



U.S. Fish & Wildlife Service

Fire Management Handbook

[Introduction] [Legal Authorities] [Interagency
Coord.] [Responsibilities] [Guidelines]



2.3 AIR QUALITY AND SMOKE MANAGEMENT

2.3.1 INTRODUCTION

Home

Clean air is a primary natural resource value in all Fish and Wildlife Service units. The protection of these resources must be given full consideration in fire management planning and operations.

What's New

Preparedness

Program Mgt.

FIREBASE

Prevention

Planning

Qualifications

Financial Mgt.

Info. Systems

Records &

Reports

In order to protect the air resource from the harmful effects of smoke, refuges must not only comply with the regulations and standards stated herein, but take aggressive action to manage smoke from wildland fires to minimize impacts and maintain air quality. To do this, the effects of smoke on air resources must be identified, the current levels of pollutants established, the levels of pollution for different fire management actions estimated, the effects on visitor health and enjoyment identified, and the best measures to control/mitigate the smoke emissions and effects energetically pursued.

Prescribed Fire

Introduction

Operations

Smoke Mgt.

Introduction

Internal refuge programs for planning and monitoring resource and fire management actions, conducting prescribed and wildland fire activities, and interpreting fire programs must be augmented by vigorous participation in external (interagency) planning and regulatory actions as appropriate.

Introduction	This section provides:
Legal Authorities	
Interagency	<ul style="list-style-type: none"> ● The legal requirements for air quality which must be met by a smoke management program.
Coord.	<ul style="list-style-type: none"> ● Directions for establishing acceptable within-refuge standards.
Responsibilities	<ul style="list-style-type: none"> ● A statement of the need to monitor essential variables. ● Recommendations for working with regulatory boards/agencies.
Guidelines	<ul style="list-style-type: none"> ● Guidance on how and with whom to coordinate smoke management questions and practices.
Wildland Fire	
Preparedness	2.3.2 LEGAL AUTHORITIES AND RESPONSIBILITIES
Operations	
Fire Use	General Authorities for Air Resource Management. There are several acts of Congress which relate to the Fish and Wildlife Service's general authority to manage the air resources of refuge units. These include the National Wildlife Refuge Improvement Act of 1997, Clean Air Act, National Wildlife Refuge Administrative Act of 1966, the National Environmental Policy Act of 1969, the Wilderness Act of 1964, and other statutes. These laws, together with refuges' enabling legislation and legislative histories, collectively provide the Fish and Wildlife Service with opportunities to manage the air resource and protect other refuge resources and values that are dependent upon air quality.
WFSA	
Business Mgt.	
Reviews	
Fire Trespass	
Investigations	
Cost	
Determinations	
Civil Cases	
Criminal Cases	Clean Air Act (42 United States Code (USC) 7401 et seq). The most explicit legislation pertaining to the Fish and Wildlife Service is the Clean Air Act, as amended in 1977 and 1990, which defines the authority and duty of the Fish and Wildlife Service to protect refuge resources from air pollution-related effects and damage. The Clean Air Act establishes specific air quality management programs that provide special protection for many refuges and wilderness areas.
Glossary	
References	
Rehabilitation	Sections 160-169 of the Act establish a program to prevent significant deterioration (PSD) of air quality in "clean air areas" of the country (i.e., attainment areas), which include many refuge units. Among the

purposes of the PSD program are "to preserve, protect and enhance the air quality in national wildlife refuges, parks, monuments, seashores, and other areas of special national or regional natural, recreational, scenic or historic value." Another objective of the PSD is to protect resources that might be sensitive to pollutant concentrations lower than the National Ambient Air Quality Standards (NAAQS), which are established for the protection of public health and welfare but do not necessarily provide for protection of refuge natural resources. The PSD program also establishes an area classification scheme which determines the level of air quality protection afforded these "clean air areas". All PSD areas were initially classified as Class I or Class II areas. Class I areas, which include some national wildlife refuges, receive the highest degree of protection.

Congress provided additional protection for Class I areas in Section 169A of the Clean Air Act, which specifies a national goal of "remediating any existing and preventing any future manmade visibility impairment" in these areas. Class I areas are defined in the Clean Air Act as a national park over 6,000 acres or a national wilderness area and national memorial park over 5,000 acres that were in existence as of August 7, 1977. Service wilderness Class I areas are: Bering Sea, Simenof, Tuxedni, Chassahowitzka, St. Marks, Okefenokee, Wolf Island, Breton, Moosehorn, Seney, Mingo, Medicine Lake, Red Rock Lakes, UL Bend, Brigantine, Bosque del Apache, Salt Creek, Swanquarter, Lostwood, Wichita Mountains, and Cape Romain.

The Clean Air Act instructs the EPA to establish policy and guidance for states to develop specific State Implementation Plans (SIP) and Smoke Management Programs (SMP). The latest guidelines are in the Interim Air Quality Policy on Wildland and Prescribed Fire. The states use these guidelines to develop SIPs/SMPs which Service fire

management activities must address.

Fish and Wildlife Service Compliance Responsibilities. Fish and Wildlife Service fire management activities which result in the discharge of air pollutants (e.g., particulates, carbon monoxide, and other pollutants from fires) are subject to, and must comply with, all applicable Federal, state, interstate, and local air pollution control requirements, as specified by Section 118 of the Clean Air Act, as amended (42 USC 7418). These requirements are the same substantive, procedural, and administrative requirements (See 561 FW 2) that apply to a private person or other non-governmental entity. The 1990 amendments provide for air quality permits and emissions fees. If adopted by a state in their implementation plans these fees may affect some refuges significantly.

Fire plays a principle, and in some cases a dominant role in maintaining the integrity of refuge resources. Since fires are not point sources, but rather tend to be spatially distributed singular events, temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This may include temporary closures or warnings as acceptable during the progress of beneficial, ecologically essential fires. Interpretive programs should include clear and reasonable explanations for such necessary practices.

All refuges, including those with exclusive jurisdiction, are required to obtain necessary permits for prescribed fires, comply with the NAAQS both inside and outside refuge unit boundaries, and protect visibility in Congressionally-mandated Class I areas.

There are certain absolute or minimum requirements that apply to Fish and Wildlife Service fire management activities, such as compliance with the NAAQS and the visibility protection regulations for Class I

areas. These are Federally mandated programs that are enforced nationwide. Implementation of these programs is primarily carried out by state and local air quality agencies.

There may be additional state and/or local air quality rules and regulations that must also be complied with if the jurisdictional boundaries of these agencies include lands managed by the Fish and Wildlife Service or lands that may be affected by activities occurring on Fish and Wildlife Service lands.

Such additional requirements may include:

- State or local ambient air quality standards that are more stringent than the NAAQS.
- Ambient standards that are for pollutants other than those for which NAAQS have been developed, such as particulate matter smaller than 2.5 microns in size (PM-2.5). This is a size range of particulate that could significantly affect the management of smoke from wildland fires.
- Protection of state-identified scenic views that may or may not be associated with Fish and Wildlife Service areas.
- Possible quantitative standards for protection of visibility in Class I areas, such as specified minimum acceptable levels of visual range or contrast that will be allowed.

Compliance with these various requirements may necessitate the use of computer simulation models or even instrumented monitoring in the field, as specified by the regulatory authority.

An additional concern is whether smoke emissions from fires are considered to be "natural" or "human caused" emissions. Air pollution caused by prescribed fires may reasonably be interpreted by state and local air quality agencies to come within the scope of Section 118 of the Clean Air Act. A thorough knowledge of interstate, state, and local air quality regulations and policies toward the regulation of prescribed fires is essential. Failure to comply with any applicable requirements,

such as open burning permit requirements, could subject the Fish and Wildlife Service to fines or other sanctions.

Accidental or willful noncompliance with air quality standards or visibility protection requirements may result in the development of control programs by external agencies that could directly affect and hamper the Fish and Wildlife Service's management of its fire program. Previous intense smoke episodes caused by fires have raised concerns about exposure to unhealthy levels of smoke (measured as PM-10) and the need to develop emergency episode plans to effectively deal with such problems.

Many western state air quality agencies are considering appropriate steps to take in case future episodes are encountered. Anticipated state actions could include requiring land managing agencies to deploy and operate monitoring equipment, issuing notices to the general public about the potential health hazards of such exposure, and issuing evacuation orders when certain air pollution levels are present.

The 1990 Clean Air Act provides new emphasis for reducing emissions in areas that do not meet the NAAQS and are designated a non-attainment areas (NAA). Refuges located in NAA's may be subject to reasonable or best available control measures including:

- Smoke impact monitoring
- Mandatory state permits
- Audits by state air quality staffs
- Emissions reporting and inventory
- Emission fees
- Burner certification
- Emission reduction tracking
- More state oversight

2.3.3 INTER AND INTRA-AGENCY COORDINATION

A good working relationship between the Fish and Wildlife Service, other Federal and state land management agencies, and interstate, state, and local air quality officials should help assure that both air quality control and fire management objectives are met with the least amount of conflict. The Interim Air Quality Policy on Wildland and Prescribed Fire correctly identified that cooperation and partnerships are needed in order to balance America's natural heritage and the public interest. Air quality interests (i.e., regulators, public, and neighbors) must be involved in Comprehensive Conservation, Habitat Management, and Fire Management Plan development. Wildlife resource interests (i.e., Service wildland and fire management program managers, partners, and public) must be involved in SIP and SMP development.

State Agency Coordination. Coordination with a state or states air regulatory office is required during the development of resource and fire management plans in order to determine procedures for compliance with state air quality regulations. Refuge staff can consult with the regional air quality coordinator or the FWS Air Quality Branch (AQB) on the proper procedures for obtaining coordination with the state or states in which the refuge is located.

The regional air quality coordinator may handle the coordination activities with the state or may recommend that the refuge staff work directly with the representative of the state. If more than one refuge with fire management concerns is located in a state, it may be advantageous for each refuge to coordinate with local representatives of the state agency while the regional air quality or fire management coordinator maintains coordination with the central state office. In states where more than one state agency is involved, e.g. one for smoke management and one for air quality, it is important that there be

adequate coordination with each.

Following initial consultation with the state agency, procedures for compliance with state air quality regulations should be drafted for the Fire Management Plan. A copy of the draft procedures should be supplied to the state agency for review prior to completion of the Fire Management Plan.

The refuge should continue to coordinate with the state throughout implementation of the Fire Management Plan to promote compliance with state regulations. It may be helpful to invite selected state air quality officials to visit the refuge when a prescribed fire is in progress.

In some states a memorandum of understanding with the state may be appropriate. Such memoranda should clearly specify any procedural and substantive requirements that must be met by the Fish and Wildlife Service in conducting its fire management programs. Assistance in writing such agreements should be sought from the regional office and the regional solicitor, and should include consultation with the Fish and Wildlife Service Air Quality and Fire Management Branchs.

When a refuge is notified by the state that an air pollution violation has occurred, the refuge will work with the notifying agency and provide them with a compliance plan and schedule as appropriate. The regional air quality coordinator should be notified, and the Air Quality Branch should be contacted if technical assistance is required.

Air Quality Branch (AQB) Coordination. At the time the draft Fire Management Plan is sent to the regional office for review, the regional office will determine if the smoke management portions of the plan will be sent to the AQB for review and comment. A copy of the comments from the AQB will be returned to the region and will be forwarded to the

refuge with the regional comments. When the draft Fire Management Plan is in the region for review, the Regional Fire Management Coordinator will ensure that the air quality coordinator reviews the smoke management portion of the plan and the comments from AQB before they are returned to the refuge. A copy of the air quality section(s) of the approved Fire Management Plan will be sent to the AQB.

Requests for technical assistance from the AQB should be made directly to that office through appropriate channels. The regional air quality coordinator and the RFMC will be notified when such a request is made.

Interagency and Regional Coordination. The Regional air quality coordinator, Regional fire management coordinator, zone FMO, or Rx fire specialist will usually be the agency representative for the development of interagency or regional smoke management plans. When a decision is made to develop an interagency or regional plan, the agency representative will inform AQB, and an agreement will be reached on the degree of their subsequent involvement. An agreement will also be reached between the refuge and region on the extent of involvement for each.

Public Coordination. Educating the public on the values of both clear air and the natural process of fire is important to increasing public understanding and support of the refuge fire management programs. Interpretation in the refuge is the primary method for providing this education. The public should be aware that the Fish and Wildlife Service is striving to protect air resources in the refuge while still using fire to both simulate natural ecological processes and as a tool to accomplish resource objectives. Shortly before prescribed burns are

anticipated, information will be made available to state contacts, refuge visitors, local citizenry, and the press about what is happening in the refuge. On-site information can also be used to alleviate visitor concern about the apparent destruction of refuge resources by fire or impairment of views due to temporary smoke.

2.3.4 REFUGE RESPONSIBILITIES

In addition to the influence of smoke on health and safety, the influence on the visual resource must also be considered. Visibility will be a consideration in refuges with Class I areas. In addition, FWS Class II areas located near Class I areas need to consider how emissions from smoke will impact visibility in the Class I area.

Although it is recognized that fire, and therefore smoke, is a natural process, the presence of chronic or severe episodes of smoke may impinge unacceptably upon refuge objectives.

Each refuge is required to develop methods to manage smoke from prescribed fire and, to the extent possible, from wildland fire. Air quality management objectives must be set, and prescriptions and techniques must be developed to meet these objectives. These objectives should appear in all Prescribed Fire Plans and fire situation analyses.

In some areas, local air quality offices may have already established visibility standards. These standards should be discussed with the local air quality office and the regional air quality coordinator. The refuge should identify the key smoke sensitive areas (highways, campgrounds, developments, etc.) for which smoke management objectives will be created.

Air quality management objectives must be quantifiable and

measurable at designated points in the refuge. Objectives could include maintenance of acceptable visual range, allowable loss of detail or clarity of a key feature, the number of consecutive days in which the visual range is attenuated below the acceptable standard, consecutive nights with the odor of smoke in a developed area, or maintenance of acceptable visibility on highways.

The techniques and prescribed conditions which will be used to achieve smoke management objectives are defined in a similar fashion to the way techniques and burning prescriptions are defined for the achievement of fire management objectives. Critical mixing heights, transport wind speeds, and wind directions should be stated. Smoke management techniques should include an appropriate combination of the dilution of particulate matter, avoidance of targets, and emission reduction. Smoke management courses are available that provide instruction in these techniques.

The documents will also describe the personnel and the methods which will be used to monitor and measure the degree to which the objectives have been met, or when they are violated. The presence or absence of the prescribed conditions for smoke management will also be recorded.

Prescribed Fire Plans, Wildland Fire Implementation Plans, or Wildland Fire Situation Analysis will describe the holding actions which may be used to keep the fire within prescription for air quality objectives, particularly when smoke dispersion is deteriorating to the point that it is possible that smoke and air quality objectives will no longer be achieved. Example may include:

- Using firing crews to ignite fuels so that the fuels burn with flaming rather
- Using natural barriers or constructing firelines to halt fire spread.

- Using natural barriers or constructing firelines to halt fire spread.
- Mopping up smoldering heavy fuels until conditions improve for smoke dispersion, at which time the fire may be reignited.
- Or, using hose lays and pumps to wet fuels to extinguish all or a portion of the fire front, with possible subsequent re-ignition under prescribed dispersal conditions.

All such actions must be approved by the Refuge Manager as part of the Prescribed Fire Plan, and may be funded only with the funding source supporting that activity.

The Prescribed Fire Plan will also describe the amount or periods of time that air quality objectives may be violated before the fire is declared an unwanted wildland fire and appropriate suppression actions are taken. This time period should be discussed with the local air quality regulatory office and regional air quality coordinator if actual regulatory values such as NAAQS are involved.

If a prescribed fire is not meeting objectives or is exceeding prescription parameters, a Wildland Fire Situation Analysis will be completed and the appropriate management response implemented. The fire will remain an unwanted wildland fire even if dispersal conditions improve again to prescribed standards. The suppression strategies chosen and tactics employed should consider smoke objectives (preferred WFSA alternative).

Some fires can be reasonably expected to significantly affect air quality in and around the refuge. A Wildland Fire Situation Analysis should be sent to the appropriate state air quality regulatory agency for its information and comment. Large fires may affect the number of burning permits which can be issued, and therefore affect the amount of prescribed burning which can be done by neighboring land management agencies.

2.3.5 SMOKE MANAGEMENT GUIDELINES

General Guides - "How to do it" publications which cover all kinds of burning in all areas where Fish and Wildlife Service is involved are not available. Four publications to which one may refer for more detail are:

- Southern Forestry Smoke Management Guidebook. Mobley et.al., USDA
- Principles of Smoke Dispersion from Prescribed Fires in Northern Rocky
- Slash Smoke Management Guidelines. Office of the State Forester, Salem,
- Prescribed Fire Smoke Management Guide. National Wildfire Coordinating
- Smoke Signals - a U. S. Fish and Wildlife Service information resource for

Principles - Listed below are some abbreviated principles to guide smoke management planning.

to cause control problems. Again, the fire weather forecaster can help.

- Determine the direction and volume of smoke. Especially near highways and populated areas. The screening system described below will help in making this determination.
- Use caution when near or upwind of smoke sensitive areas. Burning should be done when wind will carry smoke away from heavily traveled roads, airports, and populated areas.
- Notify local fire control office, nearby residents, and adjacent landowners. This is only common courtesy, as well as a requirement in many areas. It will let them know it is not a wildland fire and will provide advance notice of any adverse public reaction - such as people with respiratory ailments, wash day, etc. Keep the public informed
- Use test fires to confirm smoke behavior. Set in the area proposed for burning, away from roads and other 'edge' effects.
- Use backing fires where possible. Assuming resource management objectives can be met, backing fires give more complete consumption of fuel and produce less smoke. Even though slower and more expensive, less pollutants are put into the air and visibility is less affected. If other firing methods are used, be sure that the fire is hot enough and the weather conditions suitable for venting smoke into the upper atmosphere.
- Burn in small blocks. The larger the area being burned, the more visibility is reduced downwind and a higher concentration of particulates is put into the air. However, it may be better to burn all the area when weather conditions are ideal for smoke dispersion.
- Mop up along roads. Burn out and start mop up along roads as soon as possible to reduce impact on visibility.
- Be cautious of nighttime burning. Predicting smoke drift and visibility is more difficult at night. The wind may lessen or die out completely and smoke will tend to stay near the ground. Burn at night only when a forecast of optimum conditions has been made.
- Have emergency plan. Be prepared to control traffic on nearby roads if the wind direction changes. Be prepared to stop a prescribed fire if it is not burning according to plan or if weather conditions change.
- Burn when duff and soil moistures are high to prevent smoldering ground fires.
- Avoid involving snag trees or stumps by treating with foam or chainsaw felling. Be prepared to mop up if necessary.
- When piling debris, use round piles rather than windrows. Avoid mixing with dirt (use root rake for piling) and allow fuels time to dry prior to piling.

- Burn under conditions of low relative humidity and fuel moistures because smoke particles combine with moisture to produce poor visibility.
- Avoid days with low morning transport wind speed (less than 4 mph) or low morning mixing heights (less than 1500 feet).
- Anticipate down-drainage smoke flow, particularly at night.

Screening System for Managing Smoke. By following a written prescription and all of the directions under Principles above, a land manager will reduce the production of smoke and insure good dispersion. However, smoke will still be produced, and the manager needs to determine the impact it might have on the safety and welfare of people or the environment. The Southern Forestry Smoke Management Guidebook includes a system for predicting smoke concentrations at any distance downwind. The whole system is not discussed here, but consists of five steps.

Step 1 - Plotting the trajectory of the smoke plume.

Step 2 - Identify smoke sensitive areas.

Step 3 - Identify critical targets.

Step 4 - Determine fuel type. If your fuel type is not comparable with those in the Guidebook, you can not use the system.

Step 5 - Minimize risk.

Information Exchange. Keep in contact with other land management agencies that use prescribed fire. Take advantage of any information that can be obtained.

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