

Unit 3E, Air and Smoke, Activity 1

1. The following pre-work is centered on the technical aspects of smoke management. Specifically, the laws and regulations associated with air quality. Federal land management agencies are not considered to be exempt from federal laws. In addition, The United States Environmental Protection Agency has delegated much of the air quality enforcement down to the state level. The type of enforcement and the level of oversight vary from state to state. States and local agencies may adopt more stringent rules and standards than required in the Clean Air Act but not less stringent. It is the fire manager's responsibility to know and to adhere to all state and federal regulations.

2. An outline is included with each pre-reading segment. The outline highlights key points found in the literature. NWCG has an approved Smoke Management course that covers the material in much greater detail. Fire Management Officers, Assistant Fire Management Officers need to be well versed in the air quality regulations. Smoke will continue to be a key factor in fire management and fire managers need to be especially prepared to deal with the public when smoke issues arise.

3. During the classroom session a case study of the Grand Canyon National Park will demonstrate how air quality and fire objectives are successfully achieved.

Read the outline that follows and the required and recommended literature. The literature can be accessed through the web site listed.

I. SMOKE AS AN AIR POLLUTANT

Required Reading;

-1998 "Interim Air Quality Policy on Wildland and Prescribed Fires"

<http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf>

-1998 National Ambient Air Quality Standards (NAAQS) chart.

<http://www.epa.gov/air/criteria.html>

-2001 "Wildfire Smoke, A Guide for Public Health Officials"

<http://www.deq.state.mt.us/FireUpdates/WildfireSmokeGuide.pdf>

A. Smoke from prescribed fire includes both what you can see (soot, tar droplets, and water droplets) and what you cannot see (gases and organic vapors).

B. The primary products of combustion of organic material include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons (300+), nitrogen oxides, and trace minerals. However, the principle combustion products that fire managers need to address are carbon monoxide and particulate matter.

1. Carbon Monoxide

a. Emission factor for carbon monoxide for prescribed burning is 20-500 lbs/ton.

b. Carbon monoxide is a colorless, odorless gas that can cause health effects and even death at high concentrations.

c. It is classified as a criteria pollutant by EPA. That is, EPA considers ambient carbon monoxide concentrations enough of a threat to health and welfare that it has developed ambient air quality standards to protect the public.

d. As a result of rapid dilution, carbon monoxide emissions from prescribed burning are not a concern to the general public. However, carbon monoxide emissions may be a concern to firefighters and persons on prescribed burning crews.

2. Particulate Matter

a. Emission factor for particulate matter for prescribed fire is 20-180 lbs/ton

b. Particulates are a criteria pollutant and can impact health and visibility.

c. EPA has recently proposed new particulate standards and visibility regulations, which will be discussed in detail later.

d. Particulates are presently the major pollutant of concern from prescribed burning.

e. Wood smoke particulates are relatively small, generally, 70% are less than 2.5 microns in diameter; 20% are between 2.5 and 10 microns in diameter; and 10% are greater than 10 microns in diameter.

f. The size distribution of particulates produced from prescribed burning can vary greatly, depending on the rate of energy release of the fire. For example, for high intensity fires, particulate emissions have a bimodal size distribution with peaks near 0.3 microns and 35+ microns. For less intense fires, particulate emissions have a normal distribution with the peak near 0.3 microns.

g. Larger particulates found in plumes from high intensity fires are not products of combustion but rather products of mechanical mixing (turbulence).

h. The small size of wood smoke particulates allows them to be carried deep into the lung. Wood smoke particulates also have a size range near the wave length of visible light which makes them an excellent in scattering of light and, therefore, excellent reducers of visibility.

C. Air Toxics

1. An emerging concern about prescribed fire smoke is the possible presence of air toxics.

2. Those chemicals in prescribed fire smoke which are of most concern are polyaromatic hydrocarbons (PAH). Formation of PAH from wood combustion has long been understood. While a large number of PAH have been identified as combustion products,

only a few have been measured in fires. Examples of PAH known to be in wood smoke are:

- a. Benzo(c)phenanthrene
- b. 3-methyl-cholanthrene
- c. Dimethylbenzanthracene
- d. Benzo(a)pyrene. [Benzo(a)pyrene is known to be a human carcinogen.]

3. At this time, it is difficult to assign a risk to the public and those persons on prescribed fire and wildfire crews because of through possible air toxics in smoke from prescribed fire.

4. There are major problems involved in trying to determine the concentration of toxic material that actually reaches the respiratory system. However, research in this area is currently underway.

III. LEGAL REQUIREMENTS RELATIVE TO SMOKE FROM WILDLAND BURNING

Required Reading:

-The Clean Air Act: "The Plain English Guide to the Clean Air Act"

http://www.epa.gov/oar/oaqps/peg_caa/pegcaain.html

Recommended Reading:

- EPA's Regional Haze Rule "Fact Sheet"

<http://www.epa.gov/oar/visibility/program.html>

A. The Clean Air Act

The Clean Air Act as amended in 1977 and 1990 identifies standards and legal requirements that must be met by federal agencies, the states, and private industry. Prior to 1990, the Federal Clean Air Act did not directly address prescribed burning. However, the 1990 amendments contain a number of sections, which may result in both direct and indirect regulatory controls on the use of fire.

1. Section 109 requires EPA to develop primary air pollution standards to protect human health and secondary standards to protect welfare. Standards to protect human health must be designed to protect the most sensitive portion of the population (i.e., those persons who already have chronic obstructive lung disease, the elderly, and very young).

2. Section 110 requires states to develop State Implementation Plans (SIPS), which identify how the state will attain and maintain national ambient air quality standards and other federal air quality regulations.

3. Section 116 allows states to develop standards and regulations, which are more stringent than federal standards and regulations.

4. Section 118 requires all federal agencies to comply with all federal, state, and local air quality regulations. This section as amended in 1990 so that the preceding applies “(A) to any requirement whether substantive or procedural (including any record keeping or reporting requirement, any requirement respecting permits and any other requirement whatsoever); (B) to any requirement to pay a fee or charge imposed by any State or local agency to defray the costs of its air pollution regulatory program; (C) to the exercise of any Federal, State, or local administrative authority; and (D) to any process and sanction, whether enforced in Federal, State, or local courts or in any other manner.”

5. Sections 160-169 provide for the prevention of significant deterioration of air quality in those areas of the country, which has air quality concentrations that are better than the standards set under Section 109. Sections 160-169 provide specific protection for certain national parks and wildernesses.

6. Section 169A provides visibility protection for mandatory Federal Class I areas. Those areas include international parks, national memorial parks that exceed 5,000 acres in size, national parks that exceed 6,000 acres in size, and wilderness areas, which exceed 5,000 acres in size and were in existence as of August 7, 1977, including any additions to those areas made after that date.

7. Section 176(c) prohibits federal agencies from permitting, approving, providing financial assistance, or supporting in any way any activity which does not conform to a State Implementation Plan (SIP). This Section may come in to play where an agency “finances or supports in any way” prescribed burning activities on its lands.

8. Section 190 directs EPA to issue technical guidance on reasonably available control measures and best available control measures for prescribed silvicultural and agricultural burning by May 1992. As a result, EPA worked with land managers to develop a document “Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures” (EPA-450-92-003).

A. Fine Particulate Regulations

1. On July 31, 1987, the Environmental Protection Agency (EPA) promulgated ambient air quality standards for those particulates less than 10 microns in diameter (PM-10). The PM-10 standards were designed to protect that portion of the population, which is most susceptible to airborne particulates.

2. However, more recent information indicates that the PM-10 SIEE range is not appropriate for actually protecting public health.

3. A court order resulting from a lawsuit by the American Lung Association requires EPA to develop standards for those particulates less than 2.5 microns (PM 2.5). The EPA proposed new standards in January 1997. Litigation has surrounded the standards and a final product is expected by early 2005.

4. As a result of the large percentage of wood smoke being less than 2.5 microns in diameter, the new PM-2.5 standards will provide even greater challenges for land managers in their use of prescribed fire.

B. Visibility Regulations

1. In 1999, the U.S. Environmental Protection Agency announced a major effort to improve air quality in national parks and wilderness areas. The Regional Haze Rule calls for state and federal agencies to work together to improve visibility in 156 national parks and wilderness areas such as the Grand Canyon, Yosemite, the Great Smokies and Shenandoah.

2. The rule requires the states, in coordination with the Environmental Protection Agency, the National Park Service, U.S. Fish and Wildlife Service, the U.S. Forest Service, and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. The first State plans for regional haze are due in the 2003-2008 timeframe. Five multi-state regional planning organizations are working together now to develop the technical basis for these plans.

a. Prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Federal Class I areas from manmade air pollution.

b. The states and EPA consider smoke from prescribed fire to be manmade.

3. Research conducted in some wilderness areas and national parks indicates that viewing the scenery through "clean, fresh air" is one of the most important attributes as determined by public land users.

a. This presents an interesting challenge for land managers who want to use prescribed fire in these same areas.

b. Good visibility is also important to the tourism industry in many areas.

4. All states with Class I areas are required to amend their State Implementation Plan (SIP) to identify how they will prevent future visibility impairment and remedy existing impairment of visibility.

a. As a part of their visibility regulations, EPA requires that states, in their State Implementation Plan, consider the impacts of prescribed burning on visibility and the adequacy of smoke management programs.

b. The SIP must be reviewed every 3 years to determine if a state's "long term strategy:" for meeting the national visibility goal is appropriate.

IV. 1998 INTERIM AIR QUALITY POLICY ON WILDLAND AND PRESCRIBED FIRES.

Recommended Reading:

- 1998 "Interim Air Quality Policy on Wildland and Prescribed Fires

<http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf>

The 1998 Interim Policy designates the required elements of a state smoke management program:

- A. Authorizing burns
- B. Actions for minimizing emissions and impacts
- C. Smoke management components of burn plans
 - 1. Actions to minimize emissions
 - 2. Smoke dispersion evaluation
 - 3. Public notification procedures
 - 4. Air quality monitoring
- D. Public education and awareness
- E. Surveillance and enforcement of program compliance
- F. Program evaluation and review schedule
- G. Optional programs (special protection zones or buffers, etc.)

V. 1999 REGIONAL HAZE RULE AND WESTERN REGIONAL AIR PARTNERSHIP (WRAP) POLICIES

Recommended Reading:

-2001 "WRAP Policy: Categorizing Fire Emissions

<http://wrapair.org/forums/fejf/documents/nbtt/FirePolicy.pdf>

-2002 "WRAP Policy: Fire Tracking System"

<http://www.wrapair.org/forums/fejf/documents/fts/fts.html>

- A. Attain natural visibility in Class I areas by 2064
- B. Five states under section 309 submitted visibility plans end of 2003
- C. The remainder of the states must submit plans by end of 2007
- D. 156 Class I areas established in 1977
- E. National Goal: Prevent future and remedy existing visibility impairment