

**Western Regional Air Partnership Policy
on
Annual Emission Goals for Fire**

**Approved by the Western Regional Air Partnership
April 2, 2003**

**Prepared by the Annual Emission Goals Task Team
of the
Fire Emissions Joint Forum**

WRAP Policy

Annual Emission Goals for Fire

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 Annual Emission Goals for Fire (WRAP AEG 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. 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.

The GCVTC recognized that projected increases in fire activity will result in episodic impacts on visibility in the West, and called for the development of annual emission goals that would minimize these impacts. Section 309 of the Rule specifically requires the establishment of annual emission goals that minimize emission increases from fire to the maximum extent feasible. Further, these goals must be developed in cooperation with states, tribes, land management agencies and private entities.

The WRAP defines the annual emission goal as a quantifiable value that is used to measure progress each year toward the desired outcome of achieving the minimum emission increase from fire. In this WRAP AEG Policy, the WRAP outlines a process by which states/tribes may establish annual emission goals, based on the utilization of currently available emission reduction techniques (ERTs), to include in their regional haze implementation plans.

Although Section 309 of the Rule specifically requires the establishment of annual emission goals, the strategy outlined here for the utilization of ERTs could be considered by states and tribes that choose to follow the requirements of Section 308 of the Rule and/or may be used to protect visibility in non-mandatory Federal Class I areas.¹

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. 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. In the case of annual emission goals, the WRAP considers them a viable tool for all tribes in the WRAP region to use to achieve the minimum emission increase from fire.

The WRAP AEG Policy document is comprised of four major sections. Section 1 is the seven WRAP AEG Policy statements. Section 2 provides overall background for the WRAP AEG Policy. Section 3 is an annotation of each of the seven policy statements, further explaining and defining them. Finally, the Appendices include (A) a glossary of terms, (B) a related documents listing, (C) additional guidance for states/tribes on the implementation of annual emission goals, and D) an example of a table that will be developed as a separate guidance document by the WRAP Fire Emissions Joint Forum for use with annual emission goals.

¹ The Rule is only applicable to mandatory Class I areas. States/tribes in the WRAP region may utilize the AEG Policy to protect visibility in non-mandatory Class I areas.

WRAP Policy

Annual Emission Goals for Fire

TABLE OF CONTENTS

Executive Summary	i
1. The WRAP Policy on Annual Emission Goals for Fire Policy Statements	1
2. Background	1
2.1 Clean Air Act and Grand Canyon Visibility Transport Commission	1
2.2 Western Regional Air Partnership	2
2.3 Regional Haze Rule	2
3. Annotated Policy	3
3.1 Introduction	3
3.2 Policy Statement A: AEGs Required Under Section 309	4
3.3 Policy Statement B: Annual Emission Goal Defined	4
3.4 Policy Statement C: Applicability	5
3.5 Policy Statement D: Emission Reduction Techniques (ERTs)	6
3.5.1 Implementation Options	8
3.6 Policy Statement E: Feasibility Criteria	9
3.7 Policy Statement F: Utilizing Collaborative Processes	10
3.8 Policy Statement G: Tracking Procedure	10
4. Appendices	11
Appendix A: Glossary	11
Appendix B: Related Documents Listing	14
Appendix C: Annual Emission Goal Implementation Guidance	16
1. Applicability	16

TABLE OF CONTENTS

2. Regional Haze Implementation Plans	16
2.1 Section 308/309 Requirements	16
2.2 Submission of Periodic Reports	17
3. Use of ERTs	17
3.1 California	18
3.2 Oregon	18
3.3 Washington	18
3.4 Utah	18
4. Establishment of Annual Emission Goals	19
4.1 Current ERT Application	19
4.2 Non-burning Alternatives and Annual Emission Goals	19
4.3 Determination of Appropriate ERTs	20
4.4 Feasibility Criteria	21
4.5 Existing Guidance Documents	21
4.6 Research Needs	22
4.7 Calculation of Averted Emissions	22
Appendix D: ERT & Associated Emission Averted Table	24

1. WRAP Policy on Annual Emission Goals for Fire

Policy Statements

- A) The establishment and implementation of annual emission goals is a viable technique to control² fire emissions for WRAP states and tribes. Annual emission goals are required for states under Section 309 of the Regional Haze Rule.
- B) Annual emission goals will achieve the minimum emission increase from fire. Annual emission goals are quantifiable values that are distinct from emission limits.
- C) Annual emission goals are applied to all fire sources (excluding wildfire) due to their potential impacts on visibility.
- D) The minimum emission increase from fire is accomplished through the optimal application of emission reduction techniques, which provides the basis for annual emission goals.
- E) The use of emission reduction techniques to achieve annual emission goals is subject to economic, safety, technical and environmental feasibility criteria, and land management objectives.
- F) States, tribes or the designated authority will establish annual emission goals in cooperation with federal land management agencies and private entities on a yearly basis.
- G) States and tribes will need to develop a procedure for verifying the use of emission reduction techniques and for tracking the achievement of annual emission goals.

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).³ 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 (EPA) in a report dated June 1996 that indicated that visibility impairment was caused by a wide variety of sources and pollutants, and that a comprehensive strategy was needed to remedy regional haze.

² “Control” as used in this Policy means the use of techniques that result in a quantifiable reduction in emissions from individual fire sources.

³ The 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.

The GCVTC Report recognized that fire plays a significant role in visibility on the Colorado Plateau. According to the GCVTC Report, emissions from wildfire and prescribed fire are “an important episodic contributor to visibility-impairing aerosols, including organic carbon, elemental carbon, and particulate matter (PM_{2.5}).”⁴ The GCVTC Report also stated that agricultural burning emissions and their effects have been identified as a concern, but have not been quantified due to insufficient data.⁵

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,⁶ 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.”⁷ 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 (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 visibility impairment in mandatory Class I areas due to emissions from all sources, including fire activities. 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 utilize the nationally applicable Section 308 provisions 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 CAA, seek approval to be treated in the same manner as states, under the Tribal Authority Rule (TAR), 40 CFR 49.⁸ In these

⁴ GCVTC Report, p. 47.

⁵ Ibid.

⁶ 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.

⁷ WRAP Charter, Purpose, p. 1.

⁸ 64 FR 35759.

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 States are required by the Rule to submit periodic reports to the EPA to assess the adequacy of the implementation plan. If the state determines that the implementation plan is or may be inadequate to meet reasonable progress goals, the state is required to develop additional strategies to address deficiencies in the plan. These strategies are then submitted to EPA for approval.

3. Annotated Policy

3.1 Introduction

The WRAP AEG Policy is the result of the WRAP region-wide, multi-state/tribe stakeholder planning and coordination effort. The intent of the WRAP AEG Policy is to assist states (or the delegated authority) and tribes to address smoke impacts on visibility associated with fire in a way that is adequate for SIP/TIP implementation.

The WRAP AEG Policy provides states and tribes with a consistent method for the identification, use, and tracking of emission reduction techniques (ERTs) to meet the annual emission goals requirement of the Rule. Although this Policy promotes the use of ERTs to meet the annual emission goals requirement of Section 309 of the Rule, it does not prescribe how each state/tribe integrates this Policy into its regional haze SIP/TIP or limit the use of alternative approaches to the implementation of annual emission goals.

This WRAP AEG Policy has been developed to embody appropriate regulatory and policy requirements and to provide a predictable framework for annual emissions goals that can be reasonably implemented by states and tribes. The WRAP believes that states maintain the ultimate responsibility for the implementation of annual emission goals. Further, states are responsible for incorporating into their implementation plans federally enforceable processes to minimize emission increases from fire, whether they choose to use ERTs or some other method that meets Rule requirements. Tribes, or EPA on their behalf, may choose to utilize, as a severable element, annual

⁹ 64 FR 35758.

¹⁰ 64 FR 35759.

¹¹ WRAP Charter, p.1.

emission goals in their implementation plans. The WRAP recognizes that the implementation plans will be revisited and revised, per the schedule specified in the Rule, giving opportunities to refine individual programs for annual emission goals that reflect technical advances and policy updates.

3.2 Annual Emission Goals Required Under Section 309

Policy Statement A: The establishment and implementation of annual emission goals is a viable technique to control fire emissions for WRAP states and tribes. Annual emission goals are required for states under Section 309 of the Regional Haze Rule.

In this Policy, the WRAP seeks to provide a consistent and equitable framework that states and tribes can use to efficiently develop their regional haze implementation plans (SIPs/TIPs). Under Section 309, the Rule calls for “establishment of annual emission goals for fire (excluding wildfire) that will minimize emission increases from fire to the maximum extent feasible.”¹² The Policy can be considered by all other states and tribes as a means to control fire emissions, and annual emission goals are a viable technique for controlling fire emissions if a state’s or tribe’s visibility impairment analysis for Section 308 of the Rule shows that fire sources contribute to visibility impairment in a mandatory Class I area.

3.3 Annual Emission Goal Defined

Policy Statement B: Annual emission goals will achieve the minimum emission increase from fire. Annual emission goals are quantifiable values that are distinct from emission limits.

In its Report, the GCVTC acknowledged federal and state land managers’ projection of “significant increases in prescribed fire in order to reduce the effects of wildfire resulting from past decades of fire suppression.”¹³ The Rule also recognized that “forest fuels have built up over many years due to past management practices designed to protect public health and safety through fire suppression.” And further, that this has “...led to an increased risk of catastrophic wildfire...” which would need to be offset by “the increased use of prescribed fire...”¹⁴

This increase in fire activity prompted the GCVTC to recommend the establishment of annual emission goals that would minimize increases from fire emissions, which the Rule then adopted as a requirement under Section 309.¹⁵ The Rule utilizes the GCVTC’s terminology in Section 309 and in the Preamble, both in its section on the Treatment of the GCVTC Recommendations and in the Annex to the GCVTC Report.¹⁶ Therefore, for its definition of “annual emission goal” the WRAP looked to the GCVTC Report.

Although not formally defined, the term “goal” is specifically used in the GCVTC Report in the contexts of both Area Sources and Air Pollution Prevention to focus efforts on a desired outcome.¹⁷

¹² 64 FR 35771 §51.309 (d)(6)(v).

¹³ GCVTC Report, p. 23.

¹⁴ 64 FR 35735.

¹⁵ GCVTC Report, p. 50.

¹⁶ 64 FR 35748 and 35756.

¹⁷ GCVTC Report, p. 30.

This desired outcome may have a numeric measure associated with it, but is distinct from a limit. The GCVTC defines both the terms “cap” and “target” as emissions limits, and uses them in its section on Stationary Sources.¹⁸ The GCVTC also distinguishes between “target” and “cap” as follows:

... “targets” are intended as firm limitations on emissions and have the same effect as a “cap.” However, we are reserving the term “cap” to refer to the limits set under a regulatory program, which would be triggered if the “targets” are exceeded.¹⁹

In using the term goal, and not target or cap, the GCVTC clearly intended the annual emission goal to be something other than an emission limit, and that it not have the attendant regulatory consequences of a cap, as supported by the specific use of these terms in its Report. Therefore, the WRAP AEG Policy defines annual emission goals as quantifiable indicators of progress toward the desired outcome of minimizing increases from fire emissions.

In distinguishing between goals and limits, it is not the intent of this Policy to preclude the establishment of emission limits. However, it currently does not appear that an adequate fire emissions inventory exists throughout the WRAP Region to support the establishment of an emissions limit on fire sources.²⁰ The WRAP does recognize that scientific advances may support the feasibility of an emissions limit (either target or cap) in the future.

3.4 Applicability

Policy Statement C: Annual emission goals are applied to all fire sources (excluding wildfire) due to their potential impacts on visibility.

The Rule, the GCVTC and WRAP policy development to date acknowledge that all types of fire must be addressed equitably as part of a visibility protection strategy since all fire contributes to regional haze.²¹ Therefore, the WRAP AEG Policy applies to all fire sources, except for wildfire, which is specifically excluded in Section 309 of the Rule.²²

¹⁸ GCVTC Report, p. xi and pp. 32-37.

¹⁹ GCVTC Report, p. 34, footnote 4.

²⁰ In order to implement an emission limit, states/tribes would need to have emissions inventory data adequate to establish an emissions baseline, establish the baseline, conduct periodic evaluations of the effectiveness of the baseline, and institute sufficient enforcement mechanisms. Even so, the baseline may not be a reliable tool due to the variability of fire emissions.

²¹ GCVTC Report, p. 47, 64 FR 35735, WRAP ESMP and Fire Categorization Policies.

²² 64 FR 35771 §51.309 (d)(6)(v).

The Rule excludes wildfire from the annual emission goals requirement of Section 309 due to the inability to directly control the emissions from wildfires. The same concern would be relevant to states under Section 308 or tribes that choose to use annual emission goals as a method to control fire emissions.

This Policy applies to federal, tribal, and state land managers and to private landowners that use prescribed fire, wildland fire used for resource benefits (WFU)²³ or agricultural burning to achieve land management objectives on agricultural land or wildland.²⁴ In accordance with Section 118(a) of the CAA requiring that all entities, federal and non-federal, be subject to the same requirements, authorities and processes,²⁵ the WRAP AEG Policy will be applied equitably to all fire sources, excluding wildfire.

The WRAP AEG Policy specifically does not apply to Native American cultural non-vegetative burning for traditional, religious, or ceremonial purposes (e.g., cremation, sweat lodge fires).²⁶ Nor does it apply to open burning activities on residential, commercial, or industrial property (e.g., backyard burning, garbage incineration, residential wood combustion, construction debris).²⁷ However, states/tribes may choose to consider the impacts of these fire sources when developing their regional haze implementation plans.

3.5 Emission Reduction Techniques (ERTs)

Policy Statement D: The minimum emission increase from fire is accomplished through the optimal application of emission reduction techniques, which provides the basis for annual emission goals.

The WRAP AEG Policy provides a practical approach to establishing annual emission goals that states and tribes can use in their implementation plans. The WRAP has developed the AEG Policy to address three issues central to this visibility protection strategy.

First, *annual* emission goals are to be developed on an annual basis, for each year, and therefore need to be based on a measure that can be determined in one year's time. The annual level of fire activity is dependent on a variety of external factors such as crop type planted, funding for federal or state fire programs, weather, etc. These factors will also influence the potential use of fire emission control strategies. In order to accommodate this variability and address the annual nature of the Rule requirement, annual emission goals are to be determined each year through a collaborative process between burners and the regulatory jurisdiction.

Second, since annual emission goals are not emission limits, the goal is based on the sole purpose of minimizing emission increases from fire to the maximum extent feasible; therefore, annual emission

²³ Also known as Prescribed Natural Fire (PNF).

²⁴ WRAP Policy for Categorizing Fire Emissions, November 15, 2001 (hereafter referred to as "WRAP Fire Categorization Policy"), p. 8. See also Appendix C for further details.

²⁵ Clean Air Act §118(a).

²⁶ WRAP Fire Categorization Policy, p. 24.

²⁷ *Ibid*, however "industrial property" would not include land such as industrial forestland.

goals can reasonably be tied to actions that have this result. Under this Policy, the process for establishment of the annual emission goal, rather than the specific numeric value (which varies from year to year), will be included in implementation plan submittal. In other words, the goal will focus on the efforts to minimize emissions; this process, being in the implementation plan, will be federally enforceable.

Third, the WRAP region represents wide variety with regard to basic fire activity tracking, fire emissions data, and fire use, and therefore, the annual emission goals strategy will need to be one that is both flexible and practical. The strategy must also be capable of being implemented using tools and information currently available to meet the Section 309 deadline of December 31, 2003.

To address these issues, the WRAP AEG Policy focuses on minimizing fire emission increases through the control of emissions on all fire projects where feasible. Control of fire emissions means utilizing methods that result in a reduction of the total amount of emissions generated from each fire project. Control of fire emissions is accomplished by using emission reduction techniques (ERTs), methods proven to reduce fire emissions.²⁸

ERTs include biomass utilization prior to burning, increasing combustion efficiency, and others.²⁹ Additionally, methods exist for tracking and calculating the emissions averted from the use of ERTs for a broad array of vegetation types. For the purposes of this Policy, non-burning alternatives are not ERTs. Non-burning alternatives are techniques that replace fire as a means to achieve a particular land management objective (e.g., reduction of fuel-loading, enhancement of wildlife habitat, etc.).³⁰

Control measures are distinct from smoke management techniques, which are currently used in the West by land managers to minimize smoke impacts on public health, nuisance and visibility. A key smoke management technique is the timing of ignitions for better smoke dispersion with the intention of avoiding smoke impacts to sensitive areas (e.g., non-attainment areas, Class I areas, nearby communities). Smoke management techniques may give consideration to downwind air quality (e.g., nuisance impacts and National Ambient Air Quality Standards [NAAQS]) and visibility/regional haze.

The emission reductions that are achieved through the use of ERTs are calculated on a project-specific basis, otherwise referred to as the operational phase of the fire project. The decision to burn a specific area has already been made prior to the implementation of a specific project; therefore, project-specific basis refers to projects where fire will be used to meet land management objectives. Annual emission goals, under this Policy, are established annually and apply to the upcoming year's projects where fire has been determined as the best tool for meeting specific land management objectives. The annual emission goal in this case would be the sum of emission reductions from all fire projects where ERTs are used across the state or tribal jurisdiction, for the upcoming year.

²⁸ The GCVTC projected that the use of optimal smoke management measures (which include the use of ERTs) could decrease fine particle (PM_{2.5}) emissions from prescribed fires by approximately 15-20%. This resulted in modeled visibility improvements over the planning period of the GCVTC. GCVTC Report, p. 87.

²⁹ See Appendix C for more examples of specific ERTs and the application of ERTs.

³⁰ For a more detailed discussion of non-burning alternatives, see Section 4.2 of Appendix C.

3.5.1 Implementation Options

Two options for the utilization of ERTs to meet the annual emission goal have been outlined below. These options are based on current use of ERTs, science and technology. The first option is based on estimations of emissions averted through the application of ERTs, and allows the calculation of an annual numeric value that indicates progress toward minimizing increases from fire emissions. The second option is provided for instances where estimates of emissions averted are not feasibly calculated due to insufficient data. In this second option, the annual numeric value is based on total percent use of ERTs with subsequent emission reductions inferred.

The two options explored here are not exhaustive or definitive in structure or design. Application of these or any other options can be considered for each individual fire source sector or for combinations of them. All options for use of ERTs are subject to the feasibility criteria as outlined in Policy Statement E. Additionally, state/tribal authorities will want to be mindful of equitable treatment of sources in the implementation of ERTs.

In either Option 1 or Option 2, state/tribes will need to determine the appropriate ERTs to be used for specific vegetation or crop types that will be treated to allow attainment of land management objectives. It is a common practice to apply a certain ERT to a specific vegetation or crop type, although more than one ERT may be feasible for a certain vegetation or crop type. Next, in establishing annual emission goals, the designation of all appropriate ERTs for each of the identified vegetation or crop type needs to be completed.

For use in this process, Appendix D provides an example of a table that will correlate the use of ERTs with emissions averted. Appendix D will be augmented by subsequent guidance by the WRAP Fire Emissions Joint Forum (FEJF) that will summarize ERT options for common vegetation and crop types for both prescribed fire on wildlands and agricultural burning. This guidance document can be used in combination with known local practices to determine appropriate ERTs for the respective vegetation or crop type.

Option 1

Once applicable ERTs for the respective vegetation or crop type are agreed upon, the potential percentage use of ERTs is determined subject to the feasibility criteria for the specific project. The potential percentage use is estimated by determining the portion of the project where ERTs are to be applied. Then an estimate of the emissions averted can be made. The annual emission goal is the emissions averted through the use of ERTs for all projected fire projects across the state or tribal jurisdiction.

Option 2

An estimate of emissions averted may not be feasible if ERT emission factors are not available (i.e., the specific amount of emissions reduction has not been determined through research). In this case, the annual emission goal is the percent of total acres on which ERTs are used where fire is to be employed across a state or tribal jurisdiction for the upcoming year.

Although annual emission goals using ERTs can be established unilaterally across fire source sectors for either Option 1 or 2, there are benefits to establishing them by source sector so as to account for differences in management practices between agricultural and wildland burning, as well as in the availability of ERTs. Establishing the annual goal using ERTs by source sector may also alleviate equity issues since the goal is applied across projects with similar vegetative or crop types and land management objectives. The annual goal should be established after the evaluation of all potentially applicable ERTs.

This Policy encourages states/tribes to coordinate with neighboring states/tribes to improve the knowledge base of ERTs and to maintain consistency in calculating emissions averted. Interstate coordination is key for minimizing visibility impacts in mandatory Federal Class I areas and for addressing regional haze in the WRAP region.³¹

3.6 Feasibility Criteria

Policy Statement E: The use of emission reduction techniques to achieve annual emission goals is subject to economic, safety, technical and environmental feasibility criteria, and land management objectives.

The feasibility of ERT use is variable and dependent on criteria as established in the WRAP Fire Categorization Policy:

Per the GCVTC Recommendations, economic, safety, technical and environmental considerations are part of the application of emission controls for the implementation of this Policy statement. Due to these considerations, the control of emissions from some fire types may not be feasible, which will be determined by the land manager in collaboration with the applicable air quality regulatory authority.³²

The WRAP AEG Policy also recommends that land management objectives be included in these criteria during the decision-making process to ensure that ERTs are used appropriately and at levels of usage that are feasible. It should be noted that the specific land management objective for an area could preclude the use of a specific ERT where that ERT would prevent the attainment of the land management objective, e.g., if the land management objective is to reduce downed large fuels in an area, the use of burning under high fuel moisture of large woody fuels (i.e., the ERT being

³¹ 64 FR 35728.

³² WRAP Fire Categorization Policy, p. 11.

considered) would not be an option. See Appendix C for more detailed information on the application of ERTs.

3.7 Utilizing Collaborative Processes

Policy Statement F: States, tribes or the designated authority will establish annual emission goals in cooperation with federal land management agencies and private entities on a yearly basis.

Section 309 of the Rule requires that annual emission goals are “established in cooperation with States, tribes, Federal land management agencies, and private entities.”³³ In addition, the WRAP’s policies on fire to date endorse the importance of using this collaborative process. Annual emission goals will be reviewed and revised on a yearly basis. Coordination within states and across jurisdictional boundaries is key for minimizing visibility impacts in mandatory Federal Class I areas and for addressing regional haze in the WRAP region.³⁴

3.8 Tracking Procedure

Policy Statement G: States and tribes will need to develop a procedure for verifying the use of emission reduction techniques and for tracking the achievement of annual emission goals.

A procedure for verifying the use of ERTs should be developed. Such a procedure could also facilitate the state’s/tribe’s ability to ensure accountability of individual sources in utilizing ERTs. A state’s/tribe’s fire tracking system, as based on the WRAP Fire Tracking System (FTS) Policy, could be augmented to provide a repository for the verification information.

The verification of the use of some ERTs could also be done indirectly, for example by tracking fuel moisture.

Procedures for tracking the actual emissions averted (Option 1) and/or the actual percent of total acres on which ERTs are used (Option 2) should be developed. At year-end, these actual values can then be compared to the estimated value(s) for that year to assess whether annual emission goals are being met and for the purposes of establishing the next year’s annual emission goals. A state’s/tribe’s fire tracking system could be developed to support the tracking of the achievement of annual emission goals.

States/tribes can utilize the tracking procedure for the annual emission goal as a means for assessing the effectiveness of the control measures (i.e., ERTs) in their SIPs/TIPs. States under Section 309 are required to submit periodic reports to EPA that assess the effectiveness of their control measures, including “...a summary of the emissions reductions achieved throughout the State through implementation...” of such measures.³⁵

³³ 64 FR 35771 §51.309(d)(6)(v).

³⁴ 64 FR 35728.

³⁵ 64 FR 35772 §51.309(d)(10)(i)(A).

4. Appendices

Appendix A Glossary

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. Rangeland will be included with wildland for the purposes of the Fire Emissions Joint Forum work.

Alternatives to Burning – See Non-burning Alternatives definition below.

Best Available Control Measures (BACM) – A term used to refer to the most effective measures (according to EPA guidance) for controlling small or dispersed particulates and other emissions from sources such as roadway dust, soot and ash from woodstoves and open burning of brush, timber, grasslands, or trash.

Best Management Practices (BMPs) – A term applied collectively to any administrative or on-the-ground procedure that reduces the negative impacts of some action. An example of a Best Management Practice with respect to air quality would be conducting a prescribed burn when atmospheric ventilation is good, which in turn promotes smoke dispersal.

Control – To reduce emissions from an individual fire source.

Class I Area – An area set aside under the Clean Air Act to receive the most stringent protection from air quality degradation. Mandatory Class I Federal Areas are: 1) international parks, 2) national wilderness areas and memorial parks larger than 5,000 acres in size, 3) national parks that exceed 6,000 acres in size and which were in existence when the 1977 Clean Air Act amendments were enacted. The extent of a mandatory Class I Federal area includes subsequent changes in boundaries, such as park expansions. Class I areas can also include lands designated by states or tribes, but these areas are not deemed mandatory by the Clean Air Act.

Emission – Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; from motor vehicle, locomotive, aircraft, or other non-road engines; and from area sources such as fire.

Emission Cap - An enforceable limit on the amount of specific air pollutants that can be released or on the amount of a specific pollutant that is allowed to be in the air in a defined geographic area, and that has regulatory consequences. See also Emission Goal and Emission Target.

Emission Goal - A desired future outcome that may be represented by a numeric indicator, but without regulatory consequences, and as distinguished from a limit (i.e., target or cap). See also Emission Cap and Emission Target.

Emission Reduction Technique (ERT) - A technique for controlling emissions from prescribed fires to minimize the amount of emission output per unit of area burned.

Emission Target - A firm limit on the amount of specific air pollutants that can be released or on the amount of a specific pollutant that is allowed to be in the air in a defined geographic area, but without regulatory consequences (as distinguished from a cap). See also Emission Cap and Emission Goal.

Enhanced Smoke Management Program (ESMP) - A program for fire that considers visibility effects, in addition to health and nuisance objectives, and is based on the criteria of efficiency, economics, law, emission reduction opportunities, management objectives, and reduction of visibility impact.

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.

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

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, ecosystem 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.

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

Rangelands - 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 Haze - Visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area.

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

Smoke Management - Programs, practices, and techniques to minimize and/or reduce smoke emissions or impacts from fire.

State Implementation Plan (SIP) - 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.

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.

Tribal Implementation Plan (TIP) - 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.

Wildfire - Any unwanted, non-structural 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 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.

Appendix B Related Documents Listing

Regional Haze Rule

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

http://www.epa.gov/ttn/oarpg/t1/fr_notices/rhfedreg.pdf

EPA Interim Air Quality Policy on Wildland and Prescribed Fire

U.S. EPA, Office of Air Quality Planning and Standards, Interim Air Quality Policy on Wildland and Prescribed Fires, April 23, 1998.

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

Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures

U.S. EPA, Office of Air Quality Planning and Standards, September 1992.

Research Triangle Park, NC. EPA-450/2-92-003.

<http://www.epa.gov/ttncaaa1/t1bid.html>

AAQTF Recommendation on Air Quality Policy

Agricultural Air Quality Task Force, Air Quality Policy on Agricultural Burning, Recommendation to the U.S. Department of Agriculture, November 10, 1999.

<http://fargo.nserl.purdue.edu/faca/Archives/2000/Policy/Burning%20Policy.htm>

Tribal Authority Rule

Published in the Federal Register on February 12, 1998, 63 FR 7253.

<http://www.epa.gov/fedrgstr/EPA-AIR/1998/February/Day-12/a3451.htm>

Smoke Management Guide for Prescribed and Wildland Fire

National Wildfire Coordinating Group Fire Use Working Team (NWCG), 2001 Edition.

<http://www.nwcg.gov>

On the WRAP Website (<http://www.wrapair.org>):

Grand Canyon Visibility Transport Commission Report

Grand Canyon Visibility Transport Commission, Recommendations for Improving Western Vistas, Report to the U.S. EPA, June 10, 1996. Go to About WRAP, then the GCVTC link.

WRAP Policy for Categorizing Fire Emissions

Approved by the Western Regional Air Partnership, November 15, 2001. Go to the FEJF Task Teams, then Natural Background.

WRAP Policy on Enhanced Smoke Management Programs

Approved by the Western Regional Air Partnership, November 12, 2002. Go to the FEJF Task Teams, then Enhanced Smoke Management Programs.

WRAP Policy on Fire Tracking Systems

Approved by the Western Regional Air Partnership, April 2, 2003. Go to the FEJF Task Teams, then Fire Tracking Systems.

Non-Burning Management Alternatives on Agricultural Lands in the Western United States

Go to FEJF Task Teams, then Non-Burning Alternatives on Agricultural Lands.

WRAP Report: Integrated Assessment Update and 2018 Emissions Inventory for Prescribed Fire, Wildfire and Agricultural Burning (DRAFT).

Go to FEJF Task Teams, then Emissions.

WRAP Charter

Go to About, then to Charter.

Class I Area Map

Go to About, then the WRAP Map.

Appendix C

Annual Emission Goal Implementation Guidance

1. Applicability

As this Policy builds on the WRAP Fire Categorization Policy, the scope and applicability in regard to the “anthropogenic” or “natural” classifications defined by the WRAP Fire Categorization Policy is clarified below. Those interested should consult the WRAP Fire Categorization Policy for further detail.

Fire Categories ³⁶	WRAP AEG Policy Applicability
“Natural” Sources <ul style="list-style-type: none"> • Wildfire • Prescribed fire (including WFU) used for ecosystem maintenance purposes • Native American cultural burning for traditional, religious, and ceremonial purposes 	Exempted by Rule Covered Covered
“Anthropogenic” Sources <ul style="list-style-type: none"> • Prescribed fire (including WFU) used for any purpose except ecosystem maintenance 	Covered
Other Sources <ul style="list-style-type: none"> ▪ Native American cultural non-vegetative burning ▪ Other open burning activities 	Not Covered Not Covered

2. Regional Haze Implementation Plans

2.1 Section 308/309 Requirements

It is anticipated that annual emission goals will be incorporated into the Section 309 implementation plans submitted to EPA in order to meet the requirements of the Rule. States/tribes complying with Section 309 are required to have a regional haze implementation plan that addresses the 16 mandatory Federal Class I areas of the Colorado Plateau submitted by December 31, 2003, with implementation of certain control measures, including annual emission goals, by the following year. All other mandatory Federal Class I areas in the GCVTC transport region will be addressed by 2008 under the Section 308 or 309 implementation plan schedule.

³⁶ WRAP Fire Categorization Policy, p.8.

Although Section 309 of the Rule specifically requires the establishment of annual emission goals for fire, the methods that are promoted in this Policy could be considered by states/tribes that choose to follow the requirements of Section 308 of the Rule as a viable means to control fire emissions.

The Rule requires under Section 309 that annual emission goals for fire (excluding wildfire) be established through 2018 as a means for demonstrating reasonable progress requirements.³⁷ The WRAP considers this approach to have merit beyond 2018.³⁸ Section 309 states may need to consider developing further contingency measures, e.g., a regional application of annual emission goals, in their implementation plans if the annual emission goals do not adequately minimize emission increases from fire. The annual emission goal approach is a viable strategy to control fire emissions and, thereby, make reasonable progress toward the attainment of natural conditions by 2064, as required by the Rule.

2.2 Submission of Periodic Reports

Beginning in 2008, states are required by the Rule to submit periodic reports to the EPA to assess the adequacy of its implementation plan, including assessing the adequacy of certain elements, such as the annual emission goals. These periodic reports are due every five years. If the state determines that the implementation plan is or may be inadequate to meet reasonable progress goals, the state is required to develop additional strategies to address deficiencies in the plan. These strategies are then submitted to EPA for approval.

3. Use of ERTs

ERTs are proven to be effective methods to control fire emissions and are applied in different ways by regulatory authorities. For example, some regulatory authorities promote the use of ERTs as part of a voluntary management program while others enforce the use of ERTs through rule making. For example, the California Agricultural Burning Guidelines enforce the use of ERTs by specifying requirements for the burning of rice, barley, oat, and wheat straw. The Guidelines require the use of a "crackle test" to determine if the fuel is dry enough to burn. In the state of Washington, wildland land managers are encouraged to use techniques, such as fans, crane piling, mass ignition, accelerated mop-up, and other methods of increasing combustion efficiency and reducing the smoldering stage of burning.

Although a few states in the WRAP region do promote or require the use of ERTs and specify burning conditions that must be met in order to burn, currently no systems are in place to track the emissions averted from the application of such methods across all fire source sectors. Currently programs do exist in some areas for tracking of emissions averted through the use of ERTs for wildland prescribed fires.

³⁷ 64 FR 35771 §51.309 (d)(6)(v).

³⁸ WRAP Initiatives Oversight Committee (IOC), Transmittal Letter, November 15, 2001, Appendix C of the WRAP Fire Categorization Policy.

The following paragraphs provide a summary of some of the current efforts by regulatory entities to use ERTs as a means to reduce emissions from prescribed fire and agricultural burning.

3.1 California

Title 17 of the California Code of Regulations requires district smoke management programs to include general burning requirements for agricultural burning, prescribed burning, and prescribed fires in wildland and wildland/urban interface areas. In addition to the general requirements, the law includes specific requirements for rice, barley, oat, and wheat straw, such as certain firing techniques and specific burning windows. There are also specific fuel moisture burning requirements for rice straw burning.

3.2 Oregon

In Oregon the rules for agricultural burning include, but are not limited to, measures to ensure that crop residues are evenly distributed and in good burning condition, rapid ignition techniques are employed, and alternatives to open burning of fields are considered. For prescribed fires on wildlands, the Oregon Smoke Management Program requires land managers to consider utilization of residue, fuel reduction measures, alternate treatment practices, and reduction of prescribed burning emissions to achieve emissions reduction goals established within the Oregon Visibility Protection Plan. Burning during the spring when the 1000-hour and larger fuels have high fuel moisture is promoted. Post-burn reports require the tracking of fuel moisture content, ignition method, and other information to support calculation of ERT use.

3.3 Washington

In Washington, wildland land managers are encouraged to use techniques, such as fans, crane piling, mass ignition, accelerated mop-up, and other methods of increasing combustion efficiency and reducing the smoldering stage of burning. No tracking of specific ERTs is required. The Washington Smoke Management Plan for silvicultural burning does establish a tracking system to measure progress toward specific emission reduction targets. Burn days and specific burning conditions are established by the Department of Ecology for agricultural burning and a permitting system is in place.

3.4 Utah

Agricultural burning is not regulated by the State of Utah. However, counties require such burns to be conducted during optimal dispersion conditions. State air quality regulations require wildland land managers to take measures to prevent smoke impacts. State law requires identification of best management practices including the use of ERTs. Land managers are required to identify the techniques that are employed in addition to fuel moisture and ignition method in their daily emissions report.

4. Establishment of Annual Emission Goals

4.1 Current ERT Application

Research has shown that ERTs can result in emission reductions, which, in turn, reduce smoke impacts on air quality. According to the National Wildfire Coordination Group's (NWCG) *Smoke Management Guide for Prescribed and Wildland Fire*, methods used to reduce emissions generated from prescribed burning on wildlands are: reducing the area burned, reducing fuel loading, reducing fuel production, reducing fuel consumed, scheduling burning before new fuels appear, and increasing combustion efficiency.³⁹

EPA's *Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures* states that the methods for reducing the amount of emissions generated from agricultural burning include: reducing the acres burned annually, altering the fuel distribution, improving firing techniques, and burning under optimum fuel moisture.⁴⁰

4.2 Non-burning Alternatives and Annual Emission Goals

Annual emission goals, under this Policy, are established annually and apply to the upcoming year's projects where fire has been previously determined as the best tool for meeting specific land management objectives. Therefore, this Policy makes a distinction between those ERTs that are used *with* fire and those techniques that *replace* fire (i.e., non-burning alternatives, sometimes grouped with ERTs).⁴¹ For public lands, non-burning alternatives that replace fire are typically considered in long-term programmatic plans and do not coincide with annual operational plans for fire projects. By the time the project plan is being implemented, the decision to use fire as a tool to meet the land management objective has been made.

Land management decisions for federal land managers and possibly other land managers are made years in advance of actual project implementation and for multi-year periods, under long-term land management plans or project plans. These plans, and the supporting NEPA analyses, are the process under which alternatives to burning and levels of management application of fire are established. This land management decision process is on a different temporal/spatial scale from project level operations. In addition, the decision by federal land managers to replace fire is based on other environmental considerations that cannot be adequately addressed on an operational basis, which is the focus of the application of ERTs for annual emission goals, as defined by the Policy. Although specific projects may also go through a NEPA analysis during which non-burning alternatives may

³⁹ NWCG's *Smoke Management Guide For Prescribed And Wildland Fire*, 2001 Edition (hereafter referred to as "2001 Smoke Management Guide"), pages 143-151.

⁴⁰ EPA's *Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures*, September 1992, (hereafter referred to as "EPA's BACM Document"), p. 9-13.

⁴¹ See the Glossary in Appendix A for the definition of non-burning alternatives as used in this Policy. This definition is not meant to contradict EPA's as described in its BACM Document, but rather refers to the application of non-burning alternatives specific to annual emission goals, as defined in this Policy.

be assessed, again, these are typically done well in advance of the operational effort.

In distinguishing between ERTs used on fire projects and non-burning alternatives used to replace fire on other land management projects, it is the WRAP's intent only to clarify the application of ERTs as the basis for annual emission goals. The WRAP supports efforts to utilize alternatives to burning (such as collection and removal of residue for use offsite with no subsequent on-site burning) in land management and fire management plans or other equivalent long-term plans. The use of non-burning alternatives is one of the key elements of the enhanced smoke management program as defined by the WRAP ESMP Policy. Further, the WRAP encourages each state/tribe to work cooperatively with land managers to develop ways to identify, implement, and track all feasible non-burning alternatives.⁴²

Several guidance documents provide information on the use of various types of non-burning alternatives that could be used by land managers. WRAP's 2001 *Non-Burning Management Alternatives on Agricultural Lands in the Western United States* identifies potential non-burning management alternatives for agricultural burning including methods for assessing the impacts of alternatives. The WRAP's draft *Comprehensive Manual on Non-Burning Alternatives* provides a catalogue of alternatives to prescribed burning on wildlands, including a risk versus benefit decision-making process related to the use of alternatives. Although these guidance documents are useful for identifying non-burning alternatives, methods for calculating the benefits of using non-burning alternatives are not universally available for the WRAP region.

4.3 Determination of Appropriate ERTs

The opportunity for the application of ERTs varies greatly. The 2001 Smoke Management Guide states, "ERTs vary widely in their applicability and effectiveness by vegetation type, burning objective, region of the country, and whether fuels are natural or activity-generated."⁴³

For example, a maintenance burn in a brush vegetative type within a wilderness area may have virtually no options for ERT application. Alternatively, multiple ERTs may be applicable in a ponderosa pine vegetation type where activity such as logging or thinning has occurred. The applicability of a particular technique or practice will depend, in part, on the objectives of that burn. For example, the objective of a prescribed burn on wildlands may be to create open space for wildlife. A backing fire, which is a firing technique that is used to reduce the amount of emissions generated, may not produce sufficient fire characteristics to achieve the management objective.

It is important to note that while ERTs offer an excellent tool for meeting goals for visibility protection, ERTs may cause negative effects such as soil compaction, nutrient loss, and impaired water quality on other valuable resources. Therefore, it is imperative that ERTs are used carefully, and that land managers and air regulators are provided the information and training necessary to make informed decisions.

⁴² See the WRAP Policy on Fire Tracking Systems.

⁴³ 2001 Smoke Management Guide, p. 141.

4.4 Feasibility Criteria

The use of ERTs should be based on economic, safety, technical and environmental feasibility criteria, as well as land management objectives. The WRAP recommends that education and training are also included as feasibility criteria. It is imperative that education and training are provided to ensure that ERTs are used appropriately. All of the above criteria will affect the application of certain ERTs for vegetation or crop types, burning objectives, and area in the WRAP region.

Examples of how to apply the feasibility criteria are listed below.

Economic: What are the economic costs of applying a certain ERT? Is a specific ERT more economical than others? Any ERT that significantly reduces crop yields or exceeds the cost of a crop is not likely to be accepted by farmers or growers. The same concern is relevant to the application of ERTs on wildlands.

Safety: Are certain ERTs not feasible due to public and firefighter safety concerns? Are certain ERTs not feasible due to concerns related to containment of the fire, i.e., keeping the fire within certain boundaries? Do certain ERTs minimize the possibility of nuisance and hazard smoke?

Technical: Are the equipment and resources available to utilize a specific ERT? Are sufficient training programs available in the use of ERTs for the land managers?

Environmental: Are there specific air quality and non-air quality environmental limitations (e.g., vegetation/crop type, fire type, time of year, area in WRAP region, soil compaction, water quality, etc.) that influence the use of certain ERTs?

Land Management Objectives: Is a certain ERT not feasible due to conflicts with land management objectives? Do certain ERTs maximize the likelihood of achieving the land management objective of the burn?

4.5 Existing Guidance Documents

Several guidance documents provide information on the use and effectiveness of various types of ERTs that could be used by land managers to control fire emissions and reduce smoke impacts. EPA's BACM Document, the 2001 Smoke Management Guide, and the GCVTC's Fire Emission Project⁴⁴ are three examples.

EPA's BACM Document provides information on ERTs for both wildland and agricultural burning. The BACM Document is one of the best comprehensive references on potential ERTs for agricultural burning. Most of the WRAP states do not have agricultural smoke management programs, so the demand for additional research is minimal. Once agricultural smoke management programs are developed, further research on common ERTs for agricultural burning applications may be available.

⁴⁴ WRAP Report: Integrated Assessment Update and 2018 Emissions Inventory for Prescribed Fire, Wildfire and Agricultural Burning (DRAFT), Appendix A, pp. 61-96.

The 2001 Smoke Management Guide presents information on the use and effectiveness of ERTs, frequency of specific ERT usage, and qualitative assessment of emission reductions achieved through the use of ERTs. The majority of the information presented in the Guide was gathered from fire practitioners at three national workshops held during the fall of 1999. Much of the research into ERTs and subsequent emissions benefits for wildlands, such as the Consume software program,⁴⁵ has been conducted in the Pacific Northwest, although the general principles are applicable elsewhere in the WRAP Region.

The GCVTC's Fire Emission Project assessed the potential application of ERTs by wildland vegetation type and fire type on a region-wide basis. Included in the assessment was percentage of feasible use of ERTs for these wildland vegetation and fire types, with the emissions reduced as a result of the use of ERTs also evaluated.

4.6 Research Needs

ERTs have been proven to reduce fire emissions through documented research, but more research is needed to make them a more quantifiable tool for land managers. The 1999 Air Quality Policy on Agricultural Burning emphasized this fact by stating, "Emission reduction technology to reduce the impact of pollutants emitted from agricultural burning on ambient concentrations is needed".⁴⁶

The identification of common ERTs for agricultural burning is a difficult task since most of the WRAP states do not have smoke management programs to address agricultural burning, and therefore the demand for such information is not great. Information regarding availability, applicability, and cost effectiveness of ERTs can be found in various research documents, but a comprehensive guide does not currently exist.

The research on ERTs for wildland fire was predominantly conducted in the Pacific Northwest. Although the general principles are applicable elsewhere in the WRAP Region, more research is needed on ERTs for wildland fire, with emphasis placed on vegetation types located outside of the Pacific Northwest.

4.7 Calculation of Averted Emissions

According to the 2001 Smoke Management Guide, "The overall potential for emission reductions from prescribed fire depends on the frequency of use of emission reduction techniques and the amount of emission reduction that each method offers."⁴⁷ Therefore, in order to determine the potential for emission reductions from prescribed fire, land managers will need to calculate the specific amount of emission reduction that each method offers. Consume 2.1, a fuel consumption and emissions model, can be used to estimate potential emission reductions that may be achieved by

⁴⁵ Pacific Northwest Research Station, Forestry Sciences Laboratory, Consume Software, Version 2.1.

⁴⁶ Agricultural Air Quality Task Force's (AAQTF) Air Quality Policy on Agricultural Burning, Recommendation to the U.S. Department of Agriculture, November 10, 1999.

⁴⁷ 2001 Smoke Management Guide, p. 152.

employing certain ERTs.⁴⁸

The WRAP recognizes the need for a more comprehensive guide for estimating potential emission reductions achieved through the use of ERTs for agricultural burning and wildland fire. This guidance will be developed by the WRAP in a similar format to that of Appendix D to support states' and tribes' use of annual emission goals. Appendix D provides a table that lists ERT options that can be applied by land managers and the corresponding emissions averted by using a particular ERT.

The 2001 Smoke Management Guide contains several tables that may be useful to states/tribes in order to establish annual emission goals. The tables include information on the frequency of use of specific ERTs by region of the country, the general effectiveness of specific ERTs, the significant constraints limiting the wider application of ERTs, and the potential emission reductions that may be achieved by employing various ERTs as estimated by Consume 2.1. There are some limitations to the information contained in the 2001 Smoke Management Guide, as some vegetation types that are found in the WRAP region are not included.

These tables should be utilized with the understanding that the effectiveness of a particular ERT may vary considerably. Considering all burning nationally, if ERTs were optimally used, emissions could probably be reduced by approximately 20-25 percent assuming all other factors (vegetation types, acres, etc.) were held constant and land management goals were still met.⁴⁹ Individual states/tribes or regions may be able to achieve greater emission reductions than this or much less depending on the states' or regions' individual situations.

⁴⁸ Ottmar, Roger D.; Reinhardt, Timothy E.; Anderson, Gary; DeHerrera, Paul J. Consume 2.1 User's Guide. Gen. Tech. Rep. PNW-GTRxxx. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

⁴⁹ J. Peterson and B. Leenhouts, "What Wildland Fire Conditions Minimize Emissions and Hazardous Air Pollutants and Can Land Management Goals Still Be Met?" (Draft), August 20, 1997.

APPENDIX D

Example of ERT & Associated Emission Averted Table

(This example demonstrates the future guidance that will be issued by the FEJF.)

ERT Category	Practice	Treatment	Size Class	Vegetation Type	Smolder	Equation	Reduction Factor
Increased Combustion Efficiency	Backing Fires	First Entry	All	Ponderosa Pine	N/A	ERT Emissions = Total Emissions x 0.9	0.1
			All	Pinyon/Juniper Woodland, Oak Brush, Sage, Desert Shrub, Annual Grass, Perennial Grass	N/A	ERT Emissions = Total Emissions x 0.9	0.1
		Maintenance	All	Ponderosa Pine, Pinyon/Juniper, Woodland, Oak Brush, Sage, Desert Shrub, Annual Grass, Perennial Grass	N/A	ERT Emissions = Total Emissions x 0.9	0.1