Air Quality

Introduction

The basic framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act (CAA), as amended in 1990 and 1999. The CAA was designed to "protect and enhance" air quality. The primary means by which this is to be accomplished is through implementation of National Ambient Air Quality Standards (NAAQS).

Section 160 of the CAA requires 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, recreational, scenic, or historic value." Stringent requirements are, therefore, established for areas designated as "Class I" attainment areas. Class I areas include Forest Service and USFWS wilderness areas over 5,000 acres that existed before August 1977, and National Parks in excess of 6,000 acres as of August 1977. Designation as a Class I area allows only very small increments of new pollution above existing air pollution levels. The Bob Marshall Wildernesses and Glacier National Park were considered in the development of this project.

If a community does not meet or "attain" the NAAQSs, it is designated as a non-attainment area and must demonstrate to the public and the EPA how it will meet standards in the future. This demonstration is done through the State Implementation Plan (SIP). Kalispell, Whitefish, and Columbia Falls are non-attainment areas addressed in this report.

Under the current State and Federal rules, wildland fires are considered natural events, so the smoke they produce is not considered as a cause of violations of air quality standards or visibility protection goals. Conversely, prescribed fires are considered active management so the smoke produced is considered as an impact on air quality and visibility standards.

This analysis discloses the potential effects to air quality from implementing the Proposed Action and a No Action Alternative, to provide the decision maker with a means of comparing these alternatives. The analysis of both the action and no action alternatives include the effects of fugitive dust, prescribed burning smoke, and wildland fire smoke.

Air quality is affected by fugitive dust produced by vehicular traffic, especially on native surface roads. The silt content of the road surface layer, the distance traveled, the weight and speed of the vehicle, as well as weather conditions, influence the amount of dust produced. Paved roads produce a relatively smaller amount of dust than do native surface roads, especially during dry weather. Mitigation measures, that reduce the availability of fine silt particles, such as watering or dust suppressants, are effective. Reducing the speed of vehicles can reduce localized impacts.

Smoke produced from the prescribed burning of timber harvest residue and natural fuels can have an adverse effect on air quality. The amount of smoke produced is influenced by the same factors that influence the amount of smoke produced by wildland fires. Increasing the utilization of sub-merchantable material can reduce the amount of fuel remaining after timber harvest and so reduce the amount of smoke produced. The type and timing of burning, as well as weather conditions, influences the amount of smoke produced.

Wildland fires are a natural combustion process that consumes both living and dead vegetative material and produces smoke that can have adverse impacts on air quality. The size, intensity, and occurrence of wildland fires depends directly on variables such as meteorological conditions, the type of vegetation present, the moisture content of both live and dead fuel, topography and the total weight of consumable material available. Small fuel, such as dead grass and conifer needles, supports fire spread. Larger dead fuels are consumed to a variable extent depending on their moisture content. Under environmental conditions that reduce the moisture content of live fuels, such as drought and extreme heat, these fuels may also be consumed. Slope effects fire in much the same way wind does, the steeper the slope the greater the effect. The aspect of a slope influences the moisture content of fuels with north aspects being relatively damp and south slopes being relatively dry. Under the extreme condition of heavy fuel, drought, and hot, dry weather, nearly all forest fuels are available for consumption. The impacts to air quality vary by the amount of smoke produced, which varies with burning conditions. Large amounts of smoke are produced under extreme burning conditions.

This analysis includes the direct effects (effects resulting from the implementation of an alternative that occurs at the same place and time), indirect effects (effects resulting from the implementation of an alternative that occurs later in time or are further removed in distance but are reasonably foreseeable), and cumulative effects (effects resulting from the incremental impacts of past, present and reasonably foreseeable future actions regardless of who is responsible) (A Desk Reference for NEPA Air Quality Analysis 1995).

Analysis Area

Spatial Bounds

The analysis area for consideration of air quality impacts from the implementation of the action alternatives is the area within a radius of 90 miles (145 kilometers) from the project area. The EPA's air quality permitting system suggests that sources within a radius of 62 miles (100 kilometers) be considered especially those located downwind of the source.

Sensitive Areas

Impacts from any burning within the project area would usually occur downwind in an easterly-northeasterly direction, as prevailing winds are from the west to southwest. Sensitive areas potentially affected include the WUI within and adjacent to the project area and possibly the Bob Marshall Wilderness and Glacier National Park. The remainder of the Flathead National Forest is included in Class II Airsheds, where visibility standards are less strict (Project File Exhibit I-5).

Data Sources, Methods, and Assumptions Used

Data Sources

Historical weather data was retrieved from the WIMS database using the Condon RAWS station. Flathead National Forest GIS layers were used as part of the analysis.

Methodologies

For purposes of this analysis, fuel loading values used represent the maximum expected fuel loadings. The actual loadings would vary depending on site-specific conditions, as well as use standards and market conditions, at the time of harvest. For areas treated for fuel reduction, a value of 60 tons per acre was used. Estimates were developed using the First Order Fire Effects Model (FOFEM).

Measurement Indicators

The combustion products of smoke from wildland fires and prescribed burning include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides, and trace minerals. Federal and State ambient air quality standards have been established for particulate matter (PM), which is the pollutant of most concern from smoke. Specifically, PM less than or equal to 10 micrometers in aerodynamic diameter (PM 10) is the size that can penetrate the inner recesses of the lungs, causing health problems. Also, it is the size that most severely affects local and regional visibility.

If a community does not meet or "attain" the NAAQS, it is designated as a non-attainment area and must demonstrate to the public and the EPA how it will meet standards in the future. This demonstration is done through the SIP.

In July 1997, the EPA issued revised national air quality standards for ozone and particulate matter in the 2.5 micron class (PM 2.5). The EPA proposed the following implementation plan for the new standards, which took effect on September 18, 1998:

- Nationwide fine particulate monitors in place.
- States and EPA collect data from nationwide network.
- States submit to EPA their SIPs describing how they'll meet and enforce the new standards.
- States implement their SIPs to assure they attain the standards.

The current Federal and State standards are:

PM 10: The concentration of PM 10 must not exceed 150 micrograms per cubic meter over a 24 hour period; or the annual arithmetic average must not exceed 50 micrograms per cubic meter.

PM 2.5: The concentration of PM 2.5 must not exceed 65 micrograms per cubic meter over a 24 hour period; or the annual arithmetic average must not exceed 25 micrograms per cubic meter.

Particulate Matter 10 and 2.5 monitors are located in Libby, Kalispell, Whitefish, Missoula, Helena, and several other sites in Montana.

Affected Environment

Historic Condition

Qualitative air quality data is not available for the period prior to settlement of the analysis area late in the 19th century. However, it is known that fire played a major role in the development of vegetative patterns throughout western Montana. Journals from early day explorers and newspaper articles from the late 1800s often mention the smoke conditions from summer fires burning in western Montana and northern Idaho (Losensky 1992).

The annual amount of smoke generated from forest fires, including wildland fires and prescribed fires, has generally decreased since the early 1900s. Prior to that, there were probably 1500 to 2000 fires burning annually through the northwest. These fires would have generated smoke for as short as a few hours to as long as 90 to 120 days and would have been extinguished by fall precipitation. Settlement and subsequent fire protection has reduced the amount of burned area and to reduce the duration of smoke emissions from wildland fires. In the case of prescribed fire, the amount of smoke generated has been reduced by forest managers scheduling burns for periods of good smoke dispersion.

Use and treatment of fuels using prescribed fire has been common over the past 30 years on the Flathead National Forest and within the Hemlock Elk Analysis Area. Smoke emissions have been commensurate with the reduction of fuels and subsequent burning of forest residual on the entire Swan Lake Ranger District and have averaged 1000 to 2000 acres per year through the past decade. These acres were mostly slash and activity fuel reduction prior to 1990 and prescribed ecosystem burning with fewer acres after that. During seasons of low risk of escaped fire (typically mid to late spring or fall) and periods of good ventilation and dispersion, smoke from these activities on NFS and private lands are released into the airshed.

According to EPA's report AP-42, Compilation of Air Pollution Emission Factors, some air pollution is generated by prescribed burning, although the net amount is believed to be a relatively smaller quantity than that produced by wildfires. The EPA states in this report that

> "Prescribed fire is a cost-effective and ecologically sound tool for forest, range, and wetland management. Its use reduces the potential for destructive wildfires and thus maintains long-term air quality."

The planning, scheduling, coordinating, and monitoring of prescribed fire on NFS lands follows the guidelines described in the CAA and Amendments to the Act (1972, 1977, and 1990) that provide direction to protect and enhance the quality of the Nation's air resources and to protect public health and welfare.

Existing Condition

Montana is divided into 10 airsheds by the Montana State Air Quality Bureau. The project area lies entirely within Airshed 2. Smoke produced within the analysis area would most likely be carried in an easterly direction by the predominantly westerly, synoptic scale, windflow pattern that influences western Montana.

Smoke dispersal is usually best during the spring and early summer because daytime heating and general windflows help smoke rise above ridgetops and into the free air winds where it is diluted and dispersed. Stable high pressure systems that often occur during late summer and fall hamper the vertical motion of air and reduce the smoke dispersion potential. However, infrequent, low pressure systems also move through the area during this period and improve smoke dispersal until high pressure re-establishes. As the heat of summer passes and night time temperatures begin to drop, air quality begins to deteriorate as nighttime inversions become more prevalent, trapping smoke in valley bottoms until adequate heating breaks the inversion later in the day. Weather patterns begin to change during the fall months with periodic cold front passages being interspersed with periods of stable high pressure. These cold fronts are often dry but can bring substantial moisture. Wind associated with these cold fronts provide good ventilation but also increase the risk that a prescribed burn may escape control. The late fall often marks the return of wet, foggy, and cloudy weather to the analysis area. During this time, periods of good ventilation occur during fontal passages, but valley inversions often hamper the dispersion of smoke. Winter weather is very similar, with smoke dispersion often being poor.

The mountainous topography of the analysis area also influences the dispersion of smoke. Smoke produced at higher elevations is nearer to the free air winds that occur at and above ridge tops, so dispersion is usually better than at lower elevations. Conversely, smoke produced at lower elevations is more likely to be effected by valley inversions and must rise farther to enter the free air wind. Burns on south exposures are more likely to be effected by local thermal winds than those on north slopes. Burns on slopes exposed to the prevailing wind would have better smoke dispersion than those located on the lee slope.

Smoke dispersal is best when the daytime heating is greatest. This usually coincides with the period of greatest atmospheric instability for the day. Free air winds penetrate into lower elevations at this time resulting in good vertical motion and smoke dilution. These conditions generally occur from 1:00 to 6:00 pm. Smoke dispersal is usually poor for nighttime burning due to the increase in atmospheric stability as cool air pools in valleys. This process also results in the development of valley inversions.

Studies conducted by the Montana Department of Health and Environmental Sciences (DEQ) have demonstrated that prescribed burning of logging slash, when burned in compliance with State regulations, is not a major contributor to reduced air quality in the Kalispell area.

Source apportionment studies for Kalispell, a nonattainment area, have shown that slash burning contributes less than 3 percent of the total PM-10 load, with road dust and wood stove smoke originating within the city itself being the major contributors. PM-10 readings, taken since 1988, have shown a trend in improving air quality during the months of September through November when most of the prescribed burning takes place. The potential impacts of smoke from prescribed burning has been minimized through successful airshed coordination

Airshed 2 air quality is influenced predominantly by smoke and dust originating from areas located to the west, since the general windflow direction for the area is from this direction. This includes grass burning in Idaho and Washington, as well as other agricultural areas in northern Oregon. Industrial emissions, as well as those from internal combustion engines, add to the level of regional haze and air pollution load. Prescribed burning of logging residue by private and other government entities adds wood smoke to the air mass. Wildland fires burning as far west as the costal range of Oregon and Washington also contribute to air quality degradation. Dust, originating from tilled farm land, during dry windy weather, can add to local haze and reduce air quality.

Environmental Consequences

The Cumulative Effects Worksheet, located in the Air Quality Project File (Project File Exhibit I-4) considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in the beginning of this chapter in Tables 3-1 and 3-2. Those activities that cumulatively affect air quality are discussed below.

Fugitive Dust

This analysis considers the fugitive dust associated with post-decisional project activity by the Forest Service, as well as the timber sale contractor. The actual amount produced would be influenced by dust mitigation measures taken directly by the Forest Service and by Lake and Missoula Counties as general road maintenance, as well as actual precipitation, and timing of log hauling.

Alternative A - No Action
Direct, Indirect, and Cumulative Effects

Alternative A, the No Action Alternative, would not produce fugitive dust beyond the amount produced by routine forest management activities. There would not be any fugitive dust associated with post-decisional project road use or ground disturbances. Therefore, there would be no direct, indirect or cumulative effects to air quality from the implementation of this alternative.

Alternatives B, C, and D
Direct and Indirect Effects

This analysis considered the impacts to air quality from dust associated with project implementation, specifically, road dust. The direct effects of fugitive dust are reduced visibility on and adjacent to roads, and an increased level of small diameter particulates, specifically PM 2.5 and PM 10 (of concern for human health reasons). This analysis considered the maximum dust production during the implementation of Alternative B to be 10.5 tons of PM 10. The amount of dust produced would be influenced by dust mititation measures taken directly from Forest Service and Missoula County as general road maintenance, as well as actual precipitation, and timing of log hauling.

Indirect effects are limited to the air quality degradation, because of PM 2.5 and PM 10 particulates, since larger diameter materials would settle out near the point of production. Particulate Matter 2.5 and 10 levels would rapidly disperse as they are carried by local and general winds.

Alternatives B, C, and D
Cumulative Effects

With the implementation of the action alternatives, the cumulative effects of fugitive dust on air quality would result in a small but incremental decrease in air quality as PM 2.5 and PM 10 particles from this source combine with other particles produced both by the implementation of other aspects of this project, specifically prescribed burning, as well as other local and regional sources located upwind. Prescribed burning of logging slash, on other Federal, State, or private lands, would also contribute particulates, as would agricultural burning and fugitive dust from tilled ground. Particulates from industrial and automotive sources also contribute to regional particulate loading. Other vehicle traffic and agricultural and industrial sources within the analysis area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these other sources. However, the State Monitoring Unit would consider these sources when they prepare smoke dispersion forecasts.

This process of monitoring and forecasting has been effective at achieving the Airshed Group's objectives, which are listed in the Montana/Idaho Smoke Management Agreement.

The cumulative effects on air quality, resulting from the implementation of the action alternatives and from other local and regional pollutant sources, would likely result in PM 10 loadings, on an average daily loading equal to or less than the maximum annual arithmetic mean of 50 micrograms per cubic meter or a maximum daily concentration of PM 10 at or below 150 micrograms per cubic meter. There may be days when regional air quality does not meet these standards. However, because of the Montana/Idaho Air Shed Group Monitoring Group's effectiveness, it is unlikely that any source associated with this project or any other present or reasonably foreseeable future burning project, would be a significant contributor.

Prescribed Burning

Alternative A - No Action
Direct, Indirect, and Cumulative Effects

There would be no direct, indirect, or cumulative effects to the air quality of human health from Alternative A. Alternative A would not implement any prescribed smoke producing activities, such as pile burning, and would not directly contribute to air quality impacts. However, prescribed burning of logging slash, on other Federal, State, or private lands, would contribute particulates, as would agricultural burning and fugitive dust from tilled ground. Particulates from industrial and automotive sources would also contribute to regional particulate loading. Other vehicle traffic, agricultural and industrial sources within the analysis area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these other sources.

Alternatives B, C, and D
Direct, Indirect, and Cumulative Effects

The estimated amount of smoke emissions, produced by prescribed burning associated with the action alternatives, is shown in the following table. The project file contains the calculations used to develop these estimates. The actual amount of smoke produced would be equal to or less than these figures since worst-case conditions were used.

TABLE 3-43.
PARTICULATE AMOUNTS (TONS PER ACRE) PRODUCED BY PRESCRIBED BURNING ASSOCIATED WITH ALL ACTIVITIES

Alternatives	PM 10 total tons produced	PM 2.5 total tons produced
A	0	0
B, C & D	18.2	15.8

The effects of prescribed burning smoke are reduced visibility and increased level of small diameter particulates, specifically PM 2.5 and PM 10. These are of concern for human health reasons, particularly PM 2.5 which is smaller and tends to be inhaled deeper into the lungs where it is much harder to expel. Much of the PM 10 particulates which are inhaled are trapped in the mucus membranes of the nose and throat. Over time, wildfires would be expected to occur and produce smoke within the project area. The amount of smoke produced and the timing is not predictable, so for the purposes of this comparison, Alternative A is showing 0 tons of PM 10 and PM 2.5.

Burning slash piles could temporarily affect air quality in the analysis area and surrounding area. This pile burning would produce like smoke emissions. It also would require monitoring of smoke transport and dispersion conditions to minimize effects to airshed quality. Coordination of smoke generating activities within the Montana Airshed Group assures that effects comply with the Montana Air Quality Act and Federal CAA.

Fire intensities, fuel moisture levels, and utilization of the flaming phase of combustion would all be monitored and used to reduce particulate production and airshed impact. By burning under optimum conditions, particulate amounts would be drastically reduced as compared to amounts generated by a wildlife fire for the same acreage. PM 2.5 and PM 10 levels would rapidly disperse as they are carried by local and general winds.

Alternatives B, C, and D
Cumulative Effects

The cumulative effects on air quality of prescribed-burning smoke, produced as a result of the implementation of the action alternatives, would result in an incremental decrease in air quality as PM 2.5 and PM 10 particles from this source combine with other particles produced both by the implementation of other aspects of this project, specifically fugitive road dust, as well as other local and regional sources located upwind. Prescribed burning of logging slash, on other Federal, State, or private lands, would also contribute particulates, as would agricultural burning and fugitive dust from tilled ground. Particulates from industrial and automotive sources also contribute to regional particulate loading. Other vehicle traffic and agricultural and industrial sources within the analysis area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these other sources.

Wildland Fire Smoke

Alternative A - No Action
Direct and Indirect Effects

The direct effect of wildland fire smoke on air quality from implementing the No Action Alternative is that fire occurrence, intensity and size would be similar to fires in the recent past. Historic records from the past 30 years show that, on average, 1 fire occurs within the analysis area every 10 years. The Crazy Horse Fire occurred in 2003 and burned 11,000 acres.

These fires are generally small, burning less than 1 acre each. However, there is an increasing probability that one of these fires would escape initial attack and grow to several hundred to thousands of acres, burning for several days or even weeks. Fires of this scale and duration would impact air quality to varying degrees during the time the fire would be active.

Additional effects of wildland fire smoke from implementing Alternative A would be the gradual change in the existing fuel complexes as dead woody fuels accumulative secondary to insect, disease and weather disturbance. Live fuels, especially ladder fuels, would also increase over time as stand density declines and understory shade tolerant species increase in response to increased sunlight. As the fuel loading increases the incidence and intensity of wildland fires, and the smoke they produce, would increase. The current non-lethal to mixed lethal fire regime would change, over time, to a mixed lethal to lethal regime.

Alternative A - No Action
Cumulative Effects

Due to the increase in fuels over time with the No Action Alternative, it can be anticipated that the intensity and extent of wildfires would increase in the project area as compared with historic more frequent interval fires as discussed in the Fire and Fuels Section of this chapter. Associated smoke from such wildfires would increase as a consequence of taking no action as contrasted with the Action Alternatives B, C, and D.

Alternatives B, C, and D
Direct and Indirect Effects

For the purpose of analysis, it was assumed that all of the acres proposed for treatment followed by prescribed burning, are burned by intense, stand replacing wildland fire. In doing this, a basis for comparing the potential air quality impacts of wildland fire to the potential impacts of management activities is derived. The following table displays these estimates. Be aware that this is not an attempt to depict reality, but merely an analysis for comparison purposes.

TABLE 3-44.
PARTICULATE AMOUNTS (TONS PER ACRE) PRODUCED BY WILDLAND FIRE

Alternatives	PM 10 total tons produced	PM 2.5 total tons produced
A	0	0
B, C & D	22.5	18.7

The comparison of relative impacts of implementing an action alternative versus a stand replacement wildland fire indicates that, on an acre-to-acre basis, an action alternative would produce from 50 to 60 percent of the smoke impacts of an intense wildland fire affecting the same area.

The indirect effect of wildland fire smoke on air quality, resulting from implementing the action alternatives would be that, over time, as vegetation recovers in response to both the burning and the increase in available sunlight, the fire potential on treated areas would increase from the immediate post-burn level. The potential spread of fire would increase, but the intensity and smoke production would generally decrease from the current situation.

Alternatives B, C, and D
Cumulative Effects

The cumulative effects of wildland fire smoke on air quality, for the action alternatives, would include all pollution sources contributing particulates to the air mass in addition to the smoke produced by wildland fires within the analysis area. The greatest cumulative effect would occur when wildland fires are burning outside and upwind of the analysis area and wildland fires within the analysis area burn at the same time. The cumulative effect of these sources could result in extended periods of poor air quality. The potential amount of smoke produced would vary by alternative and would be proportionate to the amount of fuel hazard reduction resulting from each alternative.

Effects analysis of Potential Impacts to Class 1 Airsheds

Certain wilderness areas and national parks established before August of 1977 were designated as Class 1 Areas. A Class 1 designation allows only very small increments of new pollution above already existing air pollution levels. The Clean Air Act Amendments of 1977 included a program for prevention of significant deterioration of air quality, generally referred to as the PSD Program. This program is to prevent areas currently having clean air from becoming more polluted (A Screening Procedure to Evaluate Air Pollution Effects on Class 1 Wilderness Areas, General Technical Report RM -168). As stated above, the Bob Marshall Wilderness and Glacier National Park are Class 1 areas.

Naturally occurring visual range in the East (United States) may be between 65 to 118 miles (105 to 190 kilometers), while natural visual range in the West is between 118 to 167 miles (190 to 270 kilometers) (Interim Air Quality Policy on Wildland and Prescribed Fires, EPA, 1998). The existing condition of the representative standard visual range for the Class 1 areas of concern for this project is as follows:

TABLE 3-45.
STANDARD VISUAL RANGE FOR THE BOB MARSHALL WILDERNESS AND GLACIER NATIONAL PARK

10^{th} Percentile	50^{th} Percentile	90^{th} Percentile
97 kilometers (60 miles)	178 kilometers (110 miles)	249 kilometers (154 miles)

The analysis shown in Table 3-45 above indicates the probability that transport winds from a direction that would carry smoke toward the Bob Marshall Wilderness Area and Glacier National Park, would occur on about 20 percent of days. If burning occurs on one of these days, smoke could impact visual quality and could also deliver air borne pollutants reaching these points of interest. The effects of visual impairment would be less noticed during spring weather because wilderness use is very limited to deep snow. The probability of impacting the Bob Marshall Wilderness and Glacier National Park is considered to be quite low due to the distance to these areas.

The cumulative effects on Class 1 Airsheds from the implementation of the action alternatives and other current and reasonably foreseeable future actions is not known at this time. The production of air pollutants associated with the implementation of this project would vary over time and would not be continuous. Therefore impacts would be episodic in nature and the potential of occurrence would end when the implementation of this project is completed.

Regulatory Framework and Consistency

By participating in the Montana and Idaho Interstate Airshed Group, complying with the MOU with the Montana Air Quality Bureau, and meeting the requirements of the SIP and Smoke Management Plan, the proposed activities would comply with the Forest Plan and the CAA.