# WRAP POLICY

# FIRE TRACKING SYSTEMS

**APPROVED BY CONSENSUS:**
**WESTERN REGIONAL AIR PARTNERSHIP – APRIL 2, 2003**

**APPROVED BY CONSENSUS:**
**FIRE EMISSIONS JOINT FORUM – DECEMBER 19, 2002**

**PREPARED BY:**
**FIRE TRACKING SYSTEMS TASK TEAM OF THE FIRE EMISSIONS JOINT FORUM**

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## Executive Summary

The Western Regional Air Partnership (WRAP) is charged with developing technical and policy tools to assist states (or the delegated regulatory authority) and tribes with implementing the Regional Haze Rule (Rule).

The *WRAP Policy on Fire Tracking Systems* (WRAP FTS Policy) has been developed over a six-month period through a stakeholder-based consensus process to assist the WRAP region states and tribes in addressing emissions from fire sources. In this Policy, the WRAP seeks to provide a consistent framework that states and tribes can use to efficiently develop their individual implementation plans, long-term strategies, and periodic progress reports. The WRAP recognizes states' and tribes' authority and responsibility to develop, adopt and implement their regional haze implementation plans, and recognizes the Rule as the principal document on which states and tribes should rely.

The Rule requires states to develop implementation plans (SIPs) for addressing regional haze in the Nation's 156 mandatory Class I areas. Additionally, the Rule requires effective management of fire sources. The Rule provides two pathways for western states to follow as they implement the requirements of the Rule: 1) develop their regional haze implementation plans per the nationally applicable provisions of Section 308, or 2) Transport Region States may choose to incorporate the Grand Canyon Visibility Transport Commission (GCVTC) Recommendations into their regional haze implementation plans under Section 309 of the Rule.

It is the position of the WRAP FTS Policy that it is necessary to track fire activity information in the WRAP region using a fire tracking system, which will also provide the information essential to create a fire emissions inventory. The WRAP FTS Policy identifies seven essential components of a fire tracking system that represent the minimum spatial and temporal fire activity information necessary to consistently calculate emissions and to meet the requirements of the Rule. The resulting emissions will be used in modeling exercises to assess fire impacts to regional haze.

An emissions inventory and tracking system for fire are specific requirements under Section 309 and a broader requisite under Section 308 of the Rule. The fire tracking system and WRAP emissions inventory system are regional approaches to the data gathering and tracking initiatives, which are specifically encouraged in the Rule. Therefore, the WRAP is advancing the WRAP FTS Policy for states and tribes under both Sections 308 and 309 to meet the requirements of the Rule.

Tribes are not subject to the same requirements of the Rule as states, but tribes wishing to assume the regional haze requirements outlined in the Rule may, according to the Tribal Authority Rule (TAR), seek approval under 40 CFR 49 to be "treated in the same manner as States." The intent of this Policy is to assist both states and tribes with the development of their regional haze implementation plans (SIPs/TIPs), and therefore, tribes are included in all references to states, except where specific requirements and/or deadlines of the Rule are cited.

Most fire emissions inventory and tracking efforts established to date in the WRAP region have been developed in conjunction with smoke management programs to address public health and nuisance concerns. Fortunately, fire emissions inventory and tracking efforts regardless of the purpose, have some common elements. It is anticipated that the fire tracking system and WRAP emissions inventory system outlined herein will integrate well with current and future fire emissions inventory and tracking efforts.

The WRAP FTS Policy document is comprised of four major sections. Section 1 is the five WRAP FTS Policy Statements. Section 2 provides overall background for the WRAP FTS Policy, including a discussion of the regulatory environment and details of the Rule that are germane to the WRAP FTS Policy. Section 3 is an annotation of each of the five policy statements, further explaining and defining them, and a description of the seven essential fire tracking system components. Finally, Section 4 Appendices include: A) a glossary of terms, B) a website references listing, and C) supporting information on fire tracking systems.

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1. Date of Burn
2. Burn Location
3. Area of Burn
4. Fuel Type
5. Pre-Burn Fuel Loading
6. Type of Burn
7. "Anthropogenic" or "Natural" Classification

C. A fire tracking system should include additional components as needed to support the development and implementation of annual emission goals and other control measures.

D. A fire tracking system should include a component that addresses the projection of fire emissions, which is necessary to meet the requirements of the Regional Haze Rule.

E. The development of fire tracking systems by states and tribes will be done collaboratively with state, tribal, local and federal land management agencies, and private parties.

# 2. Background

### 2.1. Clean Air Act and Grand Canyon Visibility Transport Commission

In 1990, Congress amended the Clean Air Act (CAA), and as part of these amendments created the Grand Canyon Visibility Transport Commission (GCVTC).[1] The GCVTC was charged with assessing the current scientific information on visibility impacts and making recommendations for addressing regional haze in the western United States. The GCVTC signed and submitted more than 70 recommendations to the Environmental Protection Agency in a report dated June 1996 that indicated that visibility impairment was caused by a wide variety of sources and pollutants, including fire on a episodic basis, and that a comprehensive strategy was needed to remedy regional haze.

The second of the GCVTC Recommendations Regarding Fire describes the need for a consistent region-wide emissions tracking system for prescribed fire, wildfire, and agricultural burning.[2]

[1] The Grand Canyon Visibility Transport Commission (GCVTC) was composed of the governors of eight western states (AZ, CA, CO, NM, NV, OR, UT, WY), four tribes (Acoma Pueblo, Hopi, Hualapai, and Navajo), four Federal land management agencies (Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, National Park Service), the Columbia River Inter-Tribal Fish Commission, and the Environmental Protection Agency.

[2] Grand Canyon Visibility Transport Commission, Recommendations for Improving Western Vistas, Report to the

## 2.2. Western Regional Air Partnership

The Western Regional Air Partnership (WRAP) was established in 1997 as the successor organization to the GCVTC. The WRAP is a voluntary organization comprised of western governors, tribal leaders and federal agencies,[3] and is charged "to identify regional or common air management issues, develop and implement strategies to address these issues, and formulate and advance western regional policy positions on air quality."[4] These policies and technical tools are developed through inclusive, stakeholder-based processes and approved by consensus of the WRAP.

WRAP participants include state air quality agencies, tribes, federal/state/private land managers, the EPA, environmental groups, industry, academia and other interested parties. There are over 400 tribes within the WRAP region. The large number of tribes limits the participation of all of them in WRAP activities, and accordingly, in the development of this Policy. Therefore, the tribal representatives involved in the development of this Policy may not represent all tribal concerns.

## 2.3. Regional Haze Rule

Following the issuance of the GCVTC Report, the EPA issued the Regional Haze Rule[5] (Rule) in July 1999 to improve visibility in 156 national parks and wilderness areas across the country. The Rule outlines the requirements for states and tribes to address regional haze in these mandatory Class I areas. EPA incorporated all of the GCVTC Recommendations into Section 309 of the Rule, which may be used by some of the WRAP states/tribes. The remaining WRAP states must, and tribes may, utilize the nationally applicable Section 308 provisions of the Rule.

Under Sections 308 and 309 of the Rule, states must, while tribes may, address visibility impairment in mandatory Class I areas due to emissions from all sources, including fire activities, which is made possible by an inventory of emissions of pollutants that contribute to visibility impairment. Further, the Preamble to the Rule calls for the tracking of pollutant emissions to supplement the tracking of monitored visibility changes for use in periodically reviewing the progress toward the natural visibility goal.[6] In regard to the requirements for periodic progress reports, both Sections 308 and 309 of the Rule call for:

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U.S. EPA, June 10, 1996 (hereafter referred to as "GCVTC Report"), p. 48.

[3] The WRAP membership is comprised of the governors of thirteen western states and thirteen western tribes. The current WRAP members include the States of AK, AZ, CA, CO, ID, MT, ND, NM, OR, SD, UT, WA, and WY and the Tribal Nations of Pueblo of Acoma, Campo Band of Kumeyaay Indians, Cortina Indian Rancheria, Hopi Tribe, Hualapai Nation of the Grand Canyon, Nez Perce Tribe, Northern Cheyenne Tribe, Salish and Kootenai Confederated Tribes, Pueblo of San Felipe, and Shoshone-Bannock Tribes of Fort Hall. Federal WRAP members are the Department of the Interior, the Department of Agriculture, and the Environmental Protection Agency.

[4] WRAP Charter, Purpose, p. 1.

[5] Published in the Federal Register on July 1, 1999, 64 FR 35714.

[6] 64 FR 35725-35726.

> An analysis tracking the change over the past 5 years in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.[7]

Tribes are not subject to the same requirements of the Rule as states, but tribes wishing to assume the regional haze requirements outlined in the Rule may, according to the CAA, seek approval to be treated in the same manner as states, under the Tribal Authority Rule (TAR), 40 CFR 49.[8] In these cases, EPA still recognizes that "unlike States, tribes are not required by the TAR to adopt and implement CAA plans or programs, thus tribes are not subject to mandatory deadlines for submittal of implementation plans."[9] Although provision for flexibility in the submission of programs and implementation plans for tribes is made under TAR, EPA does "encourage tribes choosing to develop implementation plans to make every effort to submit by the deadlines to ensure that the plans [TIPs] are integrated with and coordinated with regional planning efforts."[10]

EPA recognizes the WRAP as the Regional Planning Organization that is developing the necessary policy and technical tools to implement the Rule in the WRAP region. A WRAP policy, once approved, represents the WRAP's consensus position on the best means for states and tribes to implement the portion of the Rule at issue. The WRAP recognizes states' and tribes' authority and responsibility to develop, adopt and implement their regional haze state and tribal implementation plans, and the seminal guidance to do this is the Rule.[11]

2.3.1. Section 309

Section 309 of the Rule specifically calls for:

> [a] statewide inventory and emissions tracking system (spatial and temporal) of VOC, $NO_X$, elemental and organic carbon, and fine particle emissions from fire. [12]

Under Section 309, states must, while tribes may, incorporate a fire tracking system and a mechanism to generate the required emissions inventory, based on fire activity information, into their SIPs/TIPs. Further, this is one step of several that will afford states/tribes the demonstration of reasonable further progress through 2018,[13] as required by the Rule. The fire tracking system will provide information critical to the implementation of other requirements under Section 309[14], including the development of an enhanced smoke management program, the establishment of annual emission goals, and the projection of fire emissions.

[7] 64 FR 35769, §51.308 (g) (4) and 64 FR 35772, §51.309 (d) (10) (i) (D).
[8] 64 FR 35759.
[9] 64 FR 35758.
[10] 64 FR 35759.
[11] WRAP Charter, p.1.
[12] 64 FR 35771, §51.309 (d) (6) (ii).
[13] 64 FR 35769, §51.309 (a).
[14] 64 FR 35771, §51.309 (d) (6).

2.3.2. Section 308

Although Section 308 of the Rule does not explicitly address the emissions inventory and tracking necessary for programs related to fire, Section 308 of the Rule does assert that the SIP/TIP must provide for:

> A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area. The inventory must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.[15]

In addition, Section 308 of the Rule states that in establishing its long-term strategy for regional haze,

> The State must document the technical basis, including modeling, monitoring and *emissions information*, on which the State is relying to determine its apportionment of emission reduction obligations necessary for achieving reasonable progress in each mandatory Class I Federal area it affects.[16]

And:

> The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy [for regional haze]. The State should consider major and minor stationary sources, mobile sources, and area sources.[17]

These Rule citations support the need for a fire tracking system that will facilitate the development of a fire emissions inventory and the establishment of long-term strategies for states under Section 308.

# 3. Annotated Policy

## 3.1. Introduction

The WRAP FTS Policy is the result of the WRAP region-wide multi-state/multi-tribe planning and coordination effort. This effort is consistent with the direction provided by EPA in the Preamble to the Rule that encourages states to work together to establish common approaches for emissions inventory development and tracking.[18]

[15] 64 FR 35767, §51.308 (d) (4) (v).
[16] 64 FR 35767, §51.308 (d) (3) (iii), emphasis added.
[17] 64 FR 35767, §51.308 (d) (3) (iv). Fire is considered an area source.
[18] 64 FR 35720.

The intent of the WRAP FTS Policy is to assist states (or the delegated authority) and tribes to address emissions inventory and tracking associated with fire in a way that is adequate for implementation plan development, long-term strategies, and periodic progress reports. The WRAP FTS Policy identifies for states and tribes in the WRAP region the essential fire activity information necessary to consistently calculate emissions and to meet the requirements of the Rule. The resulting emissions will be used in modeling exercises to assess fire impacts to regional haze.

Most states/tribes in the WRAP region track fire and its subsequent emissions differently and few, if any, states/tribes address all fire sources. Consequently, fire sources in the WRAP region are tracked and inventoried at various and inconsistent levels, from daily burn activity and emissions information to annual emissions summaries, to no tracking. This variability is a proven obstacle to inter-jurisdictional analysis of fire impacts on visibility within the WRAP region.[19] In addition, transport of fire emissions beyond the WRAP region emphasizes the need for the development and consistent application of a fire tracking system and subsequent emissions inventory mechanism that is predictable and flexible while meeting the requirements of the Rule.

The WRAP FTS Policy has been developed to embody appropriate regulatory and policy requirements and to provide a predictable framework for fire tracking systems that can be reasonably implemented by states and tribes. The WRAP believes that states maintain the ultimate responsibility for the implementation of the fire tracking system. Tribes, or EPA on their behalf, may choose to utilize fire tracking systems as a reasonably severable element in their implementation plans.

The WRAP recognizes states/tribes authority and responsibility to develop, adopt and implement their regional haze state and tribal implementation plans. The WRAP further recognizes that the implementation plans will be revisited and revised, per the schedule specified in the Rule, giving opportunities to refine individual fire tracking systems and subsequent emission inventories to reflect technical advances and policy updates.

## 3.2. Fire Activity Information

> *Policy Statement A: Fire activity information for all fire types is needed in the WRAP region. A fire tracking system that captures this information will form the basis of a fire emissions inventory compiled annually, which is needed to support Regional Haze Rule requirements.*

### 3.2.1. Fire Tracking System

A tracking system for fire is a specific requirement under Section 309 and will be needed to support general requirements under Section 308 of the Rule. A consistent fire tracking system based on fire activity information is essential in order to consistently calculate emissions. The resulting emissions will be used in subsequent regional modeling and visibility monitoring data

[19] This is the result of the findings of the WRAP's 1996 fire emission inventory development and modeling efforts, which were challenged by the dramatic variability in fire activity information found across the WRAP region, and consequently was one of the sources of uncertainty in the resulting emission inventory.

analyses. Therefore, the WRAP FTS Policy is for states and tribes in the WRAP region to track fire activity information in their respective jurisdiction using a fire tracking system, which will also provide the information essential to create a fire emissions inventory.

The ability of a state or tribe to implement a fire tracking system with known fire activity information for all fire sources may require legislative or governmental changes to existing rules, or removal of exemptions from regulation and/or tracking of specific fire sources. Therefore, the WRAP FTS Policy allows for the consideration of direct data collection as well as indirect estimation techniques, where they satisfy the minimum spatial and temporal information necessary to support emissions inventories and modeling for the WRAP region. In addition, the WRAP recognizes that progressive implementation may be necessary to attain a level of data collection that will ensure comparability between the tracking of fire activity information and monitored visibility changes. See Appendix C for general guidance on data collection, and the Fire Emissions Joint Forum (FEJF) of the WRAP will be exploring viable data collection methods at a later date.

### 3.2.2. Emissions Inventory

Information from the fire tracking system will provide the basis for an emissions inventory, which is a requirement of the Rule under Section 309 and will be necessary under Section 308.

> In reporting and tracking emissions from fire within the State, States may use information from regional data gathering and tracking initiatives.[20]

In keeping with the Rule's Preamble discussion of regional planning organizations and the role of regional planning in such matters as emission tracking and inventory development, the WRAP is developing a regional emissions inventory system.[21] States/tribes may utilize the WRAP emissions inventory system as their emissions inventory mechanism. Fire emissions will be calculated using the WRAP regional emissions inventory system based on fire activity data supplied by the respective jurisdiction. States/tribes may choose to calculate fire emissions internally within their jurisdiction. Both the fire tracking system and the WRAP emissions inventory system are regional approaches that are specifically encouraged in the Rule. Further, these systems will support the fire emissions inventory and modeling needs for regional haze and ambient air quality standards such as those for ozone and particulate matter.

The WRAP's regional emissions tracking and forecasting system for point, area, biogenic, mobile, and fire sources will result in a complete inventory of all emissions of visibility impairing pollutants (i.e., $PM_{10}$, $PM_{2.5}$, $SO_x$, $NO_x$, VOC, ROC, elemental carbon, ammonia) for all sources within the WRAP region. The emission inventories will be both temporally and spatially resolved and will include emissions from both man-made and natural sources. This effort will facilitate the technical and planning efforts of the WRAP states and tribes by compiling the emission inventories necessary for regional modeling efforts to analyze visibility impacts and meet Rule requirements.

[20] 64 FR 35771, §51.309 (d) (6) (ii).
[21] 64 FR 35720.

Stationary Source Milestones and Clean Air Corridors as cited in the Rule will require emissions to be compiled annually by the WRAP. As fire activity and subsequent emissions are highly variable in terms of strength, impact, location and timing, the WRAP FTS Policy specifies that states will and tribes may provide fire activity information to the WRAP on an annual basis.

3.2.3. Applicability

In keeping with the GCVTC Recommendations, the Rule, the WRAP *Policy for Categorizing Fire Emissions*, and recommendations in the *Interim Air Quality Policy on Wildland and Prescribed Fires* (EPA Interim Policy)[22], the WRAP FTS Policy applies equitably across all land types and fire sources. The WRAP FTS Policy calls for the tracking of fire sources on both wildland and agricultural lands regardless of ownership, cause of ignition, or purpose of the fire.

All fire sources are included in the WRAP FTS Policy because it is recognized that all fires (prescribed fire, wildfire, and agricultural burning) have an effect on air quality and contribute to regional haze.[23] Fire sources were among those specifically acknowledged in the GCVTC Report as contributors to visibility impairment on an episodic basis:

> All types of fire (prescribed fire and agricultural burning) must be addressed equitably as part of a visibility protection strategy.[24]

The use of fire by agriculture is well documented and the Agricultural Air Quality Task Force (AAQTF) has recognized that agricultural burning has the potential to impact visibility in mandatory Class I Federal areas.[25] However, the extent of fire use is not well known in some areas, and is the cause of uncertainty as to the contribution of agricultural burning sources on regional haze. Accordingly, the AAQTF's *Air Quality Policy on Agricultural Burning, Recommendation to the U.S. Department of Agriculture* states that "…the contribution from agriculture, specifically the impact of burning practices on regional air quality, must be accurately assessed in relative proportion to the region's total emissions."[26]

Section 118(a) of the Clean Air Act requires that all entities, federal and non-federal, be subject to the same requirements, authorities and processes, and the Rule is clear that all sources, facilities, and property are to be treated equitably.[27] Additionally, stakeholder input garnered in the development process of the WRAP *Policy for Categorizing Fire Emissions* supported consistent consideration of fire between Sections 308 and 309 of the Rule. The WRAP FTS Policy, therefore, will be applicable and useful to all states and tribes in the WRAP region.

[22] U.S. EPA, Office of Air Quality Planning and Standards, Interim Air Quality Policy on Wildland and Prescribed Fires, April 23, 1998 (hereafter referred to as "EPA Interim Policy").
[23] GCVTC Report, p. 47.
[24] Ibid.
[25] Agricultural Air Quality Task Force, Air Quality Policy on Agricultural Burning, Recommendation to the U.S. Department of Agriculture, November 10, 1999 (hereafter referred to as "AAQTF's Air Quality Policy Recommendation"), Section IV, E.
[26] AAQTF's Air Quality Policy Recommendation, Section VII.
[27] 64 FR 35748.

The WRAP FTS Policy does not apply to Native American cultural non-vegetative burning for traditional, religious, or ceremonial purposes (e.g., cremation, and sweat lodge fires).[28] In addition, the WRAP FTS Policy does not apply to open burning activities on residential, commercial, or industrial property (e.g., backyard burning, garbage incineration, residential wood combustion, and construction debris). However, the WRAP recognizes that the unique air quality circumstances of a state or tribe may require emissions tracking information for these fire source sectors. In addition, these sources may be quantified as area sources within populated areas in other emissions inventory efforts by states, tribes or the WRAP.

### 3.3. Essential Components of a Fire Tracking System

> *Policy Statement B: A fire tracking system includes the following seven essential components that are necessary in order to consistently calculate emissions and to uniformly assess impacts to regional haze:*
>
> *1. Date of Burn*
> *2. Burn Location*
> *3. Area of Burn*
> *4. Fuel Type*
> *5. Pre-Burn Fuel Loading*
> *6. Type of Burn*
> *7. "Anthropogenic" or "Natural" Classification*

The seven essential components of a fire tracking system identified in this Policy have been selected as the minimum spatial and temporal information to be collected consistently and universally across the WRAP region to ensure comparability between and within states and tribes, and across the WRAP region. The seven essential components are based, in part, upon careful review and consideration of the EPA's *Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures*[29] and the National Wildfire Coordination Group's *Smoke Management Guide for Prescribed and Wildland Fire 2001 Edition.*[30] The seven essential components have also been developed based on the experience gained through the FEJF's 1996 and 2018 fire emissions inventory preparation efforts.[31] [32]

The fire tracking system's essential component data will provide the basis for calculating the emissions for fire through the use of an emissions calculation mechanism, such as the WRAP emissions inventory system described above, to integrate the appropriate emissions factors and emission calculation techniques. In order to consistently calculate emissions and ensure the

[28] WRAP Policy for Categorizing Fire Emissions, November 15, 2001 (hereafter referred to as "WRAP Fire Categorization Policy"), p. 24.
[29] U.S. EPA, Office of Air Quality Planning and Standards, Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures, EPA-450/2-92-003, September 1992.
[30] National Wildfire Coordination Group, Smoke Management Guide for Prescribed and Wildland Fire, PMS 420-2, NFES 1279, December 2001 (hereafter referred to as "NWCG Smoke Management Guide").
[31] WRAP Report: 1996 Fire Emissions Inventory (DRAFT).
[32] WRAP Report: Integrated Assessment Update and 2018 Emissions Inventory for Prescribed Fire, Wildfire and Agricultural Burning (DRAFT).

comparability of the subsequent regional modeling analysis and analysis of visibility monitoring data, states/tribes should utilize identical emission factors and calculation techniques in concert with the essential fire activity information as described in this Policy.[33] The FEJF will develop further guidance, beyond that contained in the FTS Policy, for states/tribes to establish quality assurance methods, and the procedure and format for the submittal of fire tracking system information.

There are differences among states and tribes with regard to air quality issues, non-attainment areas, emissions information, fire source sectors, and state legislative or tribal governmental requirements. As a result, a state or tribe may choose to augment the seven essential components with additional information. Appendix C elaborates on additional fire activity and tracking information that a state or tribe may consider useful when developing its fire tracking system.

The essential component information described in this FTS Policy will be necessary to accomplish the emissions inventory task as cited in the Rule. However, the WRAP recognizes that the unique air quality circumstances of states/tribes may call for excluding some fires from tracking by the establishment of a de minimus level, based on number of acres, tons of fuel, or tons of emissions. The spatial and temporal variability of fire and the significance of visibility impacts is highly dependent upon a number of factors such as size, fuel consumption, meteorology, climate and proximity to a Class I area.[34] The WRAP FTS Policy *does not* prescribe a de minimus level to exclude fires from tracking. States or tribes may wish to establish de minimus levels, which should be defined in the SIP/TIP and be based on a source-impact relationship. The FEJF will be assessing potential de minimus levels based on source/impact relationships to assist states and tribes in this endeavor.

### 3.3.1. Essential Component 1. Date of Burn

It is critical that the temporal resolution of the fire activity information be attributed to a specific day for each specific burn in order to correlate with "best" and "worst" day visibility monitoring data.[35]

### 3.3.2. Essential Component 2. Burn Location

It is important that the spatial resolution of the fire activity be attributed to a specific location to allow for source/visibility impact relationships to be established.

### 3.3.3. Essential Component 3. Area of Burn

The level of accuracy of the emission inventory will depend, most significantly, on the ability to estimate the area burned (i.e., blackened acres).[36]

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[33] See footnote 19.

[34] For example, a small agricultural burn (e.g., <2,500 acres at 4 tons/acre consumption or 50 tons $PM_{10}$) within 50 kilometers upwind of a Class I area could have a greater visibility impact than a large wildland prescribed fire (e.g., >833 acres at 20 tons/acre consumption or 250 tons $PM_{10}$) within 100 kilometers downwind of a Class I area.

[35] 64 FR 35734.

[36] Peterson, Janice L. 1987. Analysis and reduction of the errors of predicting prescribed burn emissions. Thesis. Seattle: University of Washington. 70p.

3.3.4. Essential Component 4. Fuel Type

Emissions from fire are highly dependent upon the fuel or cover type (e.g., ponderosa pine, juniper, orchard residue, rice straw). It is crucial to provide the predominant fuel or cover type that is burned so that the appropriate emissions factor can be selected to calculate fire emissions. The fuel type will also help refine fuel consumption estimation.

3.3.5. Essential Component 5. Pre-Burn Fuel Loading

The pre-burn fuel loading represents the amount of fuel present at the burn location. For the preparation of the fire emissions inventories, the accuracy of the pre-burn fuel-loading component is vital. The more accurate the pre-burn fuel loading and characteristics of the fuel load (e.g., size class information), the more refined the subsequent emissions estimates will be.

3.3.6. Essential Component 6. Type of Burn

Type of burn represents the predominant configuration of the fuel burned (e.g., pile, windrow, broadcast, underburn). It is important to provide the type of burn so that the appropriate emissions factor can be selected. Type of burn can also provide information for calculating fuel consumption.

3.3.7. Essential Component 7. "Anthropogenic" or "Natural" Classification

The "anthropogenic" or "natural" classification is to be determined per the WRAP *Policy for Categorizing Fire Emissions.*[37] The WRAP will be analyzing daily visibility monitoring data annually for Class I areas and reporting on the causes of haze on an annual basis. This analysis will apportion fire emissions to natural visibility conditions and anthropogenic visibility impairment based on a fire's "anthropogenic" or "natural" classification. The apportionment will enable states and tribes to address natural reductions of visibility from fire as well as to identify those fire emissions that need to be controlled to achieve reasonable progress.

**3.4. Annual Emission Goals**

> *Policy Statement C: A fire tracking system should include additional components as needed to support the development and implementation of annual emission goals and other control measures.*

Section 309 of the Rule calls for states to establish "annual emission goals for fire, excluding wildfire, that will minimize emission increases from fire to the maximum extent feasible."[38] The *WRAP Policy on Annual Emission Goals for Fire* (WRAP AEG Policy) emphasizes the use of emission reduction techniques (ERTs) as the basis of annual emission goals. States/tribes may need to include additional components in their fire tracking system, beyond the listed essential components, that they deem necessary to support the implementation of annual emission goals

[37] WRAP Fire Categorization Policy, p. 8.
[38] 64 FR 35771, §51.309 (6) (v).

and other control measures. The tracking of additional components such as the ERT used, emission reductions achieved or other information (e.g., fuel moisture) should be tracked at the same temporal and spatial resolution of the essential components to allow for regional modeling.

The FEJF will develop guidance on additional components to support the implementation of annual emission goals and other control measures per the WRAP AEG Policy. In addition, subsequent guidance to Appendix D of the WRAP AEG Policy will be developed by the FEJF to summarize ERT options for common vegetation and crop types for both prescribed fires on wildland and agricultural burning.

### 3.5. Fire Emissions Projection

> *Policy Statement D: A fire tracking system should include a component that addresses the projection of fire emissions, which is necessary to meet the requirements of the Regional Haze Rule.*

When developing long-term strategies that will meet the reasonable progress requirements for both Sections 308[39] and 309[40], states and tribes must consider the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions. Fire is an area source. Periodic progress reports are required under both Sections 308 and 309, that specifically cite the need for future projected emissions.[41] Fire projections information also supports the Section 309 requirement for fire programs within a state to evaluate the degree of visibility impairment from smoke for both planning and operational purposes.[42] Additionally, Section 308 of the Rule asserts that implementation plans must provide for estimates of future projected emissions.[43] Therefore, a projected estimate of fire emissions from all fire source sectors will serve as the basis for the projection of visibility conditions due to fire for the most impaired and least impaired days, and will facilitate planning.

> Since the use of fire for resource management is expected to increase substantially, especially on Federal lands, State/Tribal air quality managers will need information to develop potential annual or seasonal air pollutant emissions estimates for SIP/TIP planning.[44]

The fire emissions projection component of a fire tracking system may be developed in a variety of ways to address the Rule requirements for future projected emissions from fire. Fire emission projection may be determined by surveys,[45] use of growth factors, multipliers or other techniques.

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[39] 64 FR 35767, §51.308 (d) (3) (v) (G).
[40] 64 FR 35770, §51.309 (d) (2) and 64 FR 35773, §51.309 (g) (2).
[41] 64 FR 35769, §51.308 (g) (4) and 64 FR 35772, §51.309 (d) (10) (i) (D).
[42] 64 FR 35771, §51.309 (d) (6) (i).
[43] 64 FR 35767, §51.308 (d) (4) (v).
[44] EPA Interim Policy, p. 28.
[45] WRAP Report: Integrated Assessment Update and 2018 Emissions Inventory for Prescribed Fire, Wildfire and Agricultural Burning (DRAFT), Appendix A, pp. 61-96.

The *WRAP Policy on Enhanced Smoke Management Programs for Visibility* includes the consideration of regional coordination as a necessary element in an enhanced smoke management program. A fire emissions projection component for the fire tracking system can provide information critical to the implementation of that element. Inclusion of one-year projected estimates of fire emissions on an annual basis can facilitate operational smoke management and regional coordination. One-year projected estimates may also be useful to estimate a preliminary annual emission goal.

The addition of five-year projected estimates of fire emissions into a fire tracking system will aid in regional planning as required by the Rule, as well as in the demonstration of reasonable progress over the periods addressed by the long-term strategy and progress reports. Five-year projected estimates of fire emissions would need to be submitted to support the periodic progress report schedule (i.e., every five years). Neither of these projections should be construed as a limit.[46] The FEJF will develop guidance on the fire emissions projection component to meet the various regulatory needs identified above and to work in concert with the WRAP emissions inventory system.

### 3.6. Collaborative Development

> *Policy Statement E: The development of fire tracking systems by states and tribes will be done collaboratively with state, tribal, local and federal land management agencies, and private parties.*

In developing a fire tracking system, states and tribes will use a collaborative process, as per the GCVTC Report, which includes state, tribal and federal land management agencies and private parties. Cooperation and collaboration between air regulatory agencies and fire managers is necessary to design an effective and appropriate emission inventory system.[47] There are several efforts underway within federal land management agencies and also within EPA to develop fire tracking systems. State collaboration with these efforts may lead to greater efficiency and less need to develop their own individual fire tracking systems for wildland fire. The use of a collaborative process to develop a fire tracking system and subsequent emissions inventory may promote economic efficiency by identifying mechanisms and infrastructure opportunities to avoid the duplication of time and effort.

Regional haze SIPs/TIPs will be revisited and revised, per the schedule specified in the Rule, thereby providing opportunities to refine the fire tracking system. Future refinements to the fire tracking system may reflect policy changes and/or technical advances pertinent to mechanism, infrastructure, and data collection options. The collaborative process will help to bring these changes and advances to the forefront for use in revising the fire tracking system.

[46] For clarification on emission limits as they apply to fire, see the WRAP Policy on Annual Emission Goals for Fire.
[47] NWCG Smoke Management Guide, p. 189.

# 4. APPENDICES

## APPENDIX A. GLOSSARY

This glossary is intended to provide readers with several operating definitions to facilitate a consistent review of this Policy. However, this glossary is not intended to be a complete list of all terms and acronyms.

16 Class I Areas on the Colorado Plateau - The Grand Canyon Visibility Transport Commission Report specified 16 mandatory Class I areas on the Colorado Plateau that were adopted into Section 309 of the Regional Haze Rule. The 16 Class I areas are: Grand Canyon National Park, Sycamore Canyon Wilderness, Petrified Forest National Park, Mount Baldy Wilderness, San Pedro Parks Wilderness, Mesa Verde National Park, Weminuche Wilderness, Black Canyon of the Gunnison Wilderness, West Elk Wilderness, Maroon Bells Wilderness, Flat Tops Wilderness, Arches National Park, Canyonlands National Park, Capital Reef National Park, Bryce Canyon National Park, and Zion National Park.

2064 Natural Conditions Goal[#] - The ultimate goal of the regional haze program is the absence of visibility impairment due to human-caused emissions.

AAQTF - Agricultural Air Quality Task Force. A task force to address agricultural air quality issues established by the Chief of the Natural Resources Conservation Service.

Agricultural Fire/Burning* - Any fire ignited by management actions to meet specific objectives (i.e., managed to achieve resource benefits) on agricultural land.

Agricultural Land* - Agricultural land includes croplands, pasture, and other lands on which crops or livestock are produced (PL 104-127, Section 1240A). Rangeland will be included with wildland for the purposes of the Fire Emissions Joint Forum work.

Alternatives to Burning - See Non-Burning Alternatives to Fire definition below.

Anthropogenic Emissions Source Classification ("anthropogenic")[#] - A categorization that designates which fire emissions contribute to visibility impairment in a Federal Class I area. "Anthropogenic" emissions must be controlled to achieve progress toward the 2064 natural conditions goal for each Federal Class I area in the WRAP region. This classification includes natural and human-caused ignitions.

Area Source - A source category of air pollution that generally extends over a large area. Prescribed burning, field burning, home heating, and open burning are examples of area sources.

Class I Area - See Mandatory Class I Area and Non-Mandatory Class I Area.

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* Operating Definitions from the WRAP FEJF Workplan, February 25, 1999, Section 1.1.

# Operating Definitions from WRAP Policy for Categorizing Fire Emissions, November 15, 2001, Appendix A.

Ecosystem Maintenance[#] - A prescribed fire or wildfire managed for resource benefits, in an ecosystem that is currently in an ecologically functional and fire resilient condition, that is utilized to mimic the natural role of fire.

Ecosystem Restoration[#] - The re-establishment of natural vegetation that may be accomplished through the reduction of unwanted and/or unnatural levels of biomass, which may have accumulated due to management action. Prescribed fires, wildfires managed for resource benefits and mechanical treatments may be utilized to restore an ecosystem to an ecologically functional and fire resilient condition.

Emission Factor - 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. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., pounds of particulate matter emitted per ton of biomass burned).

Emissions Forum - The Emissions Forum is responsible for the oversight of the assembly and quality assurance of the emissions inventories and forecasts to be utilized by the WRAP forums and oversees the development of a comprehensive emissions tracking and forecasting system.

Emission Inventory - A listing, by source, of the amount of air pollutants discharged into the atmosphere.

Federal Class I area - See Mandatory Class I Area.

FEJF - Fire Emissions Joint Forum. The Fire Emissions Joint Forum's mission is to address both policy and technical issues while developing programs and tools relating to prescribed fire and air quality for the Western Regional Air Partnership and related Western Regional Air Partnership forums.

Fire* - When this term appears, it refers inclusively to wildfire, prescribed natural fire/wildland fire managed for resource benefits, prescribed fire, rangeland fire, and agricultural fire.

GCVTC - Grand Canyon Visibility Transport Commission. The GCVTC was authorized under Section 169B(f) of the Clean Air Act and composed of the governors of eight western states (AZ, CA, CO, NM, NV, OR, UT, WY), four tribes (Acoma Pueblo, Hopi, Hualapai, and Navajo), four Federal land management agencies (Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, National Park Service), the Columbia River Inter-Tribal Fish Commission, and the Environmental Protection Agency. The Commission was established to recommend methods to preserve and improve visibility on the Colorado Plateau, and submitted Recommendations to EPA in June 1996.

# Operating Definitions from WRAP Policy for Categorizing Fire Emissions, November 15, 2001, Appendix A.
* Operating Definitions from the WRAP FEJF Workplan, February 25, 1999, Section 1.1.

Land Managers* - When this term appears, it refers inclusively to Federal, state, tribal, and private land managers.

Mandatory Class I Area - In 1977, Congress identified 156 national parks (over 6,000 acres), wilderness areas and national memorial parks (over 5,000 acres), and international parks in existence before August of 1977 that were to receive the most stringent protection from increases in air pollution. Congress also set a visibility goal for these areas to protect them from future human-caused haze, and to eliminate existing human-caused haze, and required reasonable progress toward that goal.

NAAQS - National Ambient Air Quality Standards.

Natural Emissions Source Classification ("natural")# - A categorization that designates which fire emissions can result in a natural reduction of visibility for each Federal Class I area in the WRAP region. This classification includes natural and human-caused ignitions.

Natural Visibility Goal - See 2064 Natural Conditions Goal.

Non-Burning Alternatives to Fire## - Techniques that replace fire as a means to achieve a particular land management objective (e.g., reduction of fuel-loading, manipulation of fuels, enhancement of wildlife habitat, eco-system restoration, etc.) In this Policy, non-burning alternatives do not include techniques used in conjunction with fire. Techniques used in conjunction with fire are referred to as ERTs.

Non-Mandatory Class I Area - Class I areas designated by states or tribes, but are not deemed mandatory by the Clean Air Act. As of January 2002, Class I areas designated by tribes include: Fort Peck Reservation in Montana, Northern Cheyenne Reservation in Montana, Flathead Reservation in Montana, Yavapai-Apache Reservation in Arizona (Class I status under litigation), and Spokane Reservation in Washington.

Pasture Land# - Grazing lands comprised of introduced or domesticated native forage species that are used primarily for the production of livestock. They receive periodic renovation and/or cultural treatments such as tillage, fertilization, mowing, weed control, and may be irrigated. They are not in rotation with crops (Natural Resources Conservation Service National Range and Pasture Handbook, 1997).

Point Source - A source of pollution that is point-like in nature. An example is the smokestack of a coal-fired power plant or smelter.

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

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* Operating Definitions from the WRAP FEJF Workplan, February 25, 1999, Section 1.1.
# Operating Definitions from WRAP Policy for Categorizing Fire Emissions, November 15, 2001, Appendix A.
## Glossary Definition from WRAP Policy on Annual Emission Goals for Fire, Appendix A.

Rangeland[#] - Land on which the historic climax plant community is predominantly grasses, grass-like plants, forbs, or shrubs. Includes lands re-vegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of ecological principles. Rangeland includes natural grasslands, savannas, shrub lands, most deserts, tundra, alpine communities, coastal marshes and wet meadows (Natural Resources Conservation Service National Range and Pasture Handbook, 1997).

Regional Planning Organization - An organization that will first evaluate technical information on regional haze and related issues to better understand how their states and tribes impact national park and wilderness areas (Federal Class I areas) across the country. The organization will then pursue the development of regional strategies to reduce emissions of particulate matter and other pollutants leading to regional haze. The five Regional Planning Organizations that receive funding from EPA to address regional haze and related issues are: Central States Regional Air Partnership (CENRAP) for the central states, Midwest Regional Planning Organization for the mid-western states, Ozone Transport Commission (OTC) for the northeastern states, Visibility Improvement State and Tribal Association of the Southeast (VISTAS), and Western Regional Air Partnership (WRAP) for the western states.

Rule - Regional Haze Rule. Regulations published in the Federal Register on July 1, 1999 (64 FR 35714) that require states to establish goals for improving visibility and to develop long-term strategies for reducing emissions of pollutants that cause visibility impairment.

Silviculture[#] - The theory and practice of controlling forest establishment, composition, and growth. The art of producing and tending a forest.

SIP - State Implementation Plan. Plans devised by states to carry out their responsibilities under the Clean Air Act. SIPs must be approved by the U.S. Environmental Protection Agency and include public review.

Smoke Effects* - The effects on visibility (both plume blight and regional haze), public nuisance, and the health-based NAAQS due to emissions from fire.

TIP - Tribal Implementation Plan. Plans devised by tribes to carry out their responsibilities under the Clean Air Act. TIPs must be approved by the U.S. Environmental Protection Agency and include public review.

Transport Region State - One of nine states that make up the Grand Canyon Visibility Transport Region: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Wyoming.

Wildfire* - Any unwanted, non-structural fire.

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# Operating Definitions from WRAP Policy for Categorizing Fire Emissions, November 15, 2001, Appendix A.
* Operating Definitions from the WRAP FEJF Workplan, February 25, 1999, Section 1.1.

Wildfire Managed for Resource Objectives[#] – The management of naturally ignited fires, regardless of land type or ownership, to accomplish specific, pre-stated resource management objectives in predefined geographic areas with or without a plan in place. This term is considered to be analogous with the terms Wildland Fire Managed for Resource Benefits and Prescribed Natural Fire that are used in regulations and policies regarding Federal wildlands.

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 USDA Conservation Reserve Program (CRP). The land may be neglected altogether or managed for such purposes as wood or forage production, wildlife, recreation, wetlands, or protective plant cover (EPA Interim Air Quality Policy on Wildlands and Prescribed Fires). The land is not "agricultural land" as operationally defined above. Silvicultural land and rangelands (per the FEJF charge), woodlots, and private timberlands will be included with wildlands for the purposes of the FEJF work.

Wildland Fire[#] - All types of fire (see definition of fire above), except fire on agricultural land.

Wildland Fire Managed for Resource Benefits/Prescribed Natural Fire* - These terms both have current use in regulations and policies. They are considered to be synonymous and are used interchangeably in this [FEJF] workplan. These terms refer to the management of naturally ignited fires to accomplish specific, pre-stated resource management objectives in predefined geographic areas outlined in the fire management plan.

WRAP Region - The WRAP region includes over 400 tribes and the states of Alaska, Arizona, California, Colorado, Idaho, Montana, North Dakota, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming.

WRAP - Western Regional Air Partnership. The WRAP is a collaborative effort of tribal governments, state governments and Federal agencies to promote and monitor implementation of Recommendations from the Grand Canyon Visibility Transport Commission. The WRAP may also address other common western regional air quality issues as raised by its membership. The activities of the WRAP are conducted by a network of committees and forums, composed of WRAP members and stakeholders who represent a wide range of social, cultural, economic, geographic and technical viewpoints. The WRAP membership is comprised of the governors of thirteen western states and thirteen western tribes. The current WRAP members include the States of AK, AZ, CA, CO, ID, MT, ND, NM, OR, SD, UT, WA, and WY and the Tribal Nations of Pueblo of Acoma, Campo Band of Kumeyaay Indians, Cortina Indian Rancheria, Hopi Tribe, Hualapai Nation of the Grand Canyon, Nez Perce Tribe, Northern Cheyenne Tribe, Salish and Kootenai Confederated Tribes, Pueblo of San Felipe, and Shoshone-Bannock Tribes of Fort Hall. Federal WRAP members are the Department of the Interior, the Department of Agriculture, and the Environmental Protection Agency.

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# Operating Definitions from WRAP Policy for Categorizing Fire Emissions, November 15, 2001, Appendix A.
* Operating Definitions from the WRAP FEJF Workplan, February 25, 1999, Section 1.1.

## APPENDIX B. WEBSITE REFERENCES

This appendix is intended to provide readers with several website addresses that were used to locate supporting information for the development of this Policy.

— Western Regional Air Partnership (WRAP) website
(http://www.wrapair.org)

— U.S. Environmental Protection Agency's, Office of Air Quality Planning and Standards, Visibility website
(http://www.epa.gov/oar/visibility)

— Agricultural Air Quality Task Force website
(http://fargo.nserl.purdue.edu/faca)

— GCVTC Recommendations for Improving Western Vistas, June 10, 1996
(http://www.wrapair.org) Go to the About WRAP link, Go to the GCVTC link

— Regional Haze Rule, 40 CFR Part 51, July 1, 1999
(http://www.epa.gov/ttn/oarpg/t1/fr_notices/rhfedreg.pdf)

— Tribal Authority Rule, 63 FR 7253, February 12, 1998
(http://www.epa.gov/fedrgstr/EPA-AIR/1998/February/Day-12/a3451.htm)

— Western Regional Air Partnership Charter, Revised November 29, 2001
(http://www.wrapair.org/about/index.html) Go to the Charter link

— WRAP, Fire Emissions Joint Forum Charge, July 29, 1998
(http://www.wrapair.org/forums/fejf/index.html) Go to the FEJF Charge link

— Workplan, WRAP – Fire Emissions Joint Forum, February 25, 1999
(http://www.wrapair.org/forums/fejf/index.html) Go to the FEJF Workplan link

— Policy for Categorizing Fire Emissions, Approved by Consensus by the Western Regional Air Partnership, November 15, 2001
(http://www.wrapair.org/forums/fejf/index.html) Go to the Natural Background link

— WRAP Policy on Enhanced Smoke Management Programs for Visibility, Approved by Consensus by the Western Regional Air Partnership, November 13, 2002
(http://www.wrapair.org/forums/fejf/index.html) Go to the Enhanced Smoke Mgmt. Programs link

— WRAP Policy on Annual Emission Goals for Fire, Approved by Consensus by the Western Regional Air Partnership, April 2, 2003
(http://www.wrapair.org/forums/fejf/index.html) Go to the Annual Emission Goal link

— WRAP Report: Integrated Assessment Update and 2018 Emissions Inventory for Prescribed Fire, Wildfire and Agricultural Burning (DRAFT)
(http://www.wrapair.org/forums/fejf/index.html) Go to the Emissions link

— WRAP Report: 1996 Fire Emissions Inventory (DRAFT)
(http://www.wrapair.org/forums/fejf/index.html) Go to the Emissions link

— WRAP Report: Non-Burning Management Alternatives on Agricultural Lands in the Western United States, Final, May 15, 2002
(http://www.wrapair.org/forums/fejf/index.html) Go to the Non-Burning Alt. on Agricultural Lands link

— WRAP Report: Comprehensive Manual on Non-Burning Alternatives (DRAFT)
(http://www.wrapair.org/forums/fejf/index.html) Go to the Non-Burning Alt. on Wildlands link

— U.S. EPA, Interim Air Quality Policy on Wildland and Prescribed Burning, April 23, 1998
(http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf)

— U.S. EPA, Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures, September 1992
(http://www.epa.gov/cgi-bin/claritgw?op-Display&document=clserv:epa-cinb:1681;&rank=4&template=epa)

— National Wildfire Coordination Group, Smoke Management Guide for Prescribed and Wildland Fire, PMS 420-2, NFES 1279, December 2001.
(http://www.nwcg.gov/pms/pubs/SMG-72.pdf)

— Smoke Management Program Surveys
1) Wildland Smoke Management Program Survey, January 26, 2001
2) Boulder Wildland Smoke Management Program Survey, February 2, 2001
3) Agricultural Burning Smoke Management Program Survey, March 30, 2001
4) Institute for Tribal Environmental Professionals (ITEP) Tribal Smoke Management Program Survey, *An Assessment of Tribal Air Quality Data and Programs in the Western United States*, September 2001
(http://www.wrapair.org/forums/fejf/index.html) Go to the Basic Smoke Mgmt. Programs link

# APPENDIX C. SUPPORTING INFORMATION

This appendix is intended to provide readers with supporting information on fire tracking systems, but does not specifically address all sections of the WRAP FTS Policy.

## 1. Essential Components

The FEJF will develop further guidance, beyond that contained in the FTS Policy, for states/tribes to establish quality assurance methods, and the procedure and format for the submittal of fire tracking system information. The following is supporting information on the fire tracking system essential components.

### 1.1. Essential Component 1. Date of Burn

For the purposes of the fire tracking system, the date of burn represents the fire activity (i.e., area burned) on any specific day for each burn. For a multiple day burn, multiple entries should correspond to the fire activity on each given day.

### 1.2. Essential Component 2. Burn Location

For each burn, the location should be provided to the nearest mile.

### 1.3. Essential Component 3. Area of Burn

Blackened acres should be determined post-burn. In a pile burn, the area burned should be represented by the pile dimensions as well as the number of piles consumed.

### 1.4. Essential Component 4. Fuel Type

The appropriate emissions factor choice can become complicated when the fire consumes multiple fuel or cover types (e.g., grass and sage). Therefore, for the purposes of the fire tracking system, the fuel type would optimally represent the predominant fuel or cover type consumed in the fire. If additional fuel types beyond the predominant type for a given burn are included in the fire tracking system, the area burned for each fuel type would need to be clearly delineated to allow for subsequent emissions calculations.

### 1.5. Essential Component 5. Pre-burn Fuel Loading

The pre-burn fuel loading should be expressed as the weight of fuel per unit area in tons per acre. The consumption of the fuel will be calculated as part of the WRAP emissions inventory system in order to reduce the propagation of field estimation errors.

### 1.6. Essential Component 6. Type of Burn

Type of burn represents the predominant configuration of the fuel burned (e.g., pile, windrow, broadcast, underburn). If available, identification of pile type (i.e., hand-piled or machine-piled) will enhance the quality of the subsequent emissions calculation. Determining the Type of Burn

can be complicated when a burn project includes multiple fuel configurations. For the purposes of the fire tracking system, the predominant burn type should be reported. If additional fuel configurations for a given burn are provided in addition to the predominant fire type, each type of burn should have an area burned and fuel type to allow for subsequent emissions calculations.

### 1.7. Essential Component 7. "Anthropogenic" or "Natural" Classification

The "anthropogenic" or "natural" classification applies as it is defined by the WRAP *Policy for Categorizing Fire Emissions*, which was developed to clarify the complex relationship between what is considered a natural source of fire and what is considered a human-caused source, as acknowledged in the Rule.[48] The appropriate classification is typically determined prior to the initiation of the fire.[49]

## 2. Optional Components

To support the integration of the fire tracking system with other policy and technical tools being developed by the WRAP, there are four optional components of a fire tracking system that states/tribes should consider in the development of their fire tracking system. The four optional components include Daily Tracking, Fuel Consumption, Non-Burning Alternatives and Additional Fire Tracking Information.

### 2.1. Daily Tracking

Smoke management is a key component in both Sections 308[50] and 309[51] of the Rule to address visibility impacts from fire. To meet the smoke management requirements for Section 309, and potentially as a tool for Section 308, the WRAP has developed its *Policy on Enhanced Smoke Management Programs for Visibility* (WRAP ESMP Policy).

The WRAP ESMP Policy recognizes that the more intensive levels of smoke management necessitate daily inter- and intra-jurisdictional coordination for approved burns. These types of smoke management programs may rely upon real-time meteorological data and daily fire activity information available to cross-jurisdictional authorities, as well as a permitting system to avoid cumulative smoke impacts and to assist in regional coordination.

To provide information critical to the implementation of daily tracking, it is recommended that the pre- and post-burn information be collected on a daily basis for the essential components, as identified in this Policy. Additional daily tracking components, such as burner contact information, may need to be identified by states/tribes to satisfy the information necessary for daily coordination.

[48] 64 FR 35735.
[49] WRAP Fire Categorization Policy, p. 12.
[50] 64 FR 35767, §51.308 (d) (3) (v) (E).
[51] 64 FR 35771, §51.309 (d) (6) (i) and §51.309 (d) (6) (iv).

## 2.2. Fuel Consumption

Pre-burn fuel loading is a key component for the calculation of fire emissions, which can be refined to a large extent based on the fuel that is actually consumed by the fire (i.e., fuel consumption). The quantity of fuel actually burned in a fire will depend on the pre-burn fuel loading and fuel moisture condition, the type of fuel, climatic and meteorological factors, and the intensity of the fire. Accuracy and precision is improved with fuel consumption estimates; however, this parameter can be difficult to estimate. For example, in wildlands the fuel consumed is often not confined to the fuels on the surface, but may include vegetation canopies and/or organic soil layers. These fuels may dominate the mass of the fuel consumed, but have often been neglected in biomass burning inventories.

Information that specifies the quantity (i.e., percentage) of the pre-burn fuel load consumed by the fire will enhance the accuracy of the emissions estimate and can be provided in the fire tracking system as an optional component labeled Fuel Consumption. Inaccuracy in Fuel Consumption can lead to the assumption that all of the pre-burn fuel load is consumed, resulting in higher than actual emissions.

A number of different options are available to develop the fuel consumption information necessary to calculate fire emissions. Fuel consumption can be determined through 1) expert opinion, 2) empirical models, 3) computer simulations (e.g., Consume[52]), or 4) other on-site measurements. Field estimates do not always provide precise estimates. When available, the most accurate methods to determine fuel consumption are the use of computer simulations. Ocular estimates are an option, but are not preferred due to field variability.

## 2.3 Non-Burning Alternatives

Consistent with the *WRAP Policy on Annual Emission Goals for Fire*, non-burning alternatives are techniques that replace fire as a means to achieve a particular land management objective. These techniques could be tracked in a fire tracking system, although the temporal scale will not coincide with the listed essential components. Information may be available from some burners to track parameters such as the area where non-burning alternatives were used, the fuels that were addressed and the specific technique(s) applied. Determining an acceptable method for calculating emissions averted through the use of the non-burning alternatives would most appropriately be developed collaboratively.

## 2.4. Additional Fire Tracking Information

There are differences among states and tribes with regard to air quality issues, emissions information, fire source sectors, and state legislative or tribal governmental requirements. As a result, a state or tribe may select various degrees of fire tracking information; this may include additional parameters for different fire source sectors and/or smoke effects (i.e., plume blight, regional haze, public nuisance, and health-based NAAQS), depending upon their projected or actual impacts.

[52] Pacific Northwest Research Station, Forestry Sciences Laboratory, Consume Software, Version 2.1.

Additional fire tracking information that a state or tribe may consider adding to a fire tracking system includes, but is not limited to, a) fuel moisture, b) purpose of burn, c) plume rise, and d) burn identification code.

## 3. Data Collection Methods

The ability of a state/tribe to implement the fire tracking system with known essential post-burn activity information for all fire sources may require legislative or governmental changes to existing rules or removal of exemptions from regulation, and/or new tracking of specific fire sources. Therefore, consistent with the WRAP's Charter, the FTS Policy allows for the consideration of direct data collection as well as indirect estimation techniques, where they satisfy the minimum spatial and temporal information necessary to support emissions inventories and modeling for the WRAP region.

There are many ways to obtain the necessary data from a category of fires. Primary activity data may be collected by the manager responsible for fire operations and forwarded to a data collection point, or an agent of the permitting or regulating authority may collect the data. Data might be collected for each operation, or a statistical sample gathered from each category of fire, as defined by unique combinations of essential information components. The information might be observed directly, or inferred from relevant parameters that can be collected more easily or more accurately than direct observations. The FEJF will be exploring viable data collection methods at a later date.

### 3.1. Direct Data Collection

Direct data collection methods cover a wide range, from something as simple as an individual burner tracking the information in a log book to something as complex as a centralized burn authority tracking the information in a database. The burner should ensure that the data and information submitted to the oversight authority via direct data collection methods is accurate, timely, and complete.

According to EPA's Interim Policy, "Federal land management agencies currently collect data on wildland and prescribed fires, however, no standard reporting format is followed."[53] The data collected by land management agencies is usually limited to the time and approximate location of the fire, fire perimeter area, and a qualitative description of fuels at the point of ignition.

The WRAP's 1996 fire emissions inventory preparation effort demonstrated that the data collected by land management agencies for wildland and prescribed fires is insufficient to support the development of a consistent emissions inventory. Although current land management agency data collection efforts do not consistently track all of the essential components identified herein, the feasibility of modifying the current tracking system to maximize economic efficiency and meet the needs of both land management and regulatory agencies should be evaluated. The modification of current land management agency data collection efforts may prove to be the most effective and economically efficient method for the tracking of wildland and prescribed fires in the WRAP region.

[53] EPA Interim Policy, p. 29.

### 3.2. Indirect Estimation

Direct data collection methods have historically been the primary means of data collection for fire tracking systems. However, emerging technologies may potentially allow for some of the fire tracking system essential component information to be addressed via indirect estimation techniques. Indirect estimation techniques have varying degrees of complexity and accuracy, and range from an annual burner survey for a particular fire source sector, to statistical methods, to daily remote sensing. Remote sensing might be considered for areas or fire sectors where no previous tracking for fire sources has been established.