

9/9/2015

# Prescribed Fires, Smoke and Health Issues

Presentation to the Wildfire Matters  
Review Committee  
9 September 2015







## Colorado Smoke Management Program

- Began in 1990 as MOU with Federal and State land managers; largely voluntary
- Use of prescribed fire, especially broadcast, grew during 1990's
- In response, Colorado legislature passed laws (1999 & 2001) requiring more formal development of the SMP (CRS 25-7-106(7) & (8))
  - SB 99-145
  - SB 01-214
- Colorado Air Quality Control Commission adopted Regulation 9 ("Open Burning, Prescribed Fire, and Permitting") in January 2002

Colorado's Prescribed Fire/Smoke Management Program is designed to reduce smoke impacts and maintain public health, welfare and visibility.



It does not directly address safety or forest health.

	<p>Good smoke dispersion and little public smoke impact</p> 
<p>Heavy smoke impacts at residences and potential for health issues</p> 	



## What is in smoke?

- **Particulate matter** - Coarse visible and fine invisible particles including soot and ash that can reach deep into the lungs and may contain irritating and cancer-causing compounds.
- **Polynuclear aromatic hydrocarbons** - A class of organic compounds found on the particulate matter from forest fires, wood stoves, and fireplaces, some of which may be carcinogenic with extended exposure.
- **Carbon monoxide** - A colorless, odorless, toxic gas. Areas even a few hundred yards downwind of the fire experiencing high particulate smoke levels typically do not have high levels of carbon monoxide. Signs of high carbon monoxide levels in the blood include headaches, dizziness, nausea, and decreased mental functioning.
- **Aldehydes** - Compounds that are extremely irritating to the eyes and mucous membranes of the mouth and nose. Some like formaldehyde are carcinogenic, while others like acrolein can injure lung tissue.
- **Volatile organic compounds** - Strong irritants, some of which are carcinogenic.
- **And many other chemical components...**

**NOTE: Only ambient air standards are for particulates and carbon monoxide**

## Context: Federal Clean Air Act

- EPA has set ambient air standards for 6 pollutants based on health
  - “National Ambient Air Quality Standards” (NAAQS)
  - For smoke, fine particulates ( $PM_{2.5}$ ) is the primary health concern
  - Can get some coarse particulates ( $PM_{10}$ ) and carbon monoxide
  - Can get ozone formation, particularly with aged smoke



## $PM_{2.5}$

- “Fine particulates”, less than 2.5 microns in diameter
- Produced from combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes
- NAAQS:
  - 24-hour:  $35 \mu\text{g}/\text{m}^3$  as the 98<sup>th</sup> percentile averaged over 3 years
  - Annual:  $12 \mu\text{g}/\text{m}^3$  as a 3-year average

Four Elk (north of Buena Vista):

155 acres

Fuel: typical ponderosa understory

Ignition ended 1 hour before sunset

Dispersion adjective: very good

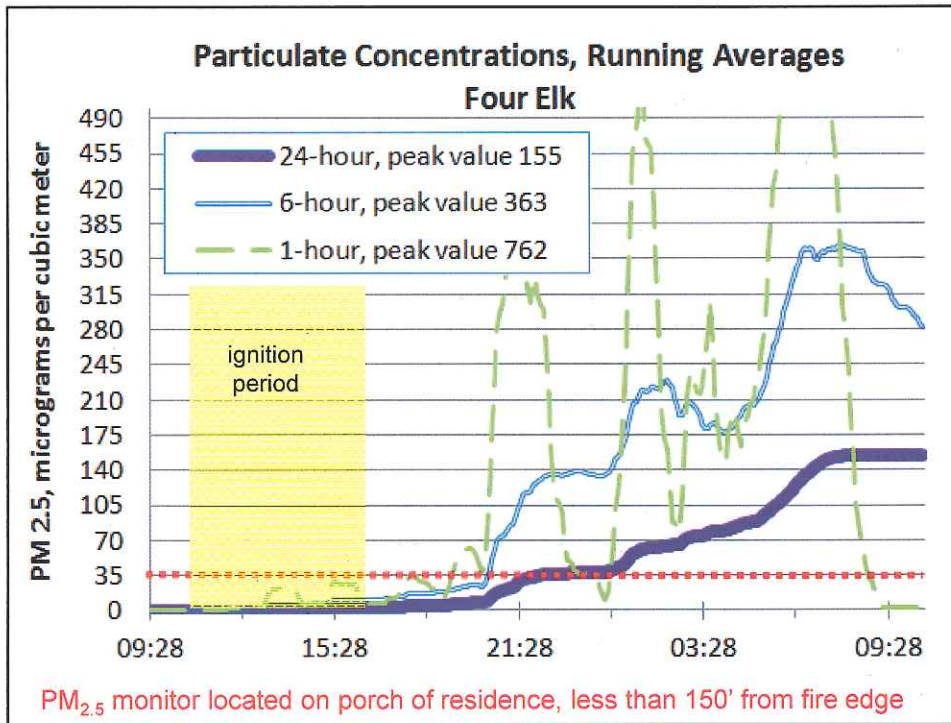


Four Elk

Subsequent morning's drainage smoke

burn area





### Wagon Tongue P4 (south of Lake George):

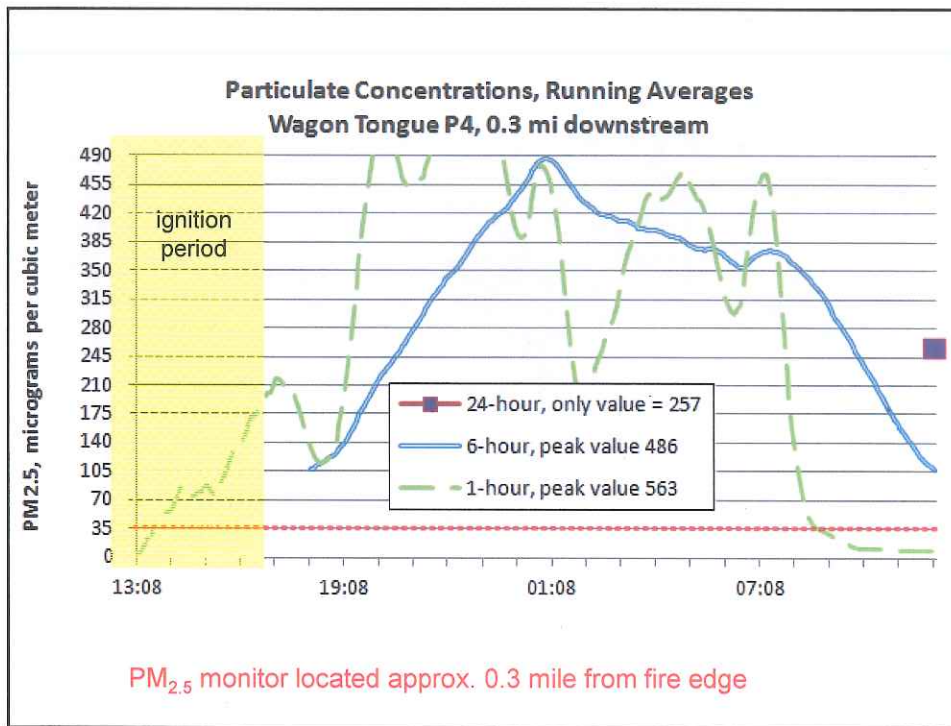
175 acres

Fuel: dry mixed conifer understory, low load

Ignition ended ½ hour before sunset

Dispersion adjective: very good





### EPA "Air Quality Index"

PM <sub>2.5</sub> , 24-hour avg	AQI Label
0-15	good
16-35	moderate
36-65	unhealthy for sensitive groups
66-150	unhealthy
151-250	very unhealthy <div style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">Four Elk peak = 155</div>
251-500	hazardous <div style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">Wagon Tongue peak = 257</div>

## EPA: Very Unhealthy for PM<sub>2.5</sub> Particulates

### Sensitive Groups

- People with respiratory or heart disease, the elderly and children are the groups most at risk.

### Health Effects

- Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.
- Significant increase in respiratory effects in general population.

### Cautionary Statements

- People with respiratory or heart disease, the elderly and children should avoid any outdoor activity.
- Everyone else should avoid prolonged exertion.

For Hazardous category, similar but stronger messages

## Presumed Conclusion:

**Only a minority of Colorado prescribed fires generate smoke concentrations well above the national health standard.**

*We now know that this is likely not a valid presumption*



## CRS 25-7-106

- (7) (a) The commission is specifically authorized and directed to develop a program to apply and enforce every relevant provision of the state implementation plan and every relevant emission control strategy to minimize emissions, including the impacts of actions by significant users of prescribed fire, including federal, state, and local government, and private land managers that are significant users of prescribed fire. The program developed by the commission under this subsection (7) shall include, but not be limited to, the imposition of any fees necessary to administer the program, including the recovery of costs by the state for the evaluation of planning documents pursuant to subsection (8) of this section, and the imposition of penalties pursuant to section 25-7-122.
- (8) (a) The commission, in exercising the powers conferred by subsection (7) of this section and this subsection (8), shall require all significant users of prescribed fire, including federal agencies for activities directly conducted by or on behalf of federal agencies on federal lands, to **minimize emissions** using all available, practicable methods that are technologically feasible and economically reasonable in order to **minimize the impact** or reduce the potential for such impact on both the attainment and maintenance of national ambient air quality standards and the achievement of federal and state visibility goals.

## Legalistic Considerations

- Agency should consider prescribed fire tradeoffs in overall protection of air quality....what is the balance?
  - Public health vs. wildfire risk and ecological health
- One exceedance  $\neq$  a violation of NAAQS
  - PM<sub>2.5</sub> NAAQS is based on the 3-year average of the 98<sup>th</sup> percentile values, not one 24-hour value from a prescribed fire
  - AG office review and concurrence in 2014 that can allow exceedances to occur

## Change in general philosophy

- Used to go on presumption that we should not allow any exceedances of the air standards
- Not realistically possible if want prescribed burning to occur
- Looking at incremental program changes based on shared learning to balance the issues and desires
- Now focusing on minimizing the number of exceedances of the air standards

## Changes to the program

- Based on creating a balance and still protecting public health, changes were made to the Prescribed Fire/Smoke Management Program, effective August 1, 2015:
  - Increasing allowable acres and number of piles for many of the “standard” conditions, and simplifying, to allow more use of prescribed fire
  - Adding a specified smoke message to all permits for required public outreach prior to burning
    - Standardized text
    - Link to webpage for more information

## Smoke Messaging

- “Prescribed fire smoke may affect your health. For more information see <https://www.colorado.gov/pacific/cdphe/wood-smoke-and-health>”
- Webpage includes:
  - How to protect your health from woodsmoke
  - Who is likely to be affected
  - Symptoms
  - Visibility/AQI reference table

Air Quality Index	Visibility
Good	10 or more miles
Moderate	5 - 10 miles
Unhealthy for Sensitive Groups	3 - 5 miles
Unhealthy	1.5 - 3 miles
Very Unhealthy	1 - 1.5 miles
Hazardous	less than 1 mile

## Questions?

