

# **The National Coalition of Prescribed Fire Councils**

## **Guide to Smoke Management**

### **September 2007 version**

## **INTRODUCTION**

The ecological need for prescribed fire is increasing as fuel loadings increase, biodiversity decreases, unnatural successional changes continue, and research clarifies the role of fire in natural ecosystems. However, in many parts of the nation prescribed fire is a large, intermittent source of air pollutants that can have a significant short-term impact on fine particulate concentrations, safety, and visibility. New and proposed air pollution standards and regulations threaten to restrict the use of prescribed burning as a land management tool. This threat can be reduced or eliminated if members of the prescribed burning community are knowledgeable of the impact of their emissions, are able to minimize both the amount and impact of smoke emitted into the atmosphere, and can participate effectively with the public and air regulatory agencies.

The National Coalition of Prescribed Fire Councils has prepared this document to identify current challenges faced by both prescribed fire practitioners and air quality managers and describes how they can best work together to make sure that healthy ecosystems along with public health and safety are protected now and for future generations. This document has been developed to be a reference for Prescribed Fire Councils and their members when trying to develop smoke management programs at a local level that best meet local fire management and air quality needs.

As land managers we need to understand and respect the role that State air regulatory agencies and EPA play in protecting human health and welfare from air pollution impacts. It should be noted that EPA, as formally described in their policies and regulations, also recognizes and respects the role that prescribed fire plays in perpetuating fire dependent ecosystems. However, developing fair and effective smoke management programs is a complex task. The rules and policies that EPA has developed have been done at a national level. The challenge is to take those national policies and rules and apply them effectively to local situations. Helping to meet this challenge is an important role for Prescribed Fire Councils.

This document describes:

- The role of fire in managing ecosystems
- Changes in national fire management policy
- The impact of fire on air quality
- EPA's role in development of air pollution regulations (what Congress requires them to do)
- Existing federal air pollution standards and regulations (what we need to deal with now)
- Potential federal air pollution standards and regulations (looking forward)
- States' role in development of air pollution regulations (what EPA requires them to do)

- How local air quality regulations and programs are developed (opportunities for involvement)
- How to become effectively involved in the development of air quality regulations at the state and local level (how to play to win)
- Options to minimize the amount and/or impact of smoke produced from prescribed fire
- What is appropriate in a State or local smoke management program
- How to influence public support for prescribed fire
- The role of Prescribed Fire Councils in addressing air quality issues

We refer to three main policies when we discuss air quality: the Clean Air Act (CAA), the Interim Air Quality Policy on Wildland Fire and Prescribed Fire (the Interim Policy), and the Exceptional Events Rule (EER). It will be important to understand these policies and their specifics, which may include unfamiliar acronyms and/or language. In addition, most of the information in this guide has been compiled from professional summarizations of the major issues within these EPA policies pertaining to the use of prescribed fire. See the Reference page for links to these documents and the Glossary section for definitions.

Much of the natural vegetation and wildlife in the nation is here as a result of wild and prescribed fire rather than in spite of it. The prescribed burning community is trying to manage a rural resource for an increasingly urban population. In general, the public has less of a tie to the land and a reduced understanding of what it takes to provide healthy ecosystems. The management and protection of healthy ecosystems is an important goal supported by the public and laws and regulations. The protection of public health and welfare from the impacts of air pollution is an important goal supported by the public and laws and regulations. The potential for these goals to conflict can be minimized through dialog and understanding by the parties trying to implement them. Prescribed Fire Councils should play a key role in facilitating this dialog and understanding.

At the State and private level, we must ensure that our voice is heard and that our needs and expectations are understood. In return, state and private land managers must understand the air quality standards and expectations provided by EPA. Clear, concise communication between all parties will ensure that prescribed fire is protected as a land management tool for ALL land managers for years to come.

## **The Role of Fire in the Landscape**

EPA has been charged by Congress with developing air quality standards and regulations to protect both human health and welfare, a charge that is supported by the vast majority of the American public. While EPA recognizes that prescribed fire can be a significant short-term air pollution source they also recognize that fire cannot be duplicated by other land management tools in fire dependent ecosystems. They also recognize that fire exclusion has had a detrimental effect to many natural areas and surrounding communities across the country. Their recognition of the ecological imperative of fire, and the consequences that have occurred from fire exclusion, led to a “re-thinking” of EPA fire policy for the United States. The following section was taken

directly from the EPA Interim Air Quality Policy on Wildland and Prescribed Fire, April 23, 1998.

*“Fire is one of the basic tools relied upon by wildland owners/managers to achieve a myriad of management objectives in fire dependent ecosystems. Most North American plant communities evolved with recurring fire and, therefore, are dependent on recurring fire for maintenance. The natural fire return interval may vary from 1-2 years for prairies, 3-7 years for some long-needle pine species, 30-50 years for species such as California chaparral, and over one hundred years for species such as lodgepole pine and coastal Douglas-fir. When one management objective is to maintain a fire dependent ecosystem the effects of fire cannot be duplicated by other tools. In such cases, fire may be the preferred management tool even when other treatments may be equally effective for meeting other objectives. Fire can also be used to reduce heavy fuel loads and prevent catastrophic wildfires.*

*The role of fire in North American ecosystems has been undergoing change since people began to play a more active role in managing their natural resources. Native Americans actively used fire to alter vegetative patterns, to ease travel, or for hunting purposes. Prior to European settlement, fire played a natural role as a necessary disturbance phenomenon, keeping fuel density in check as well as insects and the diseases they carry, thereby maintaining North American wildlands in a healthy state. After European settlement and the introduction of grazing herds of domesticated livestock, and the practice of fire exclusion/suppression, land management agencies have recognized that not allowing fire to play its natural role in our lands has had unintended negative effects. When forests and grasslands are not allowed to burn naturally (lightning serving as the principal source of ignition) the result can be heavy accumulation of dead vegetation which provides fuel for unwanted wildfires. Because of this unhealthy build-up of fuels, the risk of catastrophic wildfires is much greater as evidenced by numerous recent wildfires in our national forests and other publicly owned lands. These wildfires put firefighters and the general public in danger while destroying millions of acres of forests and costing billions of dollars to suppress annually. The lack of fire also has unintended ecological effects, leading to the loss of habitat for rare species and the decline of ecosystems. Fire exclusion can lead to an alteration in natural community types, and an important loss of biodiversity. Many plant and animal species are on the decline because they exist in fire-dependent habitats that haven't burned in decades. This situation has led to a rethinking of public land management and fire management policy.”*

## **How Changes in Fire Management Policy Have Increased the Need for Smoke Management**

The following excerpt of the Interim Policy explains the response by EPA and other agencies to the consequences of fire exclusion in public and private fire dependent ecosystems. As mentioned, these policies were developed for Federal lands, however EPA encourages policy

adherence at the State level as well. There is a wealth of information and options available to each state by working with their regional federal partners.

*“In 1995, a Federal Wildland Fire Management Policy and Program Review was conducted in response to the unhealthy condition of our public wildlands and our private fire managed areas and ecosystems, and the increase in unplanned fires that occurred in 1987, 1988, 1992 and again in 1994. As a result of this review, the five principal Federal fire/land management agencies [the Forest Service (USFS) under the Department of Agriculture; and the Bureau of Land Management (BLM), National Park Service (NPS), Fish and Wildlife Service (FWS), and the Bureau of Indian Affairs (BIA) under the DOI] agreed on need for several changes to existing fire/land management practices. Their recommendations include the reintroduction of fire, allowing it to play its natural role, into Federal land management programs in an ongoing and systematic manner, consistent with public health and environmental quality considerations. The goals of this change in land management policy are to reduce unnatural fuel densities that contribute to increasing wildfires, and to restore ecosystems to their healthy natural states.”*

## **THE ENVIRONMENTAL PROTECTION AGENCY’S ROLE IN SMOKE MANAGEMENT**

The EPA does not directly regulate the use of fire within a State. The EPA’s authority is to enforce the requirements of the CAA. The CAA requires States and tribes to attain and maintain the National Ambient Air Quality Standards (NAAQS) adopted to protect public health and welfare. Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access.

As of December 18, 2006, the daily Environmental Protection Agency (EPA) concentration standard for Particulate Matter 2.5 microns (PM 2.5) was reduced by nearly half, from 65 to 35  $\mu\text{g}/\text{m}^3$ . The annual standard was unchanged and remains at 15  $\mu\text{g}/\text{m}^3$ . The review for the annual standard has not been initiated at this time, and will be evaluated over the next five years. These standards are of interest to the prescribed fire community because approximately 70% of the particulate emitted from biomass burning are in this size range. More current epidemiological studies indicate a much stronger relationship between increases in PM 2.5 concentrations and mortality and morbidity. Under the new PM 2.5 standards and the Exceptional Events Rule, wildland fire and prescribed fire are a key part of the national PM 2.5 emissions inventory.

Further, EPA and the Department of Transportation (DOT), under the current Bush administration, have been charged with developing policy on reducing CO<sub>2</sub>. The policy response to CO<sub>2</sub> regulation must begin immediately by educating the public about the benefits of prescribed burning and accurately representing the emission costs of fire management. **We share the air shed with other states and other industries.** According to recent Electric Power Research Institute (EPRI) numbers, the U.S. electricity sector emits 2.4 billion metric tons of

carbon dioxide into the atmosphere, accounting for roughly a third of the nation's greenhouse emissions. EPRI estimates that by the year 2030, utility-related carbon dioxide emissions will rise to 3.35 billion tons a year, about a 40 percent increase. (Bookman, 2007) With global warming on the national agenda, the ecological imperative of prescribed fire needs to be communicated in articulate, innovative methods. If prescribed fire is going to be allocated a share of the air resource, we need to become proactive in educating the public, air quality managers, the media and each other.

## **A) PRESENT EPA LEGAL REQUIREMENTS FOR MANAGING SMOKE FROM PRESCRIBED FIRE**

### **The Clean Air Act (CAA)**

The CAA as amended in 1977 and 1990 identifies standards and legal requirements that must be met by EPA, other Federal agencies, the States, and private industry. Prior to 1990, the Federal CAA did not directly address prescribed burning. However, the latest amendments contain a number of sections which may result in both direct and indirect regulatory controls.

- 1) Section 109 requires EPA to develop primary ambient air quality standards to protect human health and secondary standards to protect welfare. The primary standards must be developed to protect the most sensitive portion of the population with an adequate margin of safety. The Supreme Court has held that EPA is not to consider costs of control when developing national ambient air quality standards. However, EPA and States must consider costs of control when developing regulations to implement the ambient air quality standards.
- 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. *Currently, EPA is allowing each state the flexibility to mold their State Implementation Plans (SIPS) and Smoke Management Programs (SMPs) to their individual needs.*
- 3) Section 112 identifies 188 hazardous air pollutants those pollutants (“..which are known to be, or may be reasonably anticipated to be carcinogenic, mutagenic, teratogenic, neurotoxic, which may cause reproductive dysfunction, or which are [cause] acutely or chronically toxic or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or otherwise...”). EPA has focused their attention on 33 of those 188 pollutants including 5 emitted from biomass burning: acetaldehyde; acrolein; 1,3 butadiene; formaldehyde; and polycyclic organic matter (POM). POM includes 8 major categories of compounds including polycyclic aromatic hydrocarbons (PAHs) which include numerous chemicals emitted from fire. While this section focuses control requirements on major and minor stationary air pollution sources,

States and EPA are trying to determine the risk to the public from all air toxic emissions sources including biomass burning.

- 4) Section 116 allows States to develop standards and regulations that are more stringent but not less stringent than Federal standards and regulations.
- 5) Section 118 requires all Federal agencies to comply with all Federal, State, and local air quality regulations to the same degree as any non-governmental entity. This section was amended in 1990 so that the preceding applies to "(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."
- 6) Sections 160-169 provide for the prevention of significant deterioration of air quality in those areas of the country which have air quality concentrations which are better than the standards set under Section 109. Sections 160-169 provide specific protection for certain National Parks and Wildernesses. In most cases, this section of the Act does not apply to prescribed fire.
- 7) Section 169A provides visibility protection for mandatory Federal Class I areas. Those areas include International Parks, National Memorial Parks which exceed 5,000 acres in size, National Parks which 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.
- 8) 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). However, a Federal agency's prescribed burn emissions are presumed to conform to these plans provided the burn is conducted under a certified SMP, and thus no determination is required. This Section may come in to play where an agency "finances or supports in any way" prescribed burning activities within a non-attainment area by some other organization or group.
- 9) 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. This document was developed with the assistance of National Wildfire Coordinating Group (NWCG) but is, unfortunately, out of date and needs revision due to changes in regulations, policies and smoke management technology.

- 10) Section 310 provides that the CAA shall not be construed as superseding or limiting the authorities and responsibilities under any other provision of law, of any other Federal officer, departmental or agency.
- 11) Section 319 directs EPA to promulgate regulations governing the review and handling of air quality monitoring data influenced by an exceptional event. The purpose of this section of the Act is to codify a number of existing EPA policies into a rule. That rule was published on March 22, 2007. Basically, the Exceptional Events Rule provides that if exceptional events cause violations of the NAAQS, EPA would use its discretion not to re-designate an area as non-attainment. For example, if a wildfire or a volcano caused a violation of the health standards it would not make sense to designate the area as non-attainment for a source that could not be controlled.
- 12) One of those policies referenced in the EER is the 1998 EPA Interim Air Quality Policy on Wildland and Prescribed Fire. The policy integrated two public policy goals: (1) to allow fire to function as nearly as possible in its natural role in maintaining healthy wildland ecosystems, and (2) to protect public health and welfare by mitigating the impacts of air pollution emissions on air quality and visibility. The document identified significant procedural and legal benefits for the States and the users of wildland fire if they develop smoke management programs that are State certified and approved by the EPA. A State Smoke Management Program would establish a standard framework of those related procedures and requirements for managing smoke from prescribed fires. As a result of the new EER, EPA has committed to revise the Interim Policy beginning in 2007.

### **The Exceptional Events Rule**

The Exceptional Events Rule (EER) was written to govern the handling and review of air quality monitoring data influenced by exceptional events.

The Rule defines an Exceptional Event as an event that:

- Affects air quality
- Is not reasonably controllable or preventable
- Is an event caused by human activity that is unlikely to recur at a particular location
- Is a natural event
- AND is determined by EPA to be an exceptional event

Examples of Exceptional Events Include:

- Chemical Spills and Industrial Accidents
- Structural Fires
- Exceedances due to Transported Pollution
- Exceedances due to a Terrorist Attack

Examples of Natural Events are:

- Wildfires
- Volcanic or seismic activity
- High wind events

The rule states that wildfires or “wildland fire use fires” will be treated as natural events. Prescribed fires managed for resources benefits may qualify for exceptional events if they meet certain criteria:

- If they are unlikely to recur at the same location and are not reasonably controllable or preventable.
- If the State certifies that a Smoke Management Program, or basic smoke management practices, were in place

EPA’s handling of data from all other fires will continue to be addressed under the Interim Air Quality Policy on Wildland and Prescribed Fires.

### **Establishment of the Fire/Air Issues Coordination Group and Development of State Fire/Air Cadres**

There are a number of States and local agencies that have developed regulations which directly address prescribed burning. For example, the state of Washington does not allow prescribed burning on weekends during the summer months and has required a reduction in total particulate emissions. Many states, like Arkansas, South Carolina, Delaware, Florida, and Georgia, require land managers to use a dispersion model to predict downwind particulate concentration for each prescribed burn. Pete Lahm, of the USDA Forest Service, has announced that the USFS is in the process of developing a site to act as a “national hub” for smoke related issues at [www.nifc.gov/smoke](http://www.nifc.gov/smoke). In addition, they have set up a neighborhood on [www.myfirecommunity.net](http://www.myfirecommunity.net) called Air Quality and Smoke Management intended to support dialog on the smoke topic.

In 2003 the Wildland Fire Leadership Council recognized that air quality regulations might threaten meeting the goals of the National Fire Plan (<http://www.forestsandrangelands.gov/>). As a result, they established the Fire/Air Issues Coordination Group (FAICG) whose role it is to assist in the development and implementation of effective and efficient agency programs to address fire/air issues that may arise when implementing the National Fire Plan and meeting natural resource objectives.

As a result of the challenges provided by new and potential air quality programs, the National Fire and Aviation Executive Board charged the Fire/Air Issues Coordination Group (FAICG) with developing a strategy to assure that the federal wildland fire management agencies are involved in the development of those programs and regulations at a State and local level. FAICG developed a proposal which was approved by the Fire Directors to develop Inter-agency cadres of staff on a State by State basis. These cadres could then coordinate directly with state and local air regulatory agencies as they work on programs that will impact the management of fire.



FAICG has developed a Priority Matrix identifying which States to focus regulatory development efforts based on needs identified by FAICG coordinated with agency air program staff. They are establishing processes to work with priority States including coordinating with existing smoke management groups, supporting development of new cadres of agency Fire and Air staffs at the state level, and recruiting other groups such as Prescribed Fire Councils.

In some states Cadres may only need to monitor what the State air regulatory agency is planning relative to emissions from wildland fire. In other States, Cadre members may need to actively participate with the State in their drafting of regulations. The amount of time and effort that will need to be spent on these activities will be dependent on what the State air regulatory agency is planning to do relative to prescribed fire.

## **B) NEW EPA LEGAL REQUIREMENTS FOR MANAGING SMOKE FROM PRESCRIBED FIRE**

**Fine Particulate Regulations** – EPA issued their first fine particulate standards in July, 1997 to regulate those particulates less than 2.5 microns (PM-2.5). Again, these standards are of interest to the prescribed fire community because approximately 70% of the particulate emitted from biomass burning are in this size range. As a result of previously mentioned studies linking the relationship between PM2.5 and mortality, EPA revised these standards in September, 2006 reducing the 24 hr standard from 65 to 35 micrograms per cubic meter.

|  | 1997 Standards<br>July 17, 1997      |  | 2006 Standards<br>September 21, 2006 |  |
|--|--------------------------------------|--|--------------------------------------|--|
|  | Annual                               | 24-hour                                      | Annual                               | 24-hour                                      |
| <b>PM2.5<br/>(Fine<br/>Particles)</b>  | <b>15 µg/m3</b><br>Annual<br>average | <b>65 µg/m3</b><br>98th percentile           | <b>15 µg/m3</b><br>Annual<br>average | <b>35 µg/m3</b><br>98th percentile           |
| <b>PM10<br/>(Coarse<br/>Particles)</b> | <b>50 µg/m3</b><br>Annual<br>average | <b>150 µg/m3</b><br>1 expected<br>exceedance | <b>Revoked</b>                       | <b>150 µg/m3</b><br>1 expected<br>exceedance |

The PM standard change may cause new areas of non-attainment. The following information was taken from an EPA memorandum released to provide information on the timeline for designating areas for the purpose of implementing the revised 24-hour particle (PM2.5) national ambient air quality standard (NAAQS).

#### **Time Line For Revised 24-Hour PM<sub>2.5</sub> NAAQS Designation Process**

|  |  |
|--|--|
| Effective date of revised 24-hour PM <sub>2.5</sub> NAAQS                            | December 18, 2006  |
| State and Tribal recommendations due for 24-hour PM <sub>2.5</sub> designations      | December 18, 2007  |
| EPA notifies States and Tribes concerning any modifications to their recommendations | No later than August 20, 2008 (120 days prior to final designations) |
| EPA issues final 24-hour PM <sub>2.5</sub> designations                              | No later than December 18, 2008*                                     |

\*In the event the Administrator has insufficient information to promulgate the designations by December 18, 2008, the date of final designations may be extended up to one year, but no later than December 18, 2009.

#### **Factors EPA Will Consider as the Basis for Nonattainment Area Boundaries**

EPA believes that certain factors are appropriate to consider in making nonattainment area boundary recommendations and final boundary determinations. EPA will consider these same factors, along with any other relevant information, in evaluating modifications to the boundary recommendations from States and Tribes. EPA recommends that States and Tribes consider the following nine factors in assessing whether to include an area in the designated non-attainment area boundary:

- Emission data
- Air quality data
- Population density and degree of urbanization (including commercial development)
- Traffic and commuting patterns
- Growth rates and patterns
- Meteorology (weather/transport patterns)
- Geography/topography (mountain ranges or other air basin boundaries)
- Jurisdictional boundaries (e.g., counties, air districts, Reservations, metropolitan planning organizations (MPOs))
- Level of control of emission sources

This list of recommended factors is not intended to be exhaustive, and States and Tribes may submit additional information on factors they believe are relevant for EPA to consider. In general, a State’s or Tribe’s demonstration supporting the boundary recommendation for an area should show that: 1) violations are not occurring in the excluded portions of the recommended area, and 2) the excluded portions do not contain emission sources that contribute to the observed violations. A State or Tribal submittal that only addresses whether monitored violations are occurring in an area will not suffice as the sole justification for designating the boundaries of a non-attainment area.

<sup>1</sup> An explanation of each of these nine factors is provided in Chapter 5 of the Technical Support Document for December 17, 2004 designations and April 2005 modifications, available at: <http://www.epa.gov/pmdesignations/tech.htm>

|                    |  |
|--------------------|--|
| <b>April 2005</b>  | Area designations for 1997 PM2.5 NAAQS                           |
| Dec. 2006          | Effective date for revised 2006 PM2.5 NAAQS                      |
| Dec. 2007          | States recommend designations for revised PM2.5 24-hour standard |
| <b>April 2008</b>  | State plans (SIPs) due for PM2.5 1997 annual std.                |
| Dec. 2008-9        | Final designations for revised PM2.5 24-hr std                   |
| April 2010         | Effective date for revised PM2.5 24-hr std area designations     |
| <b>Apr 2010-15</b> | Attainment date for 1997 PM2.5 annual std                        |
| April 2013         | State plans due for revised PM2.5 24-hr std.                     |
| April 2015-20      | Attainment date for revised PM2.5 24-hr std                      |

### C) STATE IMPLEMENTATION PLANS (SIPS)

Most of a State program to protect air quality is contained in a State Implementation Plan (SIP). The CAA requires federal, and therefore State, agencies to conform fire activities with SIPs, to address visibility/regional haze impacts, and to address prevention of significant deterioration of air quality. As the use of fire for resource management increases, State air quality managers will need information to develop potential annual or seasonal air pollutant emission estimates for SIP planning. **The first Regional Haze SIPs are due December 17, 2007. The new PM2.5 SIPs are due April 5, 2008. Although there is no “deadline” for State SMPs, a logical deadline would be no later than April 5, 2008.**

EPA has created guiding principles to implement SIPs:

- Air quality and visibility impacts from fires managed for resource benefits should be treated equitably with other source impacts.
- Land and vegetation management practices should be promoted that are best for wildland ecosystems, yet protect public health and avoid visibility impairment.
- States/tribes should foster collaborative relationships among wildland owners/managers, air quality managers and the public to develop and implement SMP's.
- States/tribes will be allowed the flexibility (prior to measuring violations of the PM2.5 or PM10 NAAQS attributable to fires managed for resource benefits) to decide when a SMP is needed and how the program will be designed to prevent adverse air quality impacts.
- This does not preclude wildland owners/managers from including smoke management components in burn plans for fires they conduct in the absence of an applicable State/tribal program.
- All parties (wildland owners/managers, air quality managers and the public) are expected to act in good faith and will be held accountable for implementing their respective parts of fire and SMPs.

## **D) REGIONAL HAZE AND VISIBILITY REGULATIONS**

EPA and State visibility regulations are being developed to help meet the National visibility goal identified in Section 169A of the CAA; *the prevention of any future and the remedying of any existing, impairment of visibility in mandatory Federal Class I areas from man-made air pollution*. EPA finalized their Regional Haze regulations on July 1, 1999 (64 FR 35714). These regulations specifically address fire for many states in the West (see Section 309 of the RH regs) and generally address fire in the rest of the states.

Research conducted in some wildernesses and national parks indicates that viewing the scenery through “clean, fresh air” is one of the most important attributes as determined by recreationists. This presents an interesting challenge for land managers who want to use prescribed fire in those same areas. Good visibility is important to the tourism industry in many areas.

Visibility issues are also extremely important for prescribed fires when burn units are near roads, airports, homes, schools, and other smoke sensitive areas.

**All States with Class I areas are required to amend their SIPs to identify how they will prevent future visibility impairment and remedy existing impairment of visibility. As a part of their visibility regulations EPA requires that States, in their SIPs, consider the impacts of prescribed burning on visibility and the adequacy of SMPs. The SIP must be reviewed every 3 years to determine if the State's "Long Term Strategy" for meeting the national visibility goal is appropriate.**

Five Regional Planning Organizations (RPOs) have been established to help States develop programs to implement the Regional Haze Regulations (see appendix B). The RPO that has taken the lead nationally in developing technical programs is the Western Regional Air Partnership (WRAP). The WRAP was created to aid in the implementation of the Grand Canyon Visibility Transport Commission's recommendations. Under WRAP, wildland fire is being addressed by a specific forum (The Fire Emissions Joint Forum) whose activities can be reviewed at the web site [www.wrapair.org](http://www.wrapair.org). The WRAP has adopted a policy relative to the classification of fire as being either "natural" or "anthropogenic". Basically, the policy states that any wildfire or any fire being managed to *maintain* the natural fire frequency will be classified as natural. Any fire that is being ignited or managed to *restore* the natural fire frequency is anthropogenic. All fire such as slash burning or agricultural burning is also anthropogenic. The policy can be found at the WRAP web site.

The five RPOs are developing the technical basis for visibility protection plans that include establishing visibility goals for each Class I area based on improving the 20% haziest days and ensuring no degradation occurs on the cleanest days.

The EER specifically requires that smoke management must be considered. The State must consider smoke management techniques for agricultural and forestry management purposes including plans as currently occur within the State for these purposes. The EER also requires the development of an emission inventory, which involves a statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal Area.

## **E) EMISSIONS INVENTORY**

According to the Interim Policy, a National Interagency Fire Statistics Information Project has been initiated to develop an easily accessible system for storing a set of commonly agreed upon fire data. Post-burn data, such as that described above, on future wildland and prescribed fires would be stored in this database. The database will be accessible by air quality managers to estimate past, current, and future emission trends from this source category. The EPA encourages the Federal land management agencies to develop the fire statistics database and federal land managers to report fire data to the system. These fire data will be needed by air

quality managers in regions where most wildland and prescribed fires occur on Federal lands. **Air quality managers should request similar fire data for wild and prescribed fires on State, private and Indian lands as well as information on other types of open burning to complete their emission inventories.** We all need to take responsibility for reporting and tracking our data accurately and efficiently. Over time, this information will be very useful to prescribed managers to coordinate burns, specify firing techniques, and make more accurate, efficient “go/no go” decisions.

## **F) CURRENT POLICIES UNDER REVIEW/DEVELOPMENT**

### **The Annual PM 2.5 Standard Review**

The EPA has recently begun the next review of the PM NAAQS. Initiating this review at this time is consistent with sections 108 and 109 of the Clean Air Act which require the Agency to periodically review (at 5 year intervals) the latest scientific information and the standards. It is also consistent with the Agency’s new NAAQS review process ( for more information on the NAAQS review process, please see <http://www.epa.gov/ttn/naaqs/>). Under the new NAAQS process, the major elements of this review are: an integrated plan highlighting the key policy-relevant issues; an integrated science assessment and a risk/exposure assessment. This new process, which is being applied to the current review of the NAAQS for PM, contains four major components. The first component is an integrated review plan. This plan will specify the schedule for the review, the process for conducting the review, and the key policy-relevant science issues that will guide the review. The second component of the review process is a science assessment. Under the new process, a concise synthesis of the most policy-relevant science will be compiled into an integrated science assessment (ISA). The ISA for this review of the PM NAAQS will critically evaluate and integrate scientific information on the health effects associated with exposure to PM in the ambient air. It will focus on scientific information that has become available since the last review and will reflect the current state of knowledge on the most relevant issues pertinent to the review of the PM NAAQS. The third component of the review process is a risk/exposure assessment. The fourth component of the revised process will be a policy assessment in the form of an advanced notice of proposed rulemaking. Clean Air Scientific Advisory Committee (CASAC) and public review and comment will be solicited at several times during the development of these critical documents, which will provide the foundation upon which Agency decision-makers will ultimately base their decisions on the PM NAAQS. EPA currently anticipates that proposed decisions on the PM NAAQS will be made around the end of 2010, with final decisions in the fall of 2011.

### **Revision of the Interim Air Quality Policy on Wildland and Prescribed Fires and the Fire Strategy Document**

Revisions to the Interim Policy are currently underway and will be finished by 2008. A second document, “Fire Strategy” is also being developed. This Fire Strategy will address a “holistic view” of fire, including emissions from all biomass burning like leaf piles, woodstoves, agricultural and silvicultural burning. We need to learn more about each process, how we can be involved, and what actions are needed for us to contribute meaningful input in the revisions/developments. See Appendix A for details on the Regulatory Process.

## **Comparing Emissions Between Prescribed Fire and Other Industries**

The Forest Service has established five Fire Consortia for Advanced Modeling of Meteorology and Smoke (<http://www.fs.fed.us/fcamms/>). With proper management they have the potential to provide all fire managers with better smoke modeling and real-time emissions tracking tools. NOAA and the Forest Service have united to participate in several studies currently underway using new models to assess the cumulative effects of all emission sources, not just prescribed fire. They are also conducting studies investigating specific emissions of concern like O3 and CO2. Now is the time for States to offer to be included in these studies, and to begin working with the regional planning groups and air quality cadres. Now is the time to investigate which stakeholders are at the table during EPA public hearings that affect your state. NOW is the time to GET INVOLVED.

## **SMOKE MANAGEMENT**

### **A) SMOKE AS AN AIR POLLUTANT**

The following is an excerpt from The National Advanced Fire and Resource Institute course on Smoke and Air Quality Management that offers a clear explanation of what smoke is and what prescribed fire managers should be aware of regarding public/firefighter safety.

Smoke from wildland fire includes both what you can see (soot, tar droplets, and water droplets) and what you can not see (gases and organic vapors). The primary products of combustion of organic material include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons (300+), nitrogen oxides, and trace minerals.

1. Carbon Dioxide - The emission factor for carbon dioxide for prescribed burning is 2000-3500 lbs/ton. That is, for every ton of fuel (organic matter) burned, between 2000 to 3500 pounds of carbon dioxide is produced. Carbon dioxide is not presently regulated by EPA or the States. However, increases in carbon dioxide concentrations in the atmosphere may play a role in global climate change. All decomposition of organic material, either by fire or microbial action, produces carbon dioxide.
2. Carbon Monoxide - The emission factor for carbon monoxide for prescribed burning is 20-500 lbs/ton. Carbon monoxide is a colorless, odorless gas that can cause health effects and even death at high concentrations. 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. As a result of rapid dilution and its instability, carbon monoxide emissions from prescribed

burning are not a concern to the general public. However, carbon monoxide emissions may be a concern to fire fighters and persons on prescribed burning crews.

3. Water Vapor - The emission factor for water vapor for prescribed burning is 500-1500 lbs/ton. The only possible concern about water vapor is visibility reduction in the vicinity of the fire.
4. Particulate Matter - The emission factor for particulate matter for prescribed fire is 20-180 lbs/ton. Particulates are a criteria pollutant and can impact health and visibility. Particulates are presently the major pollutant of concern from prescribed burning. Wood smoke particulates are relatively small. In general, 70 percent are less than 2.5 microns in diameter: 20 percent are between 2.5 and 10 microns in diameter, and 10 percent are greater than 10 microns in diameter. 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. Larger particulates found in plumes from high intensity fires are not products of combustion but rather products of mechanical mixing (turbulence). 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 excellent scatterers of light and, therefore, excellent reducers of visibility.
5. Hydrocarbons - The emission factor for hydrocarbons for wildland fire is 10-40 lbs/ton. While hydrocarbons are not a criteria pollutant, they may impact health and visibility. In some cases hydrocarbons emitted from wildland fire may contribute to excessive ozone concentrations.
6. Nitrogen Oxides - The emission factor for nitrogen oxides for wildland fire is 1-9 lbs/ton. Nitrogen oxides are a criteria pollutant and can impact health and visibility. However, the low emission factor for nitrogen oxides for prescribed burning reduces our concern for violations of ambient air quality standards on a local level. However, nitrogen oxides do play a role on ozone formation and may be a concern in some areas.
7. Secondary Emissions - Secondary emissions are pollutants which are formed in the atmosphere by photochemical transformation of primary emissions. They include oxidants such as ozone which is a criteria pollutant. The specific emission factors for secondary emissions from prescribed burning are unknown but are believed to be relatively small. At this time, it is uncertain as to the role of the impacts of secondary emissions from prescribed burning on visibility.
8. Air Toxics - An emerging concern about prescribed fire smoke is the possible presence of air toxics. Those air toxics emitted by fire that EPA is presently focusing on include acetaldehyde; acrolein; 1,3 butadiene; formaldehyde; and polycyclic organic matter (POM). POM includes 8 major categories of compounds including polycyclic aromatic hydrocarbons (PAHs) which include numerous chemicals emitted from fire. At this time it is difficult to assign a risk to the public and those persons on prescribed fire and



wildfire crews resulting from possible air toxics in smoke from prescribed fire. 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.

9. On June 20, 2007, EPA proposed to strengthen the national ambient air quality standards for ground-level ozone, the primary component of smog. The proposed revisions reflect new scientific evidence about ozone and its effects on people and public welfare. EPA's proposal would revise both ozone standards: the *primary* standard, designed to protect human health; and the *secondary* standard, designed to protect welfare (such as vegetation and crops). See details about proposed changes at <http://epa.gov/groundlevelozone/fs20070620.html> EPA will take public comment for 90 days following publication of the proposal in the Federal Register. The agency also will hold four public hearings on the proposal in: Los Angeles and Philadelphia on Aug. 30, and Chicago and Houston on Sept. 5. EPA will issue final standards by March 12, 2008.

### **Firefighter Health Concerns and Mitigation Strategies**

Firefighter Health Concerns - The mixture of particles, liquids, and gaseous compounds found in smoke from wildland fires is very complex. The potential for long-term adverse health effects is much greater because of this complex mixture. Those emission products which are of concern to firefighters include: fine particulate matter, polynuclear aromatic hydrocarbons, carbon monoxide, aldehydes (mainly formaldehyde and acrolein), organic acids, semivolatile and volatile organic compounds, free radicals, ozone, and the inorganic fraction of particles. **In many cases, exposures to firefighters on prescribed fires are higher than they are on wildfires.**

Potential Mitigation Strategies - Studies of wildland firefighters indicate the potential for exposure to toxic smoke concentrations. While it is impossible to ensure complete safety from smoke inhalation on a prescribed fire, fire managers have the responsibility to ensure the safety of their crew. Recommendations to minimize the impacts of prescribed fire smoke on firefighters include the following:

- Use flank attack as opposed to head attack, where appropriate, in heavy smoke situations.
- Minimize mop-up when possible or adjust operational periods on mop-up to avoid periods of inversions. Minimize snag falling consistent with safety concerns, to avoid putting heavy fuels on the ground that will require mop-up.
- Request that fire behavior forecasts include smoke dispersion and inversion potentials.
- Rotate personnel out of heavy smoke areas.
- Plan ignition times and firing patterns to minimize smoke impacts on lighters and holding crews. Where possible, use equipment rather than people in holding areas (sprinklers, foam, etc.).
- Address smoke impacts in the job hazard analysis.

- Support continued research to develop appropriate respirators and respiratory protection programs.

## **B) THE IMPORTANCE OF SMOKE MANAGEMENT**

### **What is Smoke Management?**

Land managers use of prescribed fire entails responsibility for not only prescribed fire, but also for any incidents or problems caused by smoke. Smoke management is a system of plans and procedures used to minimize the quantity of smoke produced and mitigate the undesirable effects of smoke on the environment. The basic strategies are to conduct prescribed burning in good smoke dispersion weather and use firing techniques to reduce the amount of smoke produced. This requires the fire manager to be knowledgeable of fuels, fire size, expected weather conditions, man-made improvements around the fire site, the planned firing technique, and the surrounding smoke sensitive areas (SSAs). SSAs include, but are not limited to, hospitals, highways, airports, and population centers.

### **Why is Smoke Management Important?**

Land managers have a responsibility to be aware of and to minimize the risks of using fire as a management tool. Landowners and land managers need to work with state air quality agencies to coordinate prescribed fire activities, minimize air pollutant emissions, manage smoke from prescribed fires, and establish emergency action plans to mitigate negative impacts on public and firefighter health. By working together and increasing communication, an increase of prescribed fire can be effectively and safely implemented across the United States, reducing the risk of catastrophic wildfires and improving the ecological integrity of forests and ecosystems coast to coast, while protecting public and firefighter safety.

### **Why does EPA encourage each state to have a Smoke Management Program?**

EPA emphasizes the use of SMPs to minimize impacts of burning activities on air quality and visibility impairment, without regulating fires. EPA also supports and is willing to partner with Federal, State, Tribal and private land managers to ensure equitable and appropriate use of fire while meeting air quality goals and standards.

The Interim Air Quality Policy on Wildland and Prescribed Fire recommends that States implement SMPs to mitigate the public health and welfare impacts of fires managed for resource benefits. While SMPs will also mitigate nuisance smoke intrusions, nuisance issues have been left for the individual air quality agencies to address. It is important for states to address nuisance smoke intrusions in their individual prescribed fire/burn legislation to clearly decipher between smoke related health problems and smoke related nuisance problems.

## **Why is it imperative for all states to have a Smoke Management Program? What are our incentives?**

States have flexibility in their approach to prescribed fire regulations and are not currently mandated to have an SMP. There is no current deadline for State SMPs. However, the incentives to adopt an EPA certified SMP are high.

The following section of the Interim Policy is very important to understand. At this point, states are not required to comply with federal regulations or have SMPs. However, if states DO NOT have an SMP that complies with federal policy, and smoke from a prescribed fire causes a PM violation, it is less likely for smoke from their prescribed fire to be “flagged” by air quality regulators and included under the EER. Plus, with the new PM2.5 standards, smaller fires, and subsequently less smoke, have the ability to affect sensors and/or sensitive areas. It is IMPERATIVE for every state to have an SMP in place to ensure that private, local, and State land managers have the same opportunities and considerations as Federal land managers related to prescribed fire smoke. SMPs create open communication between agencies, landowners/public, and air quality regulators. In turn, better communication and proper planning allow land managers to carry out the use of more prescribed fire in a professional, safe, efficient manner.

*“The main incentive is that, as long as fires do not cause or significantly contribute to daily or annual PM2.5 and PM10 NAAQS violations, States/tribes may allow participation by burners in the basic SMP to be voluntary and the SMP does not have to be adopted into the State Implementation Plan (SIP). Another incentive is the commitment by EPA to use its discretion not to re-designate an area as non-attainment when fires cause or significantly contribute (see section VII.B.) to PM NAAQS violations, if the State/tribe required those fires to be conducted within a basic SMP. Rather, if fires cause or significantly contribute violations, States/tribes will be required to review the adequacy of the SMP, in cooperation with wildland owners/managers, and make appropriate improvements. If States/tribes do not certify that a basic SMP is being implemented, no special consideration will be given to PM violations attributed to fires managed for resource benefits. Rather, EPA will call for a SIP revision to incorporate a basic SMP and/or will notify the governor of the State or the tribal government that the area should be re-designated as non-attainment. The SMP adopted in response to the SIP/TIP call must require mandatory participation for greater than de minimis fires, and must be adopted into the SIP/TIP so that it is federally enforceable. Also, the SIP/TIP must meet all other CAA requirements applicable to non-attainment areas.”*

## **Who should be involved in creating a State Smoke Management Program?**

The writing of an SMP should be the combined efforts of those involved with prescribed fire in each state. It is useful to bring together the strengths and interests of several parties to ensure that the most recent technical information, the most accurate summary of prescribed fire use, and the most current air quality standards are represented. Usually the State forestry agency is heavily involved, providing the burn authorization/permitting system and the training standards

for prescribed fire. The state air quality agency must be included to ensure that proper protocol is included for managing prescribed fire smoke.

The Interim Air Quality Policy on Wildland and Prescribed Fires clearly states that a collaboration of State/Tribal air quality managers, public land managers, private and Indian land owners/managers, and the general public should be involved in the development and implementation of a State SMP. EPA also plays a role by regulating and enforcing national air quality standards. The State air quality manager must certify in a letter to the Administrator of EPA that at least a basic program has been adopted and implemented in order to receive special consideration for air quality data resulting from fires managed for resource benefits under the Interim Air Quality Policy on Wildland and Prescribed Fire and the Exceptional Events Rule.

### **Top Ten Smoke Management Questions for Land Managers to Consider**

The proceedings of [Fire in Eastern Oak Forests: Delivering Science to Land Managers](#) includes an excellent paper by Charney, Acheson, and Stacy about the top ten smoke management questions, which can be applied to all areas of the country, not just the eastern oak forest.

The following questions should be considered when developing a state SMP.

- 1) Where will burning occur?
- 2) Where are the people? Where are the population centers?
- 3) Where are the roads?
- 4) Where are existing air pollution problem areas?
- 5) Where/What are the Class I areas?
- 6) When does burning typically occur?
- 7) Where does smoke typically go?
- 8) Where is burning expected to increase/decrease?
- 9) Where are there coordinated SMPs?
- 10) What does all this mean to fire and smoke managers in your State?

### **C) COMPONENTS OF AN EPA APPROVED SMOKE MANAGEMENT PROGRAM**

The **Interim Air Quality Policy on Wildland and Prescribed Fires** describes what the content of an SMP must be in order for the SMP to be certified by the U.S. Environmental Protection Agency. The components include:

1. Authorization To Burn
2. Minimizing Air Pollutant Emissions
3. Smoke Management Components of Burn Plans (Prescriptions)
4. Public Education and Awareness
5. Surveillance and Enforcement
6. Program Evaluation

## 7. Optional Air Quality Protection (Not Required)

The following information is taken directly from the Interim Air Quality Policy on Wildland and Prescribed Fires to describe what EPA requires the states to do in order to meet the individual elements of the SMP.

### **SMOKE MANAGEMENT PROGRAMS (SMPs)**

The SMPs establish a basic framework of procedures and requirements for managing smoke from fires managed for resource benefits and are typically developed by States/tribes with cooperation and participation by wildland owners/managers. The purposes of SMPs are to mitigate the nuisance and public safety hazards (e.g., on roadways and at airports) posed by smoke intrusions into populated areas; to prevent deterioration of air quality and NAAQS violations; and to address visibility impacts in mandatory Class I Federal areas. Some strong indications that an area needs a SMP are: (1) citizens increasingly complain of smoke intrusions; (2) the trend of monitored air quality values is increasing (approaching the daily or annual NAAQS for PM<sub>2.5</sub> or PM<sub>10</sub>) because of significant contributions from fires managed for resource benefits; (3) fires cause or significantly contribute to monitored air quality that is already greater than 85 percent of the daily or annual NAAQS for PM<sub>2.5</sub> or PM<sub>10</sub>; or (4) fires in the area significantly contribute to visibility impairment in mandatory Class I Federal areas.

If a State/tribe determines that a SMP is needed, they can adopt any type of program they believe will prevent NAAQS violations and address visibility impairment. For example, general fire regulations may establish basic parameters, such as wind speed, direction, location and distance to sensitive receptors, etc., within which fires can be ignited or naturally ignited fire can be allowed to continue to burn. States/tribes may allow wildland owners/managers to voluntarily notify them of fire plans or may require prior authorization. They may also exempt de minimis fires (fires that will cover fewer than X acres or consume less than Y tons of fuel, as established by the State/tribe) from meeting the regulations. Such regulations leave much discretion to wildland owners/managers as to when to ignite fires, and what management strategy to follow with naturally ignited fires. States/tribes may exercise enforcement authorities when wildland owners/managers are found to have ignited the fire outside of the parameters of the rule, or not to have appropriately responded to air quality impacts caused by naturally ignited fires. General fire regulations may be adequate for areas where fires managed for resource benefits rarely cause or contribute to air quality problems. However, when plans to use fire on a large scale could cause significant air quality impacts, or several wildland owners/managers within an airshed are expected to use fires concurrently, a more structured SMP requiring cooperation and coordination of fire activities may be required to minimize emissions and mitigate the air quality impacts.

State/tribal air quality managers, public wildland managers, private and Indian wildland owners/managers, and the general public should collaborate in the development and implementation of State/tribal SMP's. The State/tribal air quality manager must certify in a letter to the Administrator of EPA that at least a basic program has been adopted and implemented in order to receive special consideration under this policy of air quality data resulting from fire

impacts, as explained in section VII. The SMP does not have to be incorporated into the SIP/TIP or be Federally enforceable, however. The following describes the basic components (A - F) of a certifiable SMP. There is considerable latitude within the components for individual State/tribal preferences.

### **A. Authorization to Burn**

The SMP should include a process for authorizing or granting approval to manage fires for resource benefits within a region, State, or on Indian lands and identify a central authority responsible for implementing the program. The process may be as simple as receiving applications for permission to burn and granting approval via telephone or facsimile. The SMP central authority must review fire applications, consult with the applicants, if necessary, and promptly make burn/no burn decisions. When authorizing a fire, the authority should consider all open burning activities (land clearing and construction wastes, agricultural wastes, etc.) allowed within an airshed. **The central authority should strive to treat public and private wildland owners/managers equitably when authorizing fires.** Neighboring States/tribes are encouraged to create partnerships to coordinate fire projects when inter-jurisdictional impacts are expected, so as to meet air quality and fire management objectives. Fire emissions should be minimized and the air quality impacts should be mitigated regardless of political boundaries.

States/tribes may or may not require written burn plans for de minimis fires, especially if the central authority records pertinent fire information. However, written burn plans are strongly recommended for greater than de minimis fires. Burn plans should be prepared by the wildland owners/managers. The central authority should assist private land owners that cannot prepare their own plans. When written burn plans are required, especially for fires on publicly owned lands, they should include such information as the:

- location and description of the area to be burned,
- personnel responsible for managing the fire,
- type of vegetation to be burned,
- area (acres) to be burned,
- amount of fuel to be consumed (tons/acre),
- fire prescription including smoke management components (discussed below),
- criteria the fire manager will use for making burn/no burn decisions,
- safety and contingency plans addressing smoke intrusions.

The central authority's criteria for authorizing fires should be based on existing air quality and the ability of the airshed to disperse emissions (e.g., meteorological conditions) from all burning activities on the day of the burn. For fires lasting longer than one day, predicted meteorological conditions for several days should be considered to avoid aggravating existing problems. Persons receiving authorization to ignite fires must comply with all applicable local, State, tribal and Federal requirements. Persons responsible for managing greater than de minimis fires should be adequately trained in fire and smoke management. Fire managers should be required to follow the authorized burn plan or explain why it was necessary to deviate from the plan.

### **B. Minimizing Air Pollutant Emissions**

The SMP should encourage wildland owners/managers to consider the alternative treatments discussed in section V.A.1., above. Public land managers typically consider and evaluate alternative treatments that may achieve management objectives, their costs and the environmental impacts of each method. States/tribes should assist private land owners to also identify economically feasible treatments that will meet their objectives with minimum air pollutant emissions. When the use of fire is selected as the best means to accomplish management goals, there are several ways to reduce emissions from a single fire. The approaches fall into four categories and their applicability varies by fuel type, (1) minimize the area burned, (2) reduce the fuel loading in the area to be burned, (3) reduce the amount of fuel consumed by the fire, (4) minimize emissions per ton of fuel consumed. These emission reduction techniques rely almost exclusively on reducing the amount of fuel consumed by a particular fire. The excluded fuels could be consumed by a subsequent fire, however, unless they are removed from the area or biologically decompose. Also, generally these techniques cannot be used to reduce emissions from naturally ignited fires. Emission reduction techniques are discussed further in the white paper “What Wildland Fire Conditions Minimize Emissions and Hazardous Air Pollutants and Can Land Management Goals Still be Met?”

### **C. Smoke Management Components of Burn Plans**

When burn plans are required they should include the following smoke management components.

#### **1. Actions to Minimize Fire Emissions**

The burn plan should document the steps taken prior to the burn and actions that will be taken during and after the burn to reduce air pollutant emissions. This includes measures that will be taken to reduce residual smoke, such as rapid and complete mop-ups, mop-ups of certain fuels, etc.

#### **2. Evaluate Smoke Dispersion**

The central authority should evaluate dispersion conditions prior to authorizing fires. Burn plans should evaluate potential smoke impacts at sensitive receptors and time fires to minimize exposure of sensitive populations and avoid visibility impacts in mandatory Class I Federal areas. The plan should identify the distance and direction from the burn site to local sensitive receptor areas and to regional/interstate areas where appropriate. Fire prescriptions submitted prior to the day of the fire must specify minimum requirements for the atmospheric capacity for smoke dispersal such as minimum surface and upper level wind speeds, desired wind direction, minimum mixing height, and dispersion index. It may be necessary to purchase meteorological services from private companies if they are not available from the National Weather Service.

#### **3. Public Notification and Exposure Reduction Procedures**

The plan should identify actions that will be taken to notify populations and authorities (e.g., local air quality managers) at sensitive receptors, including those in adjacent jurisdictions, prior to the fire. The plan should also identify contingency actions that will be taken during a fire to reduce the exposure of people at sensitive receptors if smoke intrusions occur. The central

authority should perform these functions, if needed, for some private land owners. Appropriate short-term (less than 24-hour) contingency actions may, among other things, include:

- Notifying the affected public (especially sensitive populations) of elevated pollutant concentrations,
- Suggesting actions to be taken by sensitive persons to minimize their exposure (e.g., remain indoors, avoid vigorous activity, avoid exposure to tobacco smoke and other respiratory irritants),
- Providing clean-air facilities for sensitive persons,
- Halting ignitions of any new open burning that could impact the same area,
- Analyzing the fire situation and identifying alternative management responses upon becoming aware that a fire is out of air quality prescription with regard to the air quality criteria, (Federal land management agencies perform a Wildland Fire Situation Analysis),
- Consulting State/tribal air quality managers regarding appropriate short-term fire management response to abate verified impacts,
- Implementing management responses that will mitigate the adverse impacts to public health,
- Reporting the steps taken to mitigate adverse impacts to the public and appropriate State/tribal agencies after they have been completed.

#### **4. Air Quality Monitoring**

The plan should identify how the effects of the fire on air quality at sensitive receptors, and visibility in mandatory Class I Federal areas will be monitored. The extent of the monitoring plan should match the size of the fire. For small fires, visual monitoring of the direction of the smoke plume and monitoring nuisance complaints by the public may be sufficient. Other monitoring techniques include posting personnel on vulnerable roadways to look for visibility impairment and initiate safety measures for motorists; posting personnel at other sensitive receptors to look for smoke intrusions; using aircraft to track the progress of smoke plumes; and continued tracking of meteorological conditions during the fire. For large fires expected to last more than one day, locating real-time PM monitors at sensitive receptors may be warranted to facilitate timely response to smoke impacts. If needed, the central authority may perform these monitoring functions for some private land owners. For additional information on monitoring wildland fire impacts see the white paper “Air Monitoring for Wildland Fire Operations.”

#### **D. Public Education and Awareness**

The SMP should establish criteria for issuing health advisories when necessary, and procedures for notifying potentially affected populations, including those in adjacent jurisdictions, of planned fires. A program should be implemented to explain the use and importance of fire for ecosystem management, the implications to public health and safety, and the goals of the SMP.



Wildland and air quality managers should work with the press to announce pre-fire health advisories, and post-fire results including such things as the management objectives met; smoke intrusions observed, and/or successful minimization of air quality impacts.

### **E. Surveillance and Enforcement**

The SMP should include procedures to ensure that wildland owners/managers will comply with the requirements of the SMP. Fire managers must follow the burn plan, including the fire prescription and smoke management components, or explain any deviations from the plan. Memorandums of understanding may be used to specify the responsibilities of each State/tribal agency in implementing the SMP.

### **F. Program Evaluation**

The SMP should provide for periodic review by all stakeholders of its effectiveness and revision of the program as necessary. The effectiveness review should be based on observations such as reports of smoke intrusions, nuisance complaints, and monitored air quality impacts. Post-burn reports should be required for fires that exceed their air quality prescription and/or fires that cause smoke impacts at sensitive receptors. Post-burn reports for escaped fires should describe the incident, describe the contingency plan implemented, and provide recommendations to prevent future smoke related problems. State/tribal SMP's should include procedures for re-evaluating the effectiveness of rules and regulations every 3 to 5 years. Such procedures should involve all the original participants (e.g., wildland owners/managers, air quality managers, the public, etc.) and should review the:

- Acres of fires managed for resource benefits planned for the next 5 years,
- Need to expand the scope of the program to include authorization of other open burning,
- Need for changes in the SMP.

### **G. Optional Air Quality Protection**

The following components are not required in a basic SMP, but States/tribes may adopt more stringent SMP's or include additional smoke management requirements. For example, "special protection zones" may be established to provide better protection against smoke impacts. Special protection zones could be buffers (e.g., 10 - 25 miles) around wildland/urban interface areas, nonattainment areas, or mandatory Class I Federal areas. Additional requirements for burns within a special protection zone may include no burning if high pollution levels already exist in the area. Also, special protections may only be required for burns that will last overnight, for multi-day burns or burns during specific seasons. States/tribes may also establish "performance standards" that would trigger implementation of additional smoke management requirements if exceeded in an area. The performance standards could set limits on the frequency and intensity (e.g., hours/day, PM concentration, visibility impairment) of smoke intrusions. Implementation of performance standards may require real-time monitoring of air quality. Additional requirements for fires after the performance standards are exceeded may include better dispersion parameters (e.g., increased wind speed, mixing height, dispersion index, etc.).

## **EDUCATION AND RESEARCH**

The benefit of local, regional, and national agencies joining forces through the National Coalition of Prescribed Fire Councils is more evident every day as brilliant scientists, experienced practitioners, and skilled politicians come together to support prescribed fire. Instead of “re-creating the wheel”, we have been given the permission to use the following excerpt from The National Advanced Fire and Resource Institute course on Smoke and Air Quality Management. Our goal for the future is to engage the public and the air quality managers of the nation in the benefits of prescribed fire as a land management tool.

### **A) THE NEED FOR INVOLVEMENT WITH THE PUBLIC AND AIR REGULATORY AGENCIES**

The general public's lack of knowledge about the ecologically imperative role of fire in ecosystems has the potential to result in more stringent air quality regulations which, in the long term, could create severe changes to ecosystems. The public, including most air quality regulators, understand the need for good air quality much better than they understand the natural and historic role of fire in ecosystem development. Few of the public are aware that many natural forest ecosystems exist because of periodic fire rather than in spite of it. Few understand the relationship of fire to wildlife habitat and populations, forest diseases, protection of rare and endangered species, management of national parks and wilderness, forest succession, and biological diversity. Unfortunately, the public is becoming more urban and, as a result, may have less of an understanding of biological processes and ecology than their rural counterparts.

Agency administrators need to communicate all acquired knowledge on the role of periodic fire in forest ecosystems as well as knowledge of wildfire effects to the public. This awareness and education of the public will increase public sensitivity to the role of fire in ecosystem maintenance. This message needs to be clear and concise for different ecosystems. Fire managers also need to let the public know that we are doing the best possible job (assuming that is the case) of managing our smoke, that we are aware of air quality concerns and that we take those concerns seriously.

Population and industrial growth in much of the country are increasing at the same time as the ecological need for the use of prescribed fire is increasing. However, given a finite atmosphere and a need to control air pollutants, the public must determine which sources will be allocated shares of the air resource. Public decisions on the allocation of the air resource will be based to some degree on the public's knowledge of the need for tolerating certain short-term pollutant sources. This has the potential to result in severe restriction on the use of prescribed fire as compared to restriction of other "more understood" air pollution sources. In short, the public's lack of knowledge on the ecological needs for fire could result in unnatural, unwanted, and potentially catastrophic fuel loadings and ecosystem changes. Land managers must effectively inform the public

and regulatory agencies of the potential changes to ecosystem viability and productivity that may result from withholding fire from a fire dependent ecosystem.

Most environmental laws and protection programs managed by States and EPA are media specific (air, water, soil, etc). This situation does not provide for protection and management of ecosystems as a whole. Real solutions to environmental management problems cannot be solved through segmented and fragmented regulatory approaches. It is a major concern that control of one environmental problem such as air pollution might contribute to another environmental problem such as loss of biological diversity or catastrophic wildfire.

EPA is just beginning to develop multi-media environmental protection programs which, in the future, may be able to better consider issues such as fire in wildland ecosystems. However, comprehensive environmental decision making processes to truly address the problems caused by single media protection programs will require elimination of existing institutional and statutory constraints. Agency administrators have the opportunity to help support the elimination of these constraints.

## **B) THE NEED FOR CONTINUED RESEARCH**

In order to address a number of issues raised above, agency administrators need to support continued smoke management research. Wildland fuel consumption and emission factors should be developed for all major fire regimes. This should include developing values for various fuel types, fuel conditions, ignition techniques and patterns. Emission reducing techniques need to be developed for areas outside of the Pacific Northwest. Systems for accurately tracking these emissions and emission reductions should be implemented where prescribed fire takes place. Emission information should be collected for natural fire cycles and integrated into the fire history of an area in order to create an air quality baseline. Continued research to develop methods to predict and monitor particulate emissions, down wind particulate concentrations, and visibility impacts of individual and multiple prescribed fires is also needed.

The next step is for the prescribed fire community to understand how other industries have input in the Rule making processes. We need to learn EXACTLY how we compare with other emission sources like the automobile industry, the oil industry, and power plants. It appears that we are beginning a process of "competing" for a share of the air shed for our activities. We need accurate information pertaining to our emission impacts including data supporting the costs, benefits, and trade offs of using prescribed fire to maintain healthy ecosystems. We are contributors of a clean environment, not consumers. As a prescribed fire community, EPA is engaging us as professionals to look internally at our operations to see where improvements can be made. To effectively make these improvements, we need to understand what emissions we produce when we burn.

## CONCLUSION

As fire frequency decreases across the country, biodiversity is rapidly declining. Since fire can no longer be conducted throughout the landscape, sustaining frequent fire is only accomplished with prescribed burning. Although burning is necessary for specific resources to be conserved, no fire proxy exists. Therefore using prescribed fire as a land management tool comes with costs, including emissions to air.

Smoke emissions from fire to the atmosphere is a consequence of prescribed burning, and some of the constituents of smoke from prescribed burning can cause health and safety concerns. These concerns have caused some to consider regulation that could make prescribed burning difficult, resulting in reduced fire intervals. However, many of the fire dependent ecosystems across the country have burned for millennium and even removing prescribed burning will not eliminate fire from the forest. Rather the fire regime will move from one of frequent controlled burning to infrequent wildfires. These wildfires often have health and safety concerns that are greater than that of prescribed fire. This wildfire regime not only results in risks associated with air quality, but also exposes people and property to the whims of weather, fuels, and wildfire.

In summary, prescribed fire is essential to conserve the various fire dependent ecosystems across the country. No surrogate to fire exists. Without prescribed fire, we do not eliminate fire from the woods but substitute frequent, low-intensity burning with benefits from management and minimal liabilities to infrequent, often catastrophic fire, with little to no control of its risks and loss of most of fire's benefits.

The Strategic Plan for the National Coalition clearly states that the Coalition will collect, organize, promote, and facilitate access to the information, tools, and techniques of prescribed fire. This includes the development of research needs assessments for priority fire science research. The National Coalition of Prescribed Fire Councils will also participate in national and multi-state legislation and rule making, such as the NAAQS discussed in this document. The Coalition was created to provide assistance and consultation to regional councils. We are here to help you identify prescribed fire barriers and assist in developing solutions. If ignored, air quality standards have the potential to become a barrier to the use of prescribed fire. We hope that this document has served as a guide to smoke management. As the wildland urban interface grows and natural areas dwindle, proper management of our smoke will be an imperative part of retaining the right and privilege to use prescribed fire as a land management tool.

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Haddow, Dennis. Lesson 16: Smoke/Air Quality Management, National Advanced Fire and Resources Institute, 2007.

Moody, C.W. A Smoke Screening System for Prescribed Fires in Alabama. Alabama Forestry Commission, January 24, 1992.

### **Sample Smoke Management Programs:**

SMP samples can be obtained/downloaded from State Forestry websites, searched on the internet, and/or requested from the State Forestry/Air Quality agencies.

[http://www.forestry.state.ar.us/manage/smoke\\_management.pdf](http://www.forestry.state.ar.us/manage/smoke_management.pdf), Arkansas Smoke Management Program

<http://www.state.sc.us/forest/smg05.pdf>, South Carolina Smoke Management Program

[http://www.airquality.utah.gov/Public-Interest/Current-Issues/Regionalhazesip/RegionalHazeTSDdocs/Utah\\_Smoke\\_Management\\_Program/SM P\\_March\\_23\\_2000.pdf](http://www.airquality.utah.gov/Public-Interest/Current-Issues/Regionalhazesip/RegionalHazeTSDdocs/Utah_Smoke_Management_Program/SM P_March_23_2000.pdf), Utah Smoke Management Program

## APPENDIX A

### The Regulatory Development Process

(Based on The National Advanced Fire and Resource Institute course on Smoke and Air Quality Management)

The Regulatory Development Process - In order to be effectively involved in the regulatory development process, land managers must understand how the process works and where involvement is most useful.

Administrative rule making is the exercise of quasi-legislative authority by a governmental agency to formulate, amend or repeal a rule. The end product has the force of law. As required by section 118 of the Clean Air Act, Federal agencies must comply with all substantive and procedural requirements of federal, state and local air quality regulations and standards. That is, Federal agencies must comply with all parts of all regulations developed by administrative rule making at state and local levels.

Administrative rule making can be divided into 3 separate phases, the legislative phase, the proposal and review phase, and the hearing phase.

- A. Legislative Phase - Prior to rule making by any administrative agency, statutory authority must be provided by the legislature. For air quality issues, the statutory authority is usually provided in the State Clean Air Act. When authority is inadequate, public and interest groups need to direct their efforts towards either lobbying the legislature or persuading the administrative agency to seek authority. Such lobbying is also appropriate when the public or interest group feels that the administrative agency has too much authority and is developing regulations that are not appropriate. It is very appropriate for land managers to be actively represented in the legislative phase.
- B. Proposal and Review Phase - Administrative rule making requires a formal process for public review and comment. Land management agencies are an important part of the public that needs to be represented. Typically, an administrative agency develops proposed regulations in-house, notifies the public and interest groups of its proposal, provides a review period, and conducts a public hearing to solicit comments on the proposal. Administrative rule making procedures vary from state to state and sometimes from agency to agency within a State. It is important that land managers understand the appropriate administrative rule making procedures before the procedures begin.

Often, regulations are adopted exactly as proposed by the administrative agency. Therefore, the most effective time for land managers to become involved in the rule making process is before the agency develops the

proposed regulations in-house. After proposed regulations are developed and proposed in draft form it is only natural that an administrative agency will feel that they have something to defend. Comments received after a draft is proposed are often considered in an adverse light. It is only human nature that administrative agency staff (or anyone else) might find it difficult to objectively review comments which are critical to their efforts. Again, the most effective time for land managers to become effectively involved in the rule making process is before it formally begins.

- C. Hearing phase - After an air regulatory agency develops and proposes a regulation there is usually a time period for public review and a subsequent public hearing. Public hearings are probably one of the worst possible places to exchange new concepts and ideas. However, public hearings are a good place to reinforce concepts and ideas that are already established. Public hearings can be an excellent opportunity to bring in support and testimony from other groups which may support the land managers position. Other groups may include industry, environmental organizations, and fish and wildlife agencies. Finally, the more supportive that land managers can be of the air regulatory agency during the public hearing, the better that the relationship between the groups will be in the future.

Education of the Public and Air Regulatory Agencies - A major problem that land management agencies must overcome is that air quality agency staff usually do not have an understanding for the needs and uses of prescribed fire. While air quality agency staff have excellent understanding of control equipment for stationary pollution sources, they often have little understanding of biological processes and the natural role of fire in driving those processes. As a result, it is possible that air quality regulations will be proposed for which the air quality staff does not understand the full consequences.

A good example is the possible restriction of the use of prescribed fire from unplanned ignitions in National Parks and Wildernesses. Many of these areas are mandatory Federal Class I areas where the National goal is to prevent any future and to remedy any existing impairment of visibility. However, in most wilderness ecosystems, exclusion of fire is presently the major man-caused impact. Carefully thought out and explained, there is no conflict between fire in wilderness and the National visibility goal.

In order to take care of this and other problems, it is necessary for land managers to educate air regulatory agencies on the uses and needs for prescribed fire. This education can be done in meetings initiated by the land manager or preferably by field trips and actual involvement in prescribed burning. One day in the field is usually worth ten days of meetings. However, it is important that meetings and field trips take place before the air regulatory agency proposes regulations.

Land managers also need to educate air regulatory agencies on smoke management techniques that are available and how various smoke management techniques relate to specific burning prescriptions. It is important that the air regulatory staff understand that the smoke management technique that is selected must fit the specific burn prescription.

It is also critical that land management agencies establish credibility with the air regulatory agency before regulations are proposed. It is much more difficult to develop credibility with any type of regulatory agency after the regulatory process has begun. In most cases, air regulatory agencies view land managers the same way that they view any other polluter. These same air regulatory agencies have heard hundreds of excuses of why specific polluters should be exempt from regulations, why it is too expensive to comply, why the polluter doesn't really cause any problem, why someone else is the real problem, and generally why the whole world will go to hell if the polluter is required to do anything. Rather than try to make lame excuses, land managers will develop credibility with air regulatory agencies if they can demonstrate how they are doing the best possible job of minimizing both the amount and impact of the smoke they emit into the air.

The key for land management agencies to be effectively involved in the regulatory development process is to be both proactive and credible. Being proactive and developing credibility takes time and effort. However, if land managers want to continue to use prescribed fire as a management tool then taking the time and effort is an absolute necessity.



## Appendix B

### Regional Planning Organizations



# GLOSSARY

## **DEFINITIONS ACCORDING TO THE INTERIM POLICY**

**Air Quality:** The characteristics of the ambient air (all locations accessible to the general public) as indicated by concentrations of the six air pollutants for which national standards have been established [i.e., particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), carbon monoxide (CO) and lead], and by visibility in mandatory Federal Class I areas. For the purposes of this policy, concentrations of PM are taken as the primary indicators of ambient air quality.

**Air Quality Manager:** The regulatory body responsible for managing the air quality protection program for a State, local or tribal government.

**Air Quality Related Values (AQRV):** Those special attributes of a mandatory Class I Federal area that deterioration of air quality may adversely affect. Some examples of AQRV include: flora and fauna, water, visibility, and odor among others.

**Ambient Air:** That portion of the atmosphere, external to buildings, to which the general public has access.

**Administrative Unit:** A unit of land (Forest, Refuge, Park, etc.) under the administration of a public land management agency.

**AP-42:** The Environmental Protection Agency's (EPA) Compilation of Air Pollutant Emission Factors for stationary point, area, and mobile sources. An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors are then used to estimate the magnitude of a source's pollutant emissions. The plan includes the project objective, fire prescription (including smoke management components), personnel, organization, equipment, etc.

**Class I Area:** An area set aside under the Clean Air Act (CAA) to receive the most stringent protection from air quality degradation. Mandatory Class I Federal areas are (1) international parks, (2) national wilderness areas which exceed 5,000 acres in size, (3) national memorial parks which exceed 5,000 acres in size, and (4) national parks which exceed 6,000 acres and were in existence prior to the 1977 CAA Amendments. The extent of a mandatory Class I Federal area includes subsequent changes in boundaries, such as park expansions.

**De Minimis Fires:** Fires that will cover fewer than X acres or consume less than Y tons of fuel, as established by a State or tribe.

**Federal Implementation Plan (FIP):** A plan (or portion thereof) promulgated by the

Administrator, as provided for under the CAA and any applicable EPA regulations, including regulations governing tribal air plans, to fill all or a portion of a gap or otherwise correct all or a portion of an inadequacy in a State or tribal implementation plan (TIP), and which may include enforceable emission limitations or other control measures, means or techniques (including economic incentives, such as marketable permits or auctions of emissions allowances), and provides for attainment of the relevant national ambient air quality standard (NAAQS).

**Federal Land Manager (FLM):** With respect to any lands in the United States, the Secretary of the Federal department with authority over such lands. Generally, the Secretaries delegate their authority to specific elements within each department. For example, the National Park Service and the Fish and Wildlife Service manage those areas under the authority of the Department of the Interior.

**Fire Dependent Ecosystem:** A community of plants and animals that must experience recurring disturbances by fire, in order to sustain its natural plant succession, structure and composition of vegetation, and maintain appropriate fuel loading and nutrient cycling to ensure proper ecosystem function.

**Fire Management Plan (FMP):** A strategic plan that defines a program to manage wildland and prescribed fires, and documents the FMP to meet management objectives outlined in the approved land use plan. The plan is supplemented by operational procedures such as preparedness plans, burn plans and prevention plans.

**Fuel:** Includes combustible vegetative matter such as grass, trees, shrubs, limbs, branches, duff, and stumps.

**Indian Land:** Indian land in this document refers to Indian country which is (a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same. [See 18 U.S.C. 1151.]

**Land Use Plan:** A broad scale, long range plan (e.g., forest plan, refuge plan or resource management plan) that identifies the scope of actions and goals for the land and resources administered by a land owner/manager.

**National Ambient Air Quality Standards (NAAQS):** Standards for maximum acceptable concentrations of pollutants in the ambient air to protect public health with an adequate margin of safety, and to protect public welfare from any known or anticipated adverse effects of such pollutants (e.g., visibility impairment, soiling, materials damage, etc.) in the ambient air.

**National Environmental Policy Act (NEPA):** Establishes procedures that Federal agencies must follow in making decisions on Federal actions which may impact the environment. Procedures include evaluation of environmental effects of proposed actions, and alternatives to proposed actions; involvement of the public and cooperating agencies.

**Nuisance Smoke:** Amounts of smoke in the ambient air which interfere with a right or privilege common to members of the public, including the use or enjoyment of public or private resources.

**Particulate Matter (PM):** Any airborne finely divided material, except uncombined water, which exists as a solid or liquid at standard conditions (e.g., dust, smoke, mist, fumes, or smog).

**PM<sub>2.5</sub>:** Particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

**PM<sub>10</sub>:** Particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers (including PM<sub>2.5</sub>).

**Prescribed Fire:** Any fire ignited by management actions to meet specific objectives (i.e., managed to achieve resource benefits).

**Prescription:** Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include the meteorological conditions affecting the area under prescription, as well as factors related to the state of the area to be burned such as the fuel moisture condition and other physical parameters. Other criteria which may be considered include safety, economic, public health, environmental, geographic, administrative, social or legal considerations, and ecological and land use objectives.

**Prevention of Significant Deterioration (PSD):** A requirement in the CAA, which establishes the maximum allowable increases in ambient air concentrations of selected air pollutants above baseline concentrations in areas designated as Class I, Class II, or Class III.

**Project Plan:** A strategic plan for accomplishing specific actions and goals (objectives) established in a land use plan. A project may include several activities such as cutting and hauling trees and shrubs, planting trees, building trails, and fire treatment.

**Regional Haze:** Generally, concentrations of fine particles in the atmosphere extending up to hundreds of miles across a region and promoting noticeably hazy conditions; widespread visibility impairment, especially in mandatory Class I Federal areas where visibility is an important value.

**Sensitive Receptors:** Population centers such as towns and villages, camp grounds and

trails, hospitals, nursing homes, schools, roads, airports, mandatory Class I Federal areas, etc. where smoke and air pollutants can adversely affect public health, safety and welfare.

**Smoke Management Program (SMP):** Establishes a basic framework of procedures and requirements for managing smoke from fires that are managed for resource benefits. The purposes of SMP's are to mitigate the nuisance and public safety hazards (e.g., on roadways and at airports) posed by smoke intrusions into populated areas; to prevent deterioration of air quality and NAAQS violations; and to address visibility impacts in mandatory Class I Federal areas in accordance with the regional haze rules.

**State Implementation Plan (SIP):** A CAA required document in which States adopt emission reduction measures necessary to attain and maintain NAAQS, and meet other requirements of the Act.

**Suppression:** A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

**Tribal Implementation Plan (TIP):** A document authorized by the CAA in which eligible tribes adopt emission reduction measures necessary to attain and maintain NAAQS, and meet other requirements of the CAA for lands within tribal jurisdictions.

**Violation of the PM NAAQS:** As revised in 1997, the daily PM standard is violated 10 when the 99th percentile of the distribution of 24-hour concentrations for a period of 1 year (averaged over 3 calendar years) exceeds 150  $\mu\text{g}/\text{m}^3$  at any monitor within an area. The annual PM standard is violated when the arithmetic average of 24-hour concentrations for a period of 1 10 year (averaged over 3 calendar years) exceeds 50  $\mu\text{g}/\text{m}^3$  at any monitor within an area. The new NAAQS levels for PM are set at a daily concentration less than or equal to 65 2.5  $\mu\text{g}/\text{m}^3$ , and an annual mean concentration of less than or equal to 15  $\mu\text{g}/\text{m}^3$ . The daily standard is violated when the 98th percentile of the distribution of the 24-hour concentrations for a period of 1 year (averaged over 3 calendar years) exceeds 65  $\mu\text{g}/\text{m}^3$  at any monitor within an area. The annual standard is violated when the annual arithmetic mean of the 24-hour concentrations from a network of one or more population-oriented monitors (averaged over 3 calendar years) exceeds 15  $\mu\text{g}/\text{m}^3$ . Compliance with the annual PM<sub>2.5</sub> NAAQS is based on population-oriented monitors because the health information, upon which the standard is based, relates area-wide health statistics to area-wide air quality as measured by one or more monitors.

**Volatile Organic Compounds (VOC):** Any organic compound which participates in atmospheric photochemical reactions, which are measured by a reference method, an equivalent method, or an alternative method. Some compounds are specifically listed as exempt due to their having negligible photochemical reactivity. [See 40 CFR 51.100.] Photochemical reactions of VOC's with oxides of nitrogen and sulfur can produce O<sub>3</sub> and PM.

**Wildfire:** An unwanted wildland fire.

**Wildland:** An area where development is generally limited to roads, railroads, power lines, and widely scattered structures. The land is not cultivated (i.e., the soil is disturbed less frequently than once in 10 years), is not fallow, and is not in the United States Department of Agriculture (USDA) Conservation Reserve Program. The land may be neglected altogether or managed for such purposes as wood or forage production, wildlife, recreation, wetlands or protective plant cover. **[The distinction between wildlands, to which the recommendations in this document apply, and agricultural lands is subject to further discussion.]**

**Wildland Fire:** Any non-structural fire, other than prescribed fire, that occurs in the

**Wildland Fire Situation Analysis (WFSA):** a decision-making process that evaluates alternative fire management strategies considering fire fighter and public safety, risk to property and resources, fire fighting resources available, land management objectives, and environmental, social, economic and political constraints. The environmental and social constraints considered include, among other things, how air quality and/or visibility will be affected at sensitive receptors by each alternative fire management strategy. The positive, neutral or negative effects of each alternative on the criteria above are weighed to select the appropriate management response to the fire. Therefore, while mitigating air quality and visibility impacts must be considered by the FLM when managing a fire that is not within a prescription, they are just two of several important criteria evaluated.

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We recognize that the policies and regulations mentioned in this document are changing and being continuously reviewed. We hope that this document can serve to assist prescribed fire managers understand the basics of current smoke issues and guide them towards relationships that will enable more prescribed fire use in the future. Thank you again for taking time to read this document. We welcome any suggestions and comments and look forward to serving you in any way we can.