XIV. AIR QUALITY

Introduction

The primary air quality concerns associated with forest management activities include road dust and smoke from wildfires and prescribed burning. The main air quality concern associated with this specific project would be the amount and concentration of particulate matter (PM) produced by proposed prescribed burning. Wood smoke produces particles too small to be seen by the human eye, measuring 10 microns (one micron equals a millionth of a meter) and smaller. Larger particles tend to settle out of the air quickly, and are less likely to affect public health. Particles 10 microns and smaller may be inhaled deep in the lungs, posing a threat to public health and visibility. Particles 2.5 microns and smaller are of the highest concern for potential health effects.

The basic framework for controlling air pollutants in the United States is the 1970 Clean Air Act (CAA), as amended in 1990 and 1999 (42 U.S.C. 7401 et seq.). The CAA was designed to protect and enhance the quality of the Nation's air resources. The CAA encourages reasonable federal, state and local government actions for pollution prevention. State Implementation Plans (SIPs) are developed to implement the provisions of the Clean Air Act. The SIPs describe the actions the state takes to achieve and maintain the "national ambient air quality standards" (NAAQS). Under the CAA, the EPA sets standards for air quality to provide both health and visibility protection. Montana has also set standards to help protect air quality.

The EPA has established NAAQS for six criteria pollutants that have been determined harmful to the public and environment, including carbon monoxide, lead, nitrogen dioxide, sulfur dioxide, ozone, $PM_{2.5}$ and PM_{10}. The major pollutant of concern in smoke from wildland fire is fine particulate matter, both PM_{10} and $PM_{2.5}$. Smoke from prescribed fire must meet the ambient air quality standards for PM_{10} and $PM_{2.5}$. In Montana, the state standard for PM_{10} is the same as the federal NAAQ: 50 $\mu g/m^3$ (micrograms per cubic meter, which is 1/1,000,000 of a gram per cubic meter) for the annual arithmetic mean, and 150 $\mu g/m^3$ for the 24-hour average. For $PM_{2.5}$, no state standard has been established; the federal NAAQ is 15 $\mu g/m^3$ for the annual arithmetic mean and 35 $\mu g/m^3$ for the 24-hour average. Fine particulate matter, generally less than 2.5 microns in diameter ($PM_{2.5}$), is the primary cause of visibility impairment although gases also contribute. Emissions from wildland burning include both gases and particulate matter ranging in size from 0.1 to 2.5 microns which greatly impacts visibility. For more information or a listing of the NAAQS, please see the Environmental Protection Agency's website at http://epa.gov/air/criteria.html, or the table included in the air quality portion (section I) of the project file.

Information Sources

The evaluation of direct, indirect and cumulative effects on air quality utilized the most recent and available information and data related to past, present and reasonably foreseeable events that have occurred or may occur in the air quality analysis area.

Analysis Methods

The Smoke Impacts Spreadsheet (SIS) was used to estimate PM_{10} and $PM_{2.5}$ emissions and airborne concentrations downwind of prescribed burning. SIS consists of existing accepted models in a spreadsheet format. SIS utilizes Consume 2.1 for pile burning emissions and CALPUFF 5.5 to model smoke dispersion, as well as FOFEM 5 to estimate material available for burning.

Analysis Area Description

The Montana Air Quality Bureau divides the State of Montana into ten airsheds. Airshed 2 is the primary analysis area for assessing the influence of the Red Whale Fuels Reduction Project activities on air quality because it encompasses the effects of any activities undertaken in the project area (as defined by the Montana/Idaho Airshed Group). Airshed 2 comprises Flathead, Lake, Sanders, and the northern portions of Missoula and Powell counties. Please see the project file for a map of Airshed 2.

Affected Environment/Existing Condition

Meteorology

Smoke dispersion is primarily determined by transport winds and mixing height. Transport winds determine the direction of a smoke plume and the speed at which it travels, while mixing height controls the ability of smoke to mix into an air mass. In the spring and summer, solar heating of the earth surface is much more intense, increasing the amount of warm air contributing to an unstable atmospheric condition. The more unstable the atmosphere the higher the likely mixing height would be, and the greater the dispersion. During the fall and winter, stable atmospheric conditions prevail as cooler air pools in the valley bottoms. Solar heating is not enough to heat this pooled air, so the stable conditions remain, reducing dispersion until a frontal passage “scours” out the valley air.

Forest Service management prescribed and wildland fire use contributes smoke that may cause short-term deterioration of air quality in the area. Management prescribed fires contribute smoke to the airshed, though prescribed fires tend to produce less smoke than wildfires of equal size since fuel consumption is typically lower in prescribed burns. On the Flathead National Forest, prescribed burning is generally accomplished when dilution, dispersal and mixing conditions are considered fair to excellent. Prescribed burning requires a permit from the Montana/Idaho Airshed Group and the burn must be implemented within the regulatory framework. This includes daily approval from the Flathead County Air Quality hotline and the Montana/Idaho Airshed Group. More information on the Montana/Idaho Airshed Group can be found online at ***www.smokemu.org***.

Airshed Characteristics

Fire has historically been a part of the vegetative dynamics in the Northern Rockies as evidenced by the burn mosaics of the surrounding forested lands. Fires continue to be a part of the natural forest ecosystem and produce local short-term impairment of air quality. The 2001 and 2003 fire seasons are extreme examples of wildland fire smoke effects on air quality.

The air quality of the Flathead River Valley is considered good to excellent throughout most of the year and meets Montana air quality laws and the CAA.

Air quality may be affected and various amounts of pollutants may occur from the following:

- Prescribed burning in the spring and fall by the Flathead NF, Glacier National Park, Montana Department of Natural Resources, and timber and land development companies.
- Prescribed burning to the west and south by other National Forests, other agencies and private companies or citizens.
- Wildland fire use for resource benefit occurring in the summer months in the Flathead National Forest, Bob Marshall Wilderness, Great Bear Wilderness and Glacier National Park.
- Wildland fires burning upwind to a distance of two hundred miles depending on the size of the fire.
- Agricultural field burning in the Flathead Valley and Idaho.
- Weather patterns, which help cause degradation when low pressure systems over Idaho pull suspended pollutants (dust and smoke) from large metropolitan airsheds and farms in Oregon, Washington and Idaho.

Sensitive Areas

The EPA designates communities that do not meet air quality standards (NAAQs) over a period of time as "non-attainment areas." States are then required to develop a plan to control source emissions and ensure future attainment of the standards. The emissions from prescribed fire may be considered as contributing emissions. Three cities in the Flathead Valley are considered sensitive areas because they are non-attainment areas for PM_{10}: Kalispell, Columbia Falls, and Whitefish. Kalispell is considered an area of concern, though not formally designated a non-attainment area for carbon monoxide.

The CAA provides for additional measures "to preserve, protect, and enhance the air quality" in larger National Parks, Wilderness Areas and other areas of special national significance. These areas are designated Class I airsheds. Of particular concern under this requirement is visibility or haze. The Prevention of Significant Deterioration (PSD) provisions of the CAA require measures "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreation, scenic, or historic value." Stringent requirements are therefore established for areas designated as Class I areas (42 U.S.C. 7475 (d)(2)(B)). Designation as a Class I area permits only very small increments of new pollution above existing air pollution levels. There are several Class I airsheds in the vicinity. Glacier National Park is located directly east of the project area, and is the Class I airshed most vulnerable to project activities affecting air quality since prevailing winds often blow from west to east.

A requirement of PSD is that new major stationary sources, or major modifications of existing stationary sources, must first receive a PSD permit from the appropriate air regulatory agency before implementing construction or modification. A stationary source is one that is well defined, such as the smokestack of a coal-fired power plant or smelter. Prescribed burning from the Red Whale Fuels Reduction Project is not considered a major stationary source and therefore is not subject to the PSD permitting process.

Environmental Consequences

Introduction

There were no significant issues raised concerning air quality. The indicator used to evaluate the effects of each alternative on smoke production was particulate matter less than 2.5 microns in diameter. The total amount of $PM_{2.5}$ and the estimated 24 hour concentrations of $PM_{2.5}$ are displayed for all alternatives. $PM_{2.5}$ was chosen because while more than 90 percent of the mass of particulate matter produced by wildland fires is less than 10 microns in diameter, 80-90 percent is less than 2.5 microns in diameter. For this reason, some models only predict $PM_{2.5}$ emissions. These small particles are inhalable and respirable. Respirable suspended particulate matter is that proportion of the total particulate matter that, because of its small size, has an especially long residence time in the atmosphere and penetrates deeply into the lungs. Small smoke particles also scatter visible light and thus reduce visibility (NWCG 2001).

Direct and Indirect Effects of Alternative 1 (No Action)

No prescribed burning would occur in this alternative, therefore no prescribed burning smoke emissions would be produced by this alternative.

Direct and Indirect Effects Common to Alternatives 2, 3, and 4

Prescribed burning would occur in each alternative, however the type of materials burned and the amount vary. The amount of prescribed burning is displayed based on the number of acres per burn type. This analysis considered six different categories of material to be burned. Five of these are mechanical treatment areas and one is natural fuels (areas that would be prescribed burned without prior mechanical fuels reduction). The six categories are listed below:

1 = LP dominated, 70-90 years old (wildfires 1910-26), densely stocked
2 = All species (LP, WL, DF, S, SAF); 70-90 years old (wildfires 1910-26), well stocked
3 = Mixed species WL, ES, DF, LP, SAF; mixed age <20-120+ years; little or no recent fire
4 = Young forest, <50 yrs old, all species (LP, WL, ES, DF, AF); usually past harvest areas
5 = Young 18 year old saplings, LP or WL; 1988 Redbench Fire
6 = Natural Fuels

For a more thorough description of these forest types, please see the vegetation portion of this document.

Prescribed burning would consist of pile burning materials that result from mechanical fuels reduction treatments and broadcast burning natural fuels units. The effects of these two types of burning are displayed separately. This is because it would not be likely that pile burning and broadcast burning would be occurring at the same time or even in the same years.

All burning would occur under conditions designed to ensure adequate smoke dispersal. This prescribed burning would produce some smoke emissions. The NAAQS $PM_{2.5}$ is 35 μg/m³ for the 24-hour average. Dispersion models indicate that all areas over ½ mile from concentrated burning are well below 35 μg/m³ for the 24-hour average (see section I of the project file for concentration graphs). Smoke from prescribed burning could cause short-term impacts on recreation and transportation in and near the project area. The size and location of a prescribed burn and weather conditions determine how much and in what direction smoke travels. Weather and smoke dispersion conditions outlined in the prescribed burn plan should alleviate any adverse smoke effects. Air quality in the Flathead Valley would not be adversely affected in the long term by the prescribed burning proposed in these alternatives.

Pile Burning

Pile burning may be used in this project to treat fuels, producing direct smoke emissions. The project may allow for total removal from the treatment area. Under this scenario, there would be no smoke produced from burning of fuels reduction materials in these alternatives. However, for the purpose of analyzing a worst case scenario, all slash will be treated with prescribed fire. It is assumed for this analysis that all units in categories 1-4 would be whole tree yarded, leaving treetops at the landing, and then machine piled. Some excess slash produced by treatment activities and existing natural fuels may be piled and burned in the units. It was assumed that slash resulting from mechanical treatments in category 5 would be left in numerous piles throughout the unit, rather than one consolidated landing pile. Although these materials may also be removed from the site, their small sapling size may make that scenario cost prohibitive. Smoke emissions vary with combustion efficiency and quantity of fuel burned. Machine piles and hand piles tend to produce more smoke than other burns because much of the consumption occurs during the inefficient smoldering phase of combustion. Potentially, pile burning would be conducted over the course of 1-3 years after fuel treatment activities, so impact would not be concentrated. Areas where fuels have been treated under conditions selected to minimize effects on air quality should be less vulnerable to future intense wildfires where smoke effects are unpredictable.

SIS model runs included assumptions of the number of landing piles that would be burned. The model projections also assume that poor smoke dispersion would be experienced. These assumptions, combined with the tendency of SIS to model emissions at the high end of the expected range, means that smoke predictions would likely represent the worst case for pile burning. Modeling also assumed that transport winds would blow from the south, west or southwest, and that burning would occur over several days in the fall over a one year period. Pile burning allows management to control the number of piles burned on any given day.

SIS- CALPUFF was used to model smoke dispersion and concentrations for each alternative. Predicted ground level concentrations of $PM_{2.5}$ emissions dispersed almost completely by

midnight the day of ignition in all action alternatives. Predicted ground level concentrations were less than 35 µg/m^3, the 24-hour average. Managers are unlikely to burn that many piles so close together in one day, especially when smoke dispersion conditions are poor. However, if they did, the 24 hour concentration average would not be violated (see section I in the project file for SIS model printouts).

Broadcast Burning

Broadcast burning of natural fuels would be included in each action alternative, although the location and number of acres to be burned varies. Burning would occur in a wide range of vegetation conditions; however this burning would be only natural fuels (no activity generated slash). It is not likely that these would be burned all in one day, however to display the worst case scenario modeling was completed to show all the acres being burned in one day. It would be very unlikely that these units would be burned on the same day or even in the same year. As in the pile burn modeling, a general worst case example was assumed to display smoke emissions and dispersion. This included a daytime stability rating of slightly unstable (unstable would be ideal) and a nighttime stability rating of neutral. These stability ratings resulted in poor smoke dispersion assumptions, representing a worst case scenario.

SIS- CALPUFF was used to model smoke dispersion and concentrations. Predicted ground level concentrations of $PM_{2.5}$ emissions where very low for all action alternatives. This is because the broadcast burn area's smoke would generally be above the mixing height. Predicted ground level concentrations were less than 35 µg/m^3, the 24-hour average for all action alternatives. Even if managers burned all the units on the same day, the 24 hour concentration average would not be violated (see Air Quality portion of project record for SIS model printouts).

Table 3-80. Alternative 2 Air Quality Emissions

Treatment Category	Number of Units	Acres	Number of Piles	PM 2.5 (tons)	Tons of PM 2.5/Acre
1-4	26	1710	86	37.28	.022
5	16	368	368	8.76	.024
Total (Groups 1-5)	**42**	**2078**	**454**	**46.04**	**.022**
6	8	1364	n/a	324.30	.238
Total	**50**	**3442**		**370.34**	**.106**

Table 3-81. Alternative 3 Air Quality Emissions

Treatment Category	Number of Units	Acres	Number of Piles	PM 2.5 (tons)	Tons of PM 2.5/Acre
1-4	21	881	44	19.26	.022
5	1	46	46	1.46	.032
Total (Groups 1-5)	**22**	**927**	**90**	**20.72**	**.022**
6	6	1192	n/a	283.61	.238
Total	**28**	**2119**		**304.33**	**.144**

Table 3-82. Alternative 4 Air Quality Emissions

Treatment Category	Number of Units	Acres	Number of Piles	PM 2.5	Tons of PM 2.5/Acre
1-4	39	2653	133	58.23	.022
5	22	930	930	29.50	.032
Total (Groups 1-5)	**61**	**3583**	**1063**	**87.73**	**.024**
6	9	1431	n/a	340.48	.238
Total	**70**	**5014**		**428.21**	**.085**

Cumulative Effects

This section discloses past, present and reasonably foreseeable effects from federal, state, tribal and private land fire use activities. The cumulative air resource analysis is unique in that past impacts to air quality are not usually evident. However, present and foreseeable effects could include impacts from other prescribed forestry burning, agricultural burning and dust from agricultural lands, residential wood combustion, traffic exhaust, fugitive road dust or point sources of pollution. Individual sources of smoke from other agencies are too numerous and variable to list. Because of the complexity and uncertainty of timing associated with other agencies burning, coordination with the Montana/Idaho State Airshed Group is critical to minimize cumulative air quality impacts within Idaho and Montana.

The cumulative effects area is Airshed 2. Smoke emissions produced by the implementation of the project, road dust, and vehicle emissions could combine with air pollutants from other projects in the area such as other prescribed burning and particulates produced west of the project area. Implementation effects would contribute to the cumulative impact of air pollutants within the Flathead Valley. Prescribed burning would be implemented during good smoke transport and dispersion conditions and would be accomplished over time; minimizing any adverse effects from prescribed burning smoke emissions.

Prescribed burning, road dust, vehicle emissions and wildfire could adversely affect the air quality in the analysis area and surrounding area temporarily. The Flathead Valley could be inconvenienced by smoky conditions for short periods during prescribed burning operations or during the summer wildland fire season. Road dust due to log hauling and normal public traffic would be common in the project area. Dust abatement may be used if needed on haul roads to minimize the effects of road dust.

The cumulative impacts of all private and agency burning are assessed daily during the burning season, through the coordination of the MT/ID Air Quality Bureau. This group also considers other sources of smoke such as wildfires, wildland fire use events and industrial sources. Any prescribed burning in the Red Whale Project area would need to be approved on a daily basis through the MT/ID Air Quality Bureau. The MT/ID State Airshed Group is able to review all prescribed burning proposed in a given area. Based on current and forecasted weather, burns are approved or disapproved based on their cumulative impact on the airshed. This regulatory mechanism helps ensure that the cumulative effects of prescribed burning do not lead to a violation of air quality standards. The USDA Forest Service is an active participant in the MT/ID State Airshed Group.

Wildland fires locally, or anywhere in the northwest and Canada, can affect regional haze in the Flathead Valley. Wildland fires would continue to produce smoke, primarily during the summer months.

The 1990 air quality rules relate to fine particulates ($PM_{2.5}$), and visibility (regional haze). Additionally, EPA has issued the Interim Air Quality Policy on Wildland Fire and Prescribed Fire. The Interim Policy encourages states to develop and certify to EPA smoke management programs to address emissions from prescribed fire and wildland fire use for resource benefits. The operations of the Montana/Idaho State Airshed Group are critical to minimize cumulative air quality impacts within Idaho and Montana. The daily operation of the Airshed Group considers and tries to minimize impacts from prescribed fire, wildland fire and wildland fire use.

Regulatory Framework and Consistency

As designated by law, state air quality rules, and the Flathead Forest Plan, the Flathead National Forest cooperates with the State Air Quality Bureau. The U.S. Forest Service is a member of the Montana/Idaho State Airshed Group. This coordination ensures that during project implementation burning only occurs under conditions that would protect air quality and meet state and national standards.