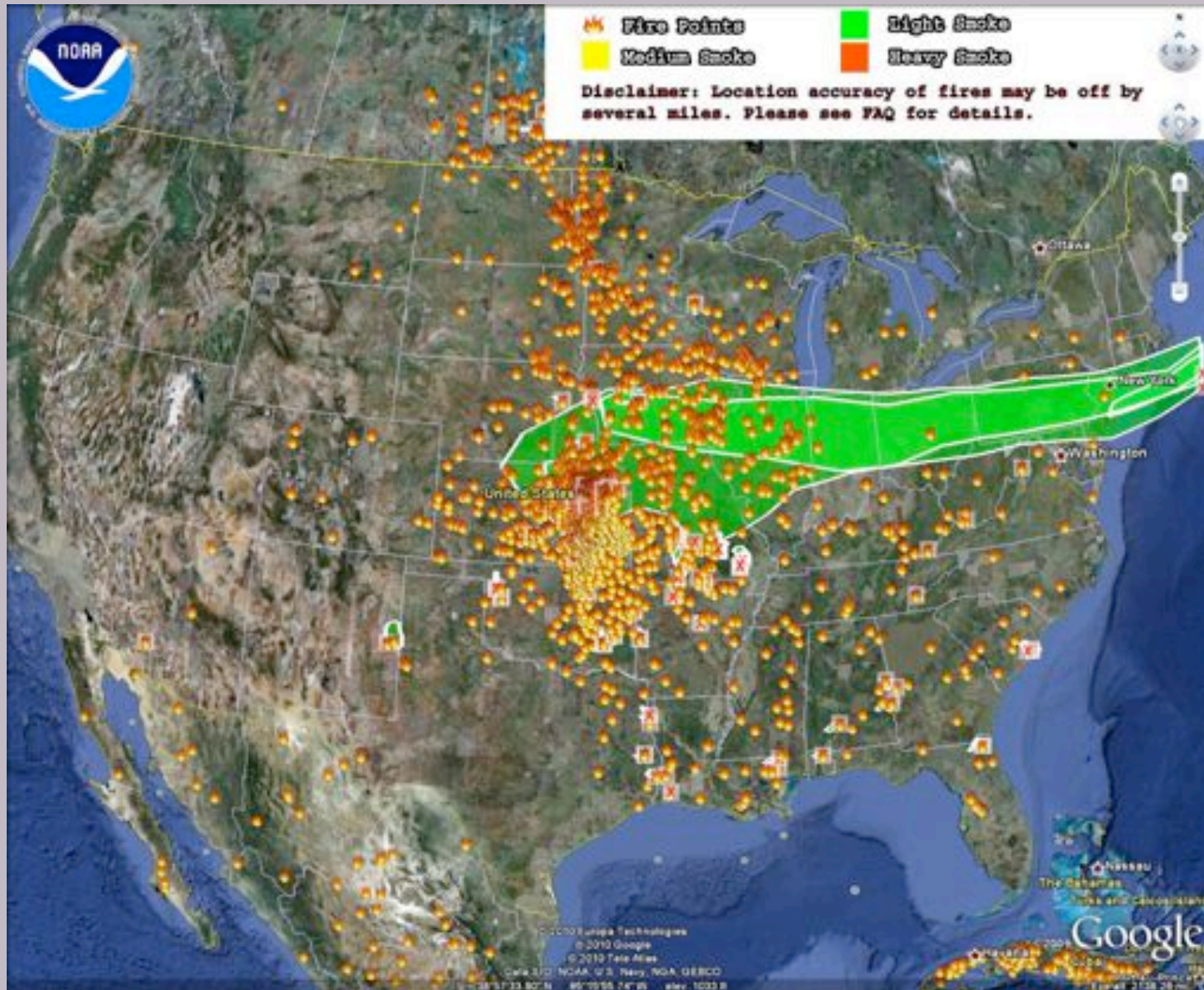
April 10, 2010 –This NOAA Hazard Mapping System graphic depicts satellite identified fire and analyzed smoke locations for April 10<sup>th</sup>. As can be seen, there continued to be a tremendous number of fires over the Flint Hills. Smoke from the previous two days of fires has spread over a wide area of the upper Midwest, stretching from Northern Arkansas to Michigan.

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Sunday, April 11, 2010



April 11, 2010 – As can be seen, there continued to be a tremendous number of fires over the Flint Hills. Smoke from the previous three days of fires has now spread from Southern Iowa across Missouri, Illinois, Indiana, Ohio, Pennsylvania, New Jersey, Long Island and out over the Atlantic Ocean.

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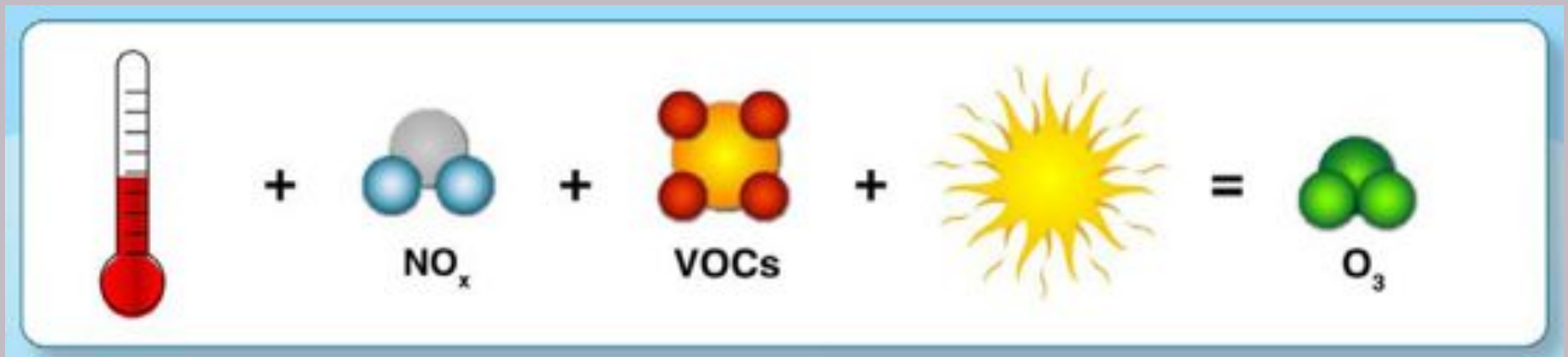
Slide: Doug Watson

# Concerns

- Ozone
  - NO<sub>x</sub>
  - Volatile Organic Compounds (VOCs)
  - 8 Hour Standard: 0.75ppm
- Particulate Matter
  - PM 10
  - PM 2.5
  - Daily Standard: 150 µg/m<sup>3</sup> (no violations)
- Visibility – Regional Haze
  - PM 2.5
  - NO<sub>x</sub> + PM 2.5

# Ozone Precursors

- Ozone is composed of nitrous oxides and volatile organic compounds.
- Ozone precursors are produced by prescribed burning and are part of the smoke.
- Under the right conditions, ozone forms.



# Ozone Concerns

- Coughing, pain with deep breathing, reduced lung function, shortness of breath in humans and animals.
- Kill tree roots, increase needle drop, increase susceptibility to disease
- Travel long distances to impact areas far away from fire site.

Saturday, April 10, 2010



Air Quality Index (AQI) - Ozone

Index Value	Level of Health Concern	Cautionary Statement
0 to 50	Good	None
51 to 100*	Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.
100 to 150	Unhealthy for Sensitive Groups	Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.
151 to 200	Unhealthy	Active children and adults, and people with lung disease, such as asthma, should avoid prolonged or heavy exertion outdoors. Everyone else, especially children, should reduce prolonged or heavy exertion outdoors.
201 to 300	Very Unhealthy	Active children and adults, and people with lung disease, such as asthma, should avoid all outdoor exertion. Everyone else, especially children, should avoid prolonged or heavy exertion outdoors.
301 to 500	Hazardous	Everyone should avoid all physical activity outdoors.

April 10, 2010 – The Air Quality Index (AQI) is an index for reporting daily air quality. The higher the AQI value, the greater the level of air pollution and the greater the health concerns. Smoke is causing elevated ozone values in areas of Eastern Kansas, Missouri, Arkansas and Western Illinois with associated AQI values in the Moderate (yellow) to Unhealthy for Sensitive Groups (orange) recorded throughout the afternoon. Ozone levels increase later in the day across the lower Great Lakes as the smoke drifts over these states.

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Slide: Doug Watson

# Particulate Matter

- $PM_{10}$

- Readily precipitates out due to weight.

- $PM_{2.5}$

- Comprises 70% of PM in smoke.

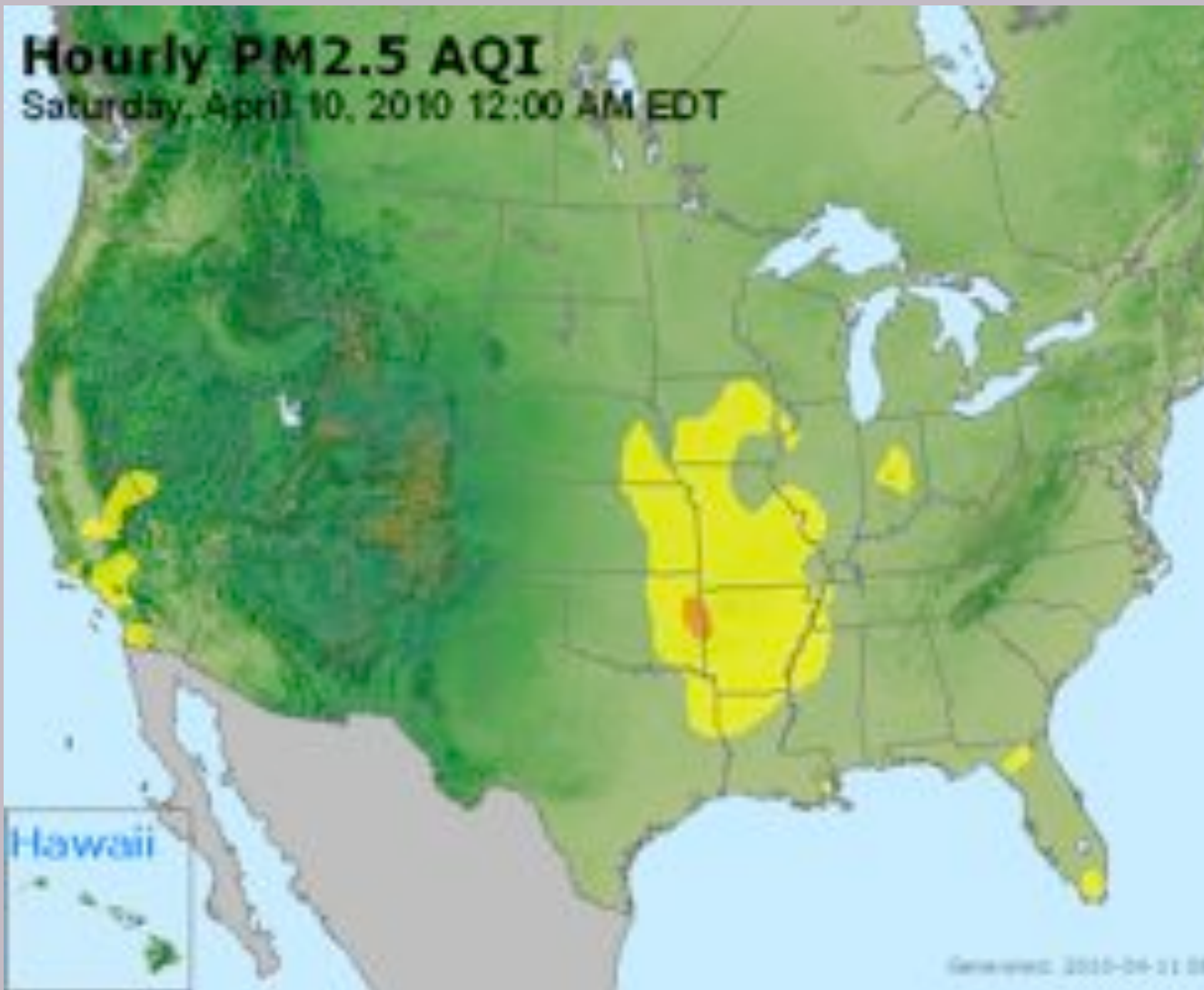
- Does not readily precipitate out.

- Removed by precipitation.

- Travels moderate distances from smoke source.

Saturday, April 10, 2010

Air Quality Index (AQI) Color



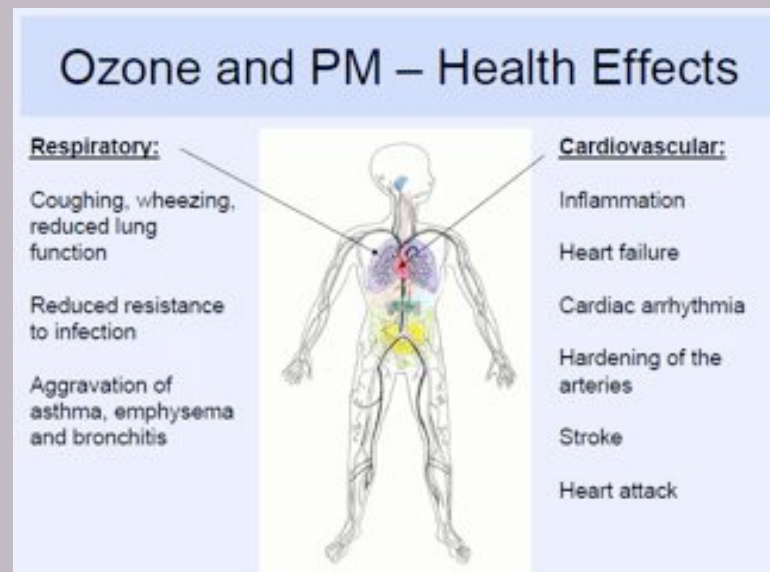
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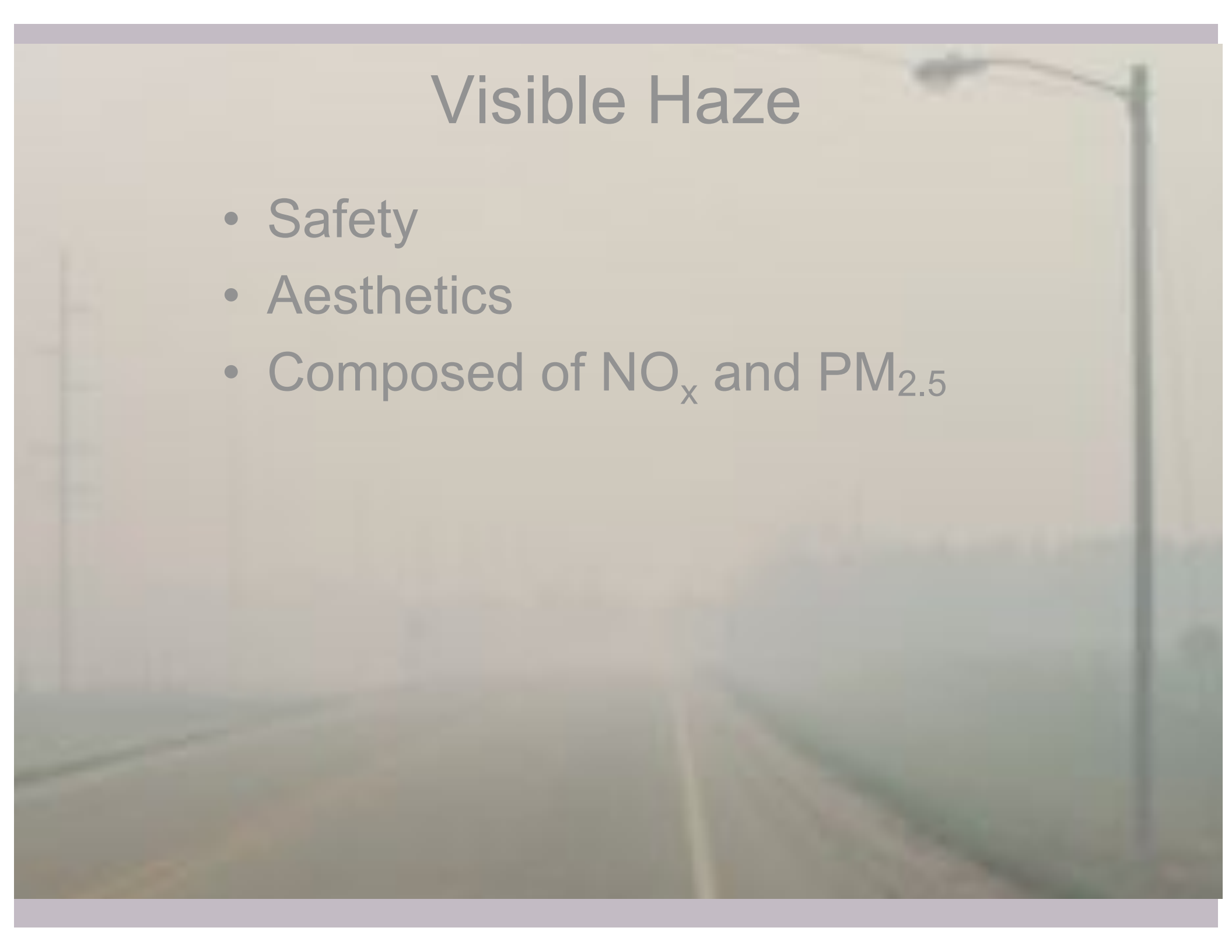
# Particulate Matter Concerns

- PM<sub>2.5</sub> causes the most health concerns.
- Shortness of breath, coughing, and irregular heart beats



# Visible Haze

- Safety
- Aesthetics
- Composed of  $\text{NO}_x$  and  $\text{PM}_{2.5}$



# Fire Management Practices

## Ideal Prescribed Burning Weather Conditions

- **Wind speed:** 5-12 mph
- **Wind direction:** steady, away from sensitive areas
- **Mixing height:** 1800 ft. or higher
- **Transport wind speed:** 8-20 mph throughout the mixing height
- **Relative humidity:** 40-70%; no less than 30%
  - 30-55% for optimal smoke management
- **Temperature:** 55°-80° F,  $\pm 5^\circ$ 
  - lower temperatures are associated with less ozone formation
- **Cloud cover:** clear to 70% cover
  - 30-50% cloud cover in both the smoke generating areas and the urban areas of concern are optimal for smoke management

# Ignition and Burn Techniques

- Number of acres burnt (extent)
  - Patch vs. annual burning
  - Burning vs. non-burning
- Amount and type of fuel
  - Wood vs. grass
  - Grazed vs. ungrazed
  - Fire return interval
  - Fuel moisture



November 21, 1988

# Riley County



Percent Cover Class	pixels	m2	acres	Percent/class
20 - 29%	4569	4112100	1016	12%
30 - 39%	5768	5191200	1283	15%
40 - 49%	5725	5152500	1273	15%
50 - 59%	7167	6450300	1594	19%
60 - 69%	5686	5117400	1265	15%
70 - 79%	4040	3636000	899	11%
80 - 89%	2574	2316600	572	7%
90 - 100%	2260	2034000	503	6%

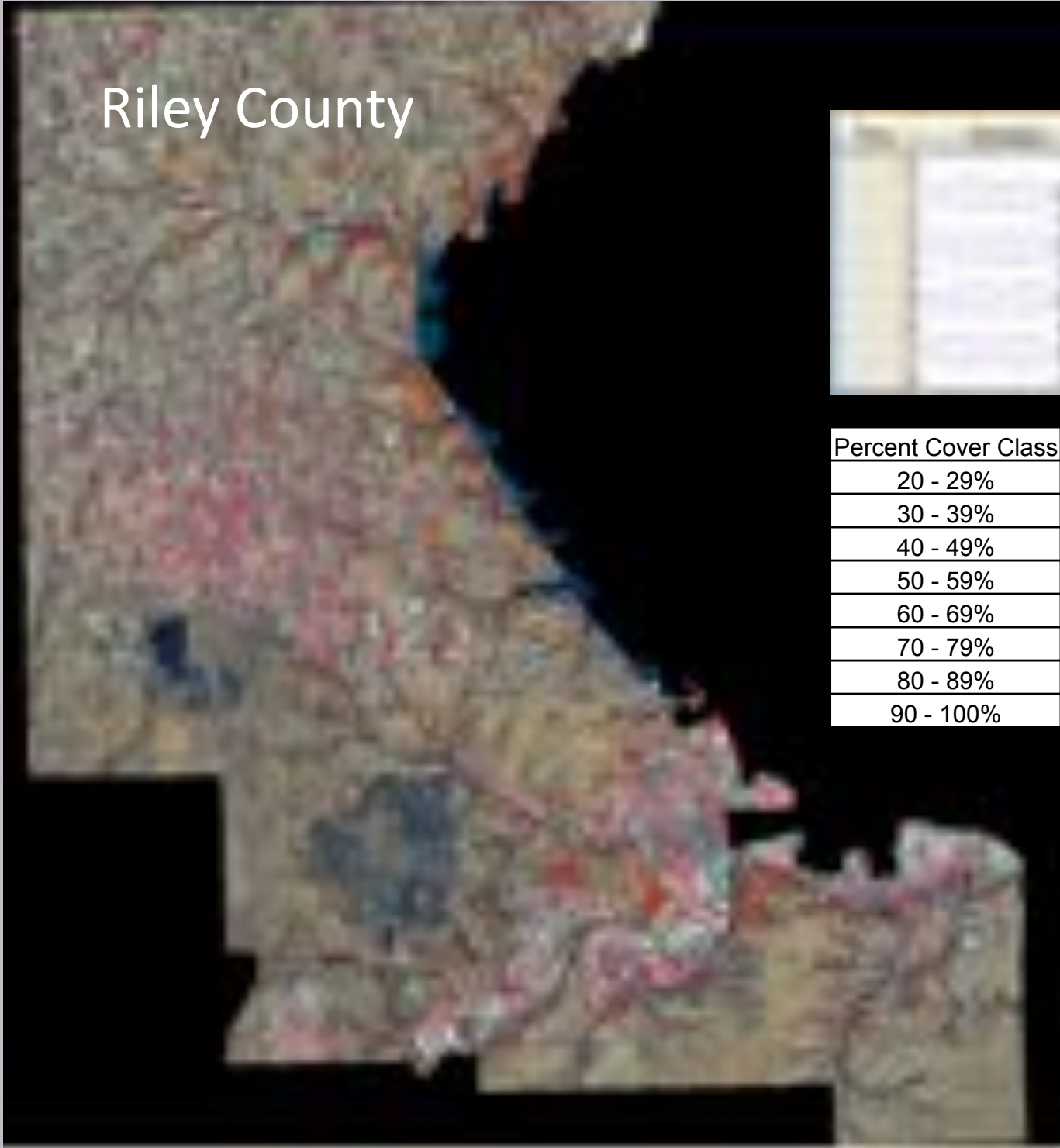
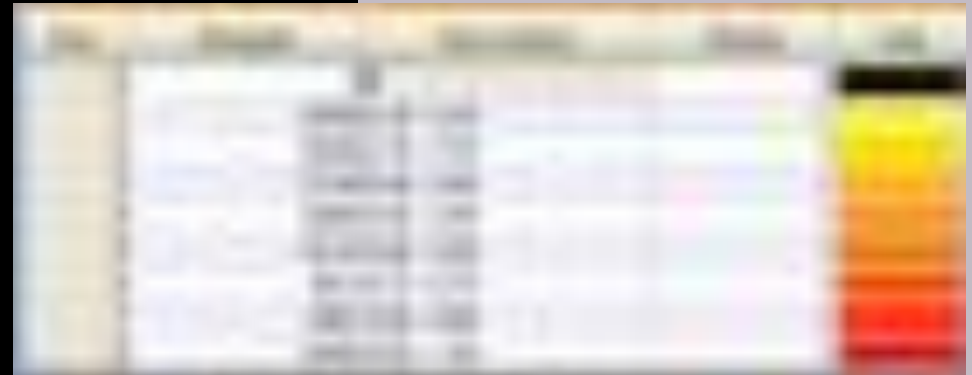


Image: Kevin Price, Bethany Grabow,  
 EASAL, Dept. of Agronomy and HFRR,  
 KSU

December 01, 2009

# Riley County



Percent Cover Class	pixels	m2	acres	Percent/class
20 - 29%	10038	9034200	2232	9%
30 - 39%	16696	15026400	3713	14%
40 - 49%	17338	15604200	3856	15%
50 - 59%	18844	16959600	4191	16%
60 - 69%	14143	12728700	3145	12%
70 - 79%	9013	8111700	2004	8%
80 - 89%	6567	5910300	1460	6%
90 - 100%	24369	21932100	5420	21%

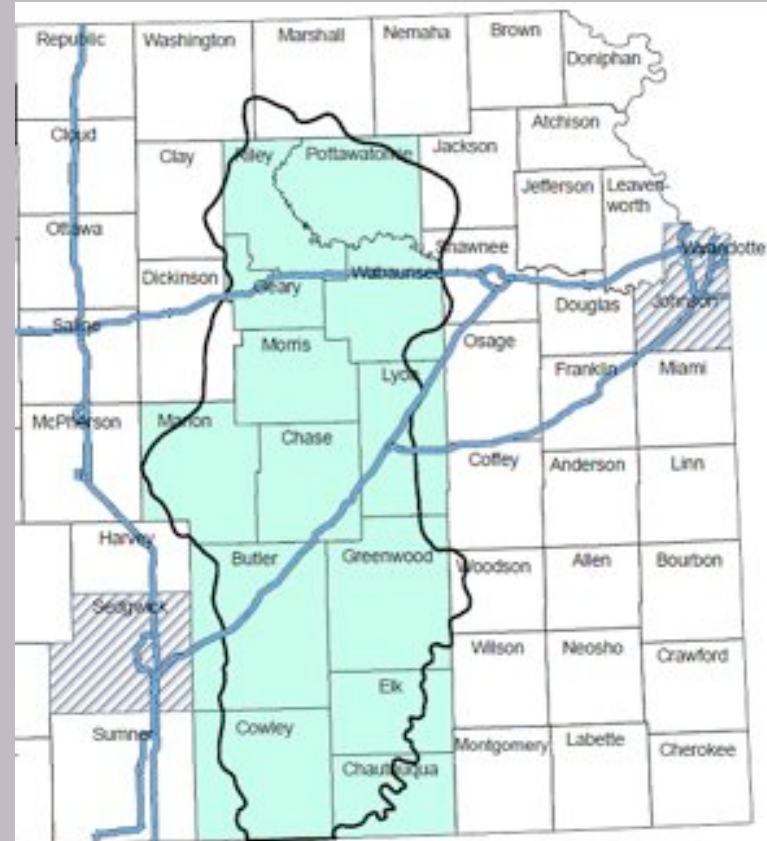
Image: Kevin Price, Bethany Grabow,  
EASAL, Dept. of Agronomy and  
HFRR, KSU

# FMP Checklist Pilot Project

- Appendix C
- Greenwood and Chase counties
- Educational Outreach
- Producers voluntarily fill out checklist
- Goal: To increase awareness of where smoke plume will go

# April Burning Restrictions

- Land clearing
- Construction debris
- Crop residues
- Training burns
- Yard waste
- Local enforcement
- Impacts urban counties too
- This is a regulation: Non-voluntary



# Producer Burning Restrictions

- Use smoke model and avoid burning on days when impact is given as “red”.
- Follow directives given by local emergency and fire staff.
  - Permit to burn
- Voluntary.
- Outreach and education effort planned.

# Monitoring

- Model Effectiveness
  - Data Collection Pilot Program (acres burned).
  - Bulter, Chase, Coffey, Geary, Greenwood, Morris, Pottawatomie, Riley, Wabaunsee.
- Outreach Effectiveness
  - Land Manager Survey after burn season.

# Monitoring

- **SMP Effectiveness**
  - Exceedances during prescribed burning period.
  - 3-5 year trial period.
  - Can be modified as needed.

## If the SMP fails to reduce exceedances, and urban areas are in non-attainment:

- Additional regulation of equipment, industrial processes and materials with attendant recordkeeping.
  - 1.5¢-2.5¢ estimated additional cost/gallon car fuel
- State Implementation Plan required.
  - Emission inventory, photochemical modeling, permitting, staffing, compliance, outreach activities
- Loss of highway funds.
- Mandatory vehicle inspections.

# SMP Contingency Measures

- April Burn Ban extended to additional counties.
- Additional burn planning required by producers.
- Notification and collection data mandatory.
- Mandatory permitting structure.
- Restricted burning time during day.
- Additional burn bans.

# Summary

- A SMP was required.
- KDHE used a committee approach to writing the plan.
- Will not become law prior to the 2011 burn season.
- The SMP is largely voluntary.
- Open comment period will start next Wednesday.

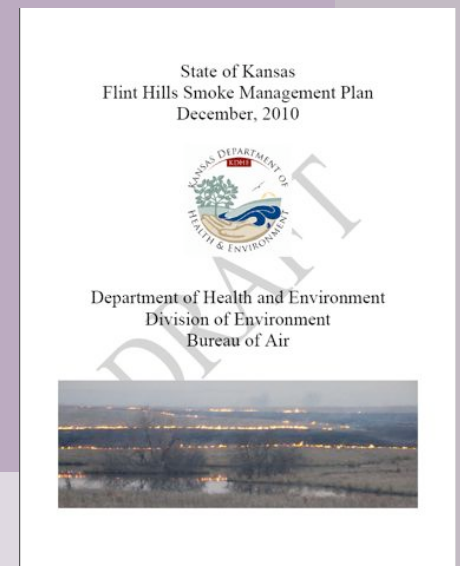


Image: State of Kansas Flint Hills Smoke Management Plan

