AIR QUALITY

I. 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 Clean Air Act 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 Fish and Wildlife Service wilderness areas over 5,000 acres that were in existence 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 Cabinet Mountains and Bob Marshall Wildernesses and Glacier National Park were considered in the development of this project.

If a community does not meet or "attain" the National Ambient Air Quality Standards, it is designated as a non-attainment area and must demonstrate to the public and the Environmental Protection Agency how it will meet standards in the future. This demonstration is done through the State Implementation Plan. Libby, 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 or one of four alternatives, including 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 wildland fire smoke, prescribed fire smoke and fugitive dust.

Wildland fires are a natural combustion process that consumes both living and dead vegetative material and produce 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.

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.

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.

This analysis includes the direct effects (effects resulting from the implementation of an alternative that occur at the same place and time), indirect effects (effects resulting from the implementation of an alternative that occur 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)

II. The Need for Prescribed Burning

Prescribed burning is a land management treatment, used during specified conditions, to accomplish natural resource management objectives. Prescribed fires are conducted within limits of a burn plan and prescription that describes the conditions under which the burn can be conducted to meet these resource objectives. Prescribed fire is a cost-effective and ecologically sound tool for forest, range and wetland management. Its use reduces the potential for high intensity wildland fires and thus has the potential to maintain long-term air quality. Also, this practice removes logging residues, controls insect and disease, improves wildlife habitat and forage production, increases water yield, maintains natural succession of plant communities, and reduces the need for pesticides and herbicides. The major air pollutant concern is the smoke produced by prescribed fire. (A Desk Reference for NEPA Air Quality Analysis, 3.1.2-1, 1995)

The following objectives are taken into consideration when selecting the appropriate fuel management technique. (FSM 5151.1, Methods of Fuel Treatment)

1. Treat activity fuels to reduce the potential for unwanted wildland fires.

2. Prepare harvested sites for tree planting using the most appropriate method, including prescribed fire and mechanical means.

3. Prepare harvested sites for natural seeding using the most appropriate method, including prescribed fire and mechanical means.

4. Use prescribed fire to enhance wildlife habitat and forage production.

5. Use prescribed fire to maintain the natural succession of fire dependant plant communities.

6. Control insect and disease outbreaks through the use of prescribed fire.

7. Use prescribed fire, as well as mechanical treatment where appropriate, to reduce natural fuel buildup resulting from wildland fire suppression.

8. Use methods that reduce unwanted fuel through improved harvest techniques or through higher utilization standards. Favor utilization when the cost of onsite treatment equals the cost of removal for utilization.

9. Reduce the amount of material that must be burned by removing unwanted fuel offsite for further utilization, storage, or disposal.

10. Reduce or eliminate unwanted fuel onsite. Methods to consider include manual, mechanical, biological, and prescribed fire treatments and their necessary associated activities.

11. Where appropriate, identify if and when fire program costs plus anticipated net value changes do not justify fuel treatment.

The selection of a fuel management technique depends of several factors including silvicultural system, timber harvest method, timber harvest type, treatment economics, wildlife habitat, soil, water, cultural resource protection, and air quality. The Interdisciplinary Team selected fuel treatment options which best balance resource objectives and economic concerns. These options include burning both natural fuel and activity created

fuel in place as well as concentrating activity and natural fuels, by whole tree yarding and/piling, followed by burning.

For this project the burning of fuel in place, without concentrating it, includes underburning and ecosystem burning. Underburning is generally associated with timber harvest. Ecosystem burning is the burning of natural fuels, generally within fire dependant plant communities.

For this project, the concentration of timber harvest residue, followed by burning, includes whole tree yarding and excavator piling. The selection of these treatments is most appropriate where fuel treatment is desirable but other resource objectives preclude the burning of fuel in place. Specific examples are when timber stand density, tree species and size, or visual concerns, cannot be met without concentrating activity fuel. Concentrated slash can be burned under much wetter conditions than underburning. This allows the available burn days, days when weather and fuel conditions are favorable, to be used burning areas where burning fuel on-site is prescribed.

Ecosystem Burning: This fuel treatment method would be applied to accomplish wildlife habitat, fuel management and forest health objectives. These burns would be accomplished during spring weather, prior to the growing season. Sites where this burning would occur are usually large areas, generally steep, sparsely vegetated with light fuel loadings. Burning is the only feasible means of accomplishing these objectives. Well developed smoke columns would seldom be generated since the rate of ignition would generally not be rapid enough, especially when the retention of live overstory trees is an objective. If, as in the case of brush fields, there is no live overstory component to protect, sufficient heat may be generated to develop a vigorous column.

Underburning: This fuel treatment method would be used to accomplish silvicultural, natural and activity fuel hazard reduction, wildlife habitat and forest health objectives where one of the objectives is to retain a component of live over-story trees. Underburning is generally used where other treatment options are not feasible. In general, underburning on southerly aspects would be done during the spring burning season (March through June) and underburning on north aspects would be done during the fall burning season (September through November). The rate of ignition, when underburning live trees, is generally slow, to control the intensity of the fire. As a result vigorous convection is seldom achieved so smoke is not driven as high into the atmosphere.

Yarding of Tree Tops followed by pile burning: This fuel treatment method would be utilized for two general timber harvest categories. First, in stands that would be commercial thinned, where the resulting stand density, species composition, tree size, economic feasibility and visual resource concerns preclude the use of underburning or piling as options. Second, where small, isolated harvest units yarded by helicopter, in visually sensitive areas, make piling and underburning un-feasible. Piles of yarded material are generally burned in late fall after receiving enough moisture to reduce the spread of fire in open areas and before piled material is to wet to burn. Since pile burning occurs late in the fall season when smoke dispersion is often poor, it is possible that piles burned on a good ventilation day will smolder long enough to cause some impacts on air quality during following poor ventilation days.

Excavator piling followed by pile burning: This treatment method would be used to accomplish a range of resource objectives in treatment areas where the resulting stand density is low, slopes are generally 45% or less and site preparation objectives can be met. Piled slash would generally be burned in late fall after receiving adequate moisture to reduce the spread of fire in open areas and before the piled material becomes too wet to burn. Since pile burning occurs late in the fall season when smoke dispersion is often poor, it is possible that piles burned on a good ventilation day will smolder long enough to cause some impacts on air quality during following poor ventilation days. In some situations, specifically when clearcuts are piled, enough heat can be generated to develop a vigorous convection column. However, the usual situation is that smoke is more diffuse and does not rise into the upper atmosphere.

Natural abatement: This treatment would be applied when it is determined that the cost of fuel treatment would be excessive when considered in the context of the risk of loss. Specific instances where this treatment would be used includes, pre-commercial thinning where the cost of fuel treatment would equal or exceed the cost of the thinning and the risk of loss to wildland fire is low; and commercially thinned units where most unwanted fuel would be removed by whole tree yarding but incidental breakage would increase fuel loadings to the degree that underburning would result in the death of the overstory trees.

Preliminary fuel management plans, that focuses on the reintroduction of fire as a means of improving ecosystem health, was developed for each of the action alternatives. The selected treatments represent the best balance of

resource management objective accomplishment; smoke production minimization, economic feasibility as well as other site-specific objectives.

III. Location and Frequency of Burning:

The proposed burning, associated with each action alternative, would occur throughout the project area. The proposed fuel treatment for each alternative is indicated on the alternative maps found in chapter II of this document.

For each of the action alternatives, areas identified for burning would receive only one burn treatment. The following assumptions were used in this analysis:

1. It is anticipated that the first timber sale would be sold in fiscal year 2,002 and the first burning would not occur until fiscal year 2004. It is anticipated that the last timber sale would be sold in fiscal year 2004.
2. Each timber sale contract would have a term of three to six years.
3. The National Forest Management Act (NFMAS) requires that all harvested areas within the suitable timber base be regenerated, fully stocked and progressing within five years after harvest.

Analysis. If the last timber sale is sold in 2004 and the last unit is not harvested until the end of the contract period in 2009, for units in the suitable timber base, the burning would need to be completed by 2013. So, the first burning would not occur until spring of 2005 and all burning would be completed by the late fall of 2013.

Due to the uncertainty about when harvest would occur it is not possible to accurately predict the exact timing of burning.

The different types of burning associated with this project would occur annually, during three general periods, until all burning is completed. All ecosystem burning and some underburns, that are located on southerly aspects, would occur during the spring burning period, which starts as early as March and ends as late as early July. Some underburning on southerly aspects and most northerly aspects would occur during the fall burning season, which starts as early as September and ends by mid-November. Pile burning would occur during the late fall burn period which would generally start in October and end by the last of November since Montana Air Quality Regulations restrict burning during December, January and February.

The criteria used to select timing of burn projects would include, fuel moistures, risk of escape, general weather patterns, smoke dispersion, live fuel moistures, and resource objectives.

IV. A Quantification of Amount of Fuel, Type of Material and Acreage to be Burned.

For the purposes of this analysis the following fuel loading values were used. They represent maximum expected loadings. The actual loadings would vary depending on site-specific conditions as well as utilization standards and market conditions at the time of harvest:

1. For areas treated as seedtree, shelterwood or clearcut with reserves, a value of 60 tons per acre was used.

2. For areas planned for ecosystem burning a fuel loading of 6 tons per acre was used.

3. For commercial thinning areas it was estimated that a maximum of one third of the basal area would be removed so the maximum amount of fuel produced would be 20 tons per acre.

The following table displays, by alternative, the fuel treatment type, the total number of acres for each treatment category, the estimated total fuel loading, in tons, for that acreage and the estimated percent fuel reduction. These estimates were developed using the First Order Fire Effects Model (FOFEM). Similar fuel treatment activities were group to simplify the analysis.

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Pile Burn Acres	**0**	**447**	**318**	**298**	**216**
total tons fuel	N/A	27,000	19,000	17,900	13,000
% fuels reduced	N/A	50%	50%	50%	50%
Spring Underburn Acres	**0**	**212**	**328**	**343**	**184**
total tons fuel	N/A	13,000	20,000	20,600	11,000
% fuel reduction	N/A	60%	60%	60%	60%
Fall Underburn Acres	**0**	**377**	**200**	**152**	**98**
total tons fuel	N/A	19,000	12,000	9,100	5,900
% fuel reduction	N/A	70%	70%	70%	70%
Ecosystem Burn Acres	**0**	**713**	**711**	**703**	**708**
total tons fuel	N/A	4,300	4,300	4,200	4,300
% fuel reduction	N/A	40%	40%	40%	40%
Whole Tree Yard Acres	**0**	**1,194**	**1,043**	**2,248**	**1,797**
total tons fuel	N/A	23,900	21,100	45,000	36,000
% fuel reduction	N/A	50%	50%	50%	50%

V. Fugitive Dust from Vehicle Traffic on Unpaved Roads

Fugitive road dust is a result of motorized vehicle use when road surfaces are dry. When a motorized vehicle travels on an unpaved road, the force of the wheels moving across the road surface causes pulverization of surface material. Dust is lofted by the rolling wheels as well as by the turbulence caused by the vehicle itself. This air turbulence can persist for a period of time after the vehicle passes.

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Variables which influence the amount of dust produced include the average vehicle speed, the average vehicle weight, the average number of wheels per vehicle, the road surface texture, the fraction of road surface material which is classified as silt (particles less than 75 microns in diameter), and the moisture content of the road surface.

The moisture content of the road surface has the greatest influence on the amount of fugitive dust produced. Within the White Pine Creek Project Area, roads are generally closed by snow during the winter months. Most timber sale activity would occur during the late spring, summer and fall months. July, August and September are generally dry so most dust production would occur during this period. Precipitation does fall during these months but is usually limited so it would only reduce dust production for short periods.

Mitigation measures that may be used to reduce fugitive road dust emissions within the White Pine Creek Project Area include: the application of chemicals that increase the moisture retention of road surfaces, specifically magnesium chloride; watering during high use periods or during road maintenance operations; and speed restrictions in sensitive areas. While some or all of these measures would likely be used, it is not possible, at this time, to quantify the actual mitigation measures which would be taken. Approximately 2.25 miles of the main White Pine Creek Road, that falls under the jurisdiction of Sanders County, is unpaved. The Forest Service does not have any control over the management of this segment of road, so, while some mitigation is likely the degree of mitigation is unknown at this time (A Desk Reference for NEPA Air Quality Analysis, 1995).

VI. Mitigation Measures Taken to Reduce Prescribed Burning Emissions and Impacts.

The amount of smoke emissions, resulting from prescribed burning of both natural fuels and logging slash, would be mitigated by four general methods; fuel loading reduction, fuel consumption reduction, flaming combustion optimization and impact avoidance.

Fuel Loading Reduction:
The Kootenai National Forest has encouraged, through sale contract provisions, the increase removal of material that is smaller than the established utilization standard for a given timber sale. First, purchasers are required to pay for, and therefore encouraged to utilize, top wood smaller than the utilization standard (Special Contract Provision C(T) 6.414). Second, the standard contract allows the purchaser to remove sub-merchantable material from regeneration harvests without prior consent of the Forest Service (Standard Contract Provision B(T) 3.41). And third, sub-merchantable material may also be removed from commercial thinning units with prior Forest Service agreement. All these measures help decrease the amount of woody fuel that must be burned.

Reduction in the Amount of Fuel Consumed:
The reduction of the amount of fuel consumed by prescribed burning would be accomplished through the use of spring burning. Harvested areas located on east, southeast, south, southwest and west aspects would be burned, to the extent possible, during the spring burn season, typically from late March through June. During this timeframe larger diameter fuels and the duff layer usually have relatively high moisture contents that reduces the amount of these fuels consumed by prescribed burning.

Flaming Combustion Optimization:
When prescribed burning is determined to be the most appropriate fuel treatment, methods which increasing flaming combustion phase would be used. Concentration of logging slash by whole tree yarding or excavator piling increases the amount of material consumed during flaming combustion and also allows material to be burned in the late fall during cloudy weather when smoke is less obvious and the risk of escape is low. Purchasers are required to construct piles so they are compact and free of excess soil.

Impact Avoidance:
Smoke impact avoidance would be accomplished through daily monitoring of airshed conditions. In Montana, the open burning season runs from March 1 through November 30. All open burning in the state is regulated by the State of Montana Air Quality Bureau. Major prescribed burners, including the Forest Service, have formed the Montana State Airshed Group. Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and restrictions to its members. To accomplish this, the Airshed Group has a monitoring unit consisting of meteorologists and technicians that use weather forecasts, balloon soundings, burn plans, and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana Airshed Group. Prescribed burning is reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return. The Forest Service would cooperate with the State in meeting the Requirements of the State Implementation Plan and the Smoke Management Plan (Forest Plan, II-26).

Large Woody Debris for Long-term Soil Development:
Current research indicates it is desirable to leave 15-25 tons per acre of large woody debris (4"+ in diameter) on site to facilitate long term nutrient recycling. The actual tons to be left is dependent on habitat type. Generally the drier habitat types require less (10-15 TPA) while the wetter habitat types require more (25-30 TPA), (Russell Graham et al, 1994). In order to meet these objectives less material is consumed in the fire with a corresponding reduction in the amount of smoke produced.

Trained and Qualified Prescribed Fire Practitioners:
Individual burn bosses are trained in smoke management techniques prior to being qualified as burn bosses. Part of a Burn Boss's responsibility is to evaluate smoke dispersion and halt burning operations in the event the smoke dispersion is not as forecasted.

Public Notification:
At the beginning of each burn season the Cabinet District places an advertisement in the local newspaper alerting the public to prescribed burning that may affect local air quality. On days when burning is expected to occur residents near the burn are contacted by telephone to make them aware of potential air quality impacts.

VII. Airshed Characteristics and Existing Condition

Montana is divided into ten airsheds by the Montana State Air Quality Bureau. The White Pine Creek Project Area lie entirely within airshed 1. 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 system also move through the area during this period and improve smoke dispersal until high pressure re-establishes. As the heat of summer passed and night time temperatures begin to drop, air quality begins to deteriorate as night time 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 front 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 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 ridgetops, so dispersion is usually better than at lower elevation. 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 elevation at this time resulting in good vertical motion and smoke dilution. These conditions generally occur from 13:00 to 18:00 hours. Smoke dispersal is usually poor for night-time burning due to the increase in atmospheric stability as cool air pools in valleys. This process also results in the development of valley inversions.

Quantitative 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 1800's often mention the smoky conditions from summer fires burning in western Montana and northern Idaho (Losensky 1992).

The annual amount of smoke generated from forest fires has generally decreased since the early 1900's, even with today's use of prescribed fire. Prior to the advent of effective fire suppression, about 1930, fires which started in the area, that is now known as the Cabinet District, burned unchecked from the time of ignition until weather changes stopped their spread. Smoke production varied as environmental factors changed. Smoke could have been produced for just a few hours or for as long as several months. During severe fire seasons, especially when stagnant high pressure systems persisted, regional air quality was no doubt poor. The number of acres burned by wildland fires decreased as effective fire suppression became common and as a result, air quality improved. During the last two decades of the 20th century, natural fuels resulting from decades of fire suppression have reached a level where larger, more intense fires are becoming common. The degradation of air quality is a direct result of these wildland fires.

Studies conducted by the Montana Health and Environmental Sciences Department 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 Eureka and Libby areas.

Source apportionment studies for Libby, a nonattainment area, have shown that slash burning contributes less than 3% 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 in Libby 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

Particulate levels in Eureka exceed the National standard of 150 micrograms/cubic meter only once between 1988 and 1991 due to smoke produced by the Dry Forks wildland fire, which burned near there during September of 1988.

According to the Environmental Protection Agency'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 Environmental Protection Agency 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."

Airshed 1 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 on the Rathdrum and Palouse Prairies, located between Sandpoint and Lewiston, Idaho, as well as other agricultural areas in Washington and 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.

VIII. Monitoring

The Forest Service is a member of the Montana Airshed Group, which monitors air quality on a daily basis during burning season. The Monitoring Unit is activated when prescribed fire activity begins in the spring and continue until the end of November when the open burn season closes. The amount of burning allowed for any given day is based on monitoring the amount of residual smoke in the airshed as well as forecast weather conditions relating to potential smoke dispersion. Air quality monitoring is done daily at several locations within the area covered by this group. The amount of burning allowed within each airshed is tied directly to the daily monitoring of ambient air quality, (Montana/Idaho Airshed Group, http://www.smokemu.org/About_us.html)

Each burn plan includes prescribed weather conditions for adequate smoke dispersal as well as the provision for a test fire. The purpose of this test fire is to allow the burn boss to determine if burn objectives would be met as well as determining if smoke dispersal would be adequate.

Air Quality Analysis Area

The analysis area for consideration of air quality impacts from the implementation of one of the action alternatives is the area within a radius of 90 miles (145 kilometers) from the mouth of White Pine Creek Canyon. The EPA's air quality permitting system suggests that sources within a radius of 100 kilometers (62 miles) be considered especially those located downwind of the source. The analysis area for this project was expanded due to past public comment.

Air Quality Effects Analysis

Direct, Indirect and Cumulative Effects: Fugitive Dust.

This analysis considers the fugitive dust associated with post-decisional project activity by both Forest Service as well as timber sale contractor. The following table depicts estimates of fugitive dust production, for all post-decisional Forest Service administrative and contractor traffic, by alternative. Maximum dust production is shown for the purposes of this analysis. The actual amount produced would be influenced by dust mitigation measures taken directly by the Forest Service and by Sanders County as general road maintenance, as well as actual precipitation, and timing of log hauling.

Fugitive dust produced, by alternative.

Alternative	PM10 total in tons	PM2.5 total in tons
1	0	0
2	10.5	3
3	7.25	2.4
4	15.7	4.5
5	11.25	3

A Desk Reference for NEPA Air Quality Analysis, 3.2.1 Fugitive Dust.

The direct effects of fugitive dust, for each action alternative, are directly related to the volume of timber to be removed. Alternative 1, the no action alternative, would not produce fugitive dust beyond the amount produced by routine forest management activities. The direct effects of fugitive dust are; reduced visibility on and adjacent to roads; and increased level of small diameter particulates, specifically PM 2.5 and PM 10, of concern for human health reason.

The indirect effects of fugitive dust produced as a result of the implementation of one of the action alternatives would be directly related to the amount of timber volume to be removed. Indirect effects are limited to the air quality degradation, as a result of PM2.5 and PM10 particulates, since larger diameter materials would settle out near the point of production. PM2.5 and PM10 levels would rapidly disperse as they are carried by local and general winds.

The cumulative effects of fugitive dust on air quality, as a result of the implementation of one of the action alternatives, 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, 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 Monitoring Unit takes these sources into account, 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.

One objective is to minimize or prevent accumulation of smoke during the fall prescribed burning season when burning is necessary for conducting accepted forest management practices such as hazard reduction, site preparation and wildlife habitat improvement. This is done by prohibiting or restricting burning at times and places where stagnant weather conditions result in poor smoke dispersion, and by conducting prescribed burns when ventilation and air quality conditions are good. The development of alternative methods are encouraged when such methods are practical.

A second objective is to develop a smoke management plan for reporting and coordinating burning operations on all forest and range lands within Montana and Idaho. Guidelines in the plan will be based upon technical information currently available on smoke dispersion and on State and Federal air quality regulations.

The third objective is to improve the smoke management program through regular review and evaluation. One or two general meetings of members are held annually to exchange ideas, review operations and offer suggestions for improving the program.

The cumulative effects on air quality, resulting from the implementation of one 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 but, 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.

Direct, Indirect and Cumulative Effects: Prescribed Burning Smoke.

The estimated amount of smoke emissions, produced by prescribed burning associated with an action alternative, is portrayed 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.

Tons of PM 10 and PM 2.5 produced as a component of smoke from prescribed burning.

Alternative	PM 10 total tons produced	PM 2.5 total tons produced
1	0	0
2	710	604
3	605	513
4	1,070	907
5	874	741

The direct effects of prescribed burning smoke, for each action alternative, are directly related to the volume of timber to be removed. Alternative 1, the no action alternative, would not produce prescribed burning smoke. The direct effects of prescribed burning smoke are; reduced visibility; and increased level of small diameter particulates, specifically PM 2.5 and PM 10, of concern for human health reason.

The indirect effects of prescribed burning smoke produced as a result of the implementation of one of the action alternatives would be directly related to the amount of timber volume to be removed. Indirect effects are limited to the air quality degradation, as a result of PM2.5 and PM10 particulates, and increased haze. PM2.5 and PM10 levels would rapidly disperse as they are carried by local and general winds.

The cumulative effects on air quality of prescribed burning smoke, produced as a result of the implementation of one 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, 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.

Direct, Indirect and Cumulative Effects: Wildland Fire Smoke.

Wildland Fire Smoke, Direct Effects

No-action Alternative
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 thirty years shows that, on average, one fire occurs within the analysis area every two years.

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

Action Alternatives
For the purpose of analysis, it was assumed that all of the acres proposed for timber harvest 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. Alternative 1 has been left out, since no management activity would occur if this alternative were selected. However, under all of the alternatives it is expected that wildland fires would occur. Be aware that this is not an attempt to depict reality but merely an analysis for comparison purposes.

Alternative	PM 10 total tons produced	PM 2.5 total tons produced
2	1,320	1,120
3	1,145	971
4	1,850	1,570
5	1,320	1,555

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 50-60% of the smoke impacts of an intense wildland fire affecting the same area.

A direct effect on wildland fire smoke on air quality, resulting from implementing one of the action alternatives, would be an increased risk of wildland fire occurrence, and accompanying smoke production, between the time timber is harvested and activity fuels are burned. After these fuels are burned the risk would return to near pre-harvest levels, except areas where the pre-harvest risk was high. Here, the risk would be reduced from the pre-treatment level.

Wildland Fire, Indirect Effects

No-action Alternative
An indirect effect of wildland fire smoke, from implementing Alternative 1, the no-action alternative, would be the gradual change in the existing fuel complexes as dead woody fuels accumulate 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 increase 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.

Action Alternatives
The indirect effect of wildland fire smoke on air quality, resulting from implementing one of 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.

Wildland Fire Smoke, Cumulative Effects On Air Quality

No-action and Action Alternatives
The cumulative effects of wildland fire smoke on air quality, for all 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. The greatest degree of reduction of wildland fire potential through fuel hazard reduction would occur from the implementation of Alternative 4, while the least amount would occur if alternative 3 were selected.

Air Quality Analysis, Potential Impacts to Non-attainment Areas, Class I Airsheds and Local Communities.

The following analysis is based on radiosonde data collected at Spokane, Washington for the period from January of 1948 to December of 1989. The data selected for this analysis is for the 750-millibar level, which corresponds to 8,400 feet above sea level. It is felt that winds at this level represent the free-air wind direction and velocity that are likely to occur over the analysis area. Wind roses and tables containing the source data are included at the end of this report.

The average wind speed at 8,400 feet above sea level, for the entire year, ranges from a low of 11 mph to a high of 23 mph. Winds that originate from a westerly direction tend to be stronger than those originating from an easterly direction. Winds with a westerly component, those ranging from SSW to NNW account for 81% of wind origin directions. Southeasterly winds are the least frequent.

Three data sources were used to estimate the likelihood that air pollutants from the White Pine Creek Project area would impact a given area of interest. First, the projected maximum surface and average surface concentrations of PM 10, which are outputs of the NFSPUFF model. Second, the percent probability that wind direction would be such that it would carry smoke toward the area of concern, information taken from the wind rose data tables. The third factor considered is the distance from the project area to the points of concern. A map attached to this report displays the location of and distance to these points of concern.

The annual average and maximum daily PM10 concentrations, January 1999 through October 1999, for Montana communities of concern are as follows:

Site Location	Maximum Value	Annual Average Value
Columbia Falls	30 $\mu g/m^3$	15 $\mu g/m^3$
Kalispell	76 $\mu g/m^3$	21 $\mu g/m^3$
Libby	83 $\mu g/m^3$	26 $\mu g/m^3$
Thompson Falls	63 $\mu g/m^3$	16 $\mu g/m^3$
Whitefish	98 $\mu g/m^3$	27 $\mu g/m^3$

(Acheson, et al, 2000, DRAFT, Appendix E)

The premise of this analysis is that the likelihood that smoke, produced as a result of the implementation of one of the action alternatives, would affect an area of concern is a function of the following factors.

1. The probability a wind direction blowing from the project area to the area of concern would occur.
2. The dilution of the smoke as it traverses the distance from the project area to the area of concern.
3. The amount of pollutants generated at the burn site.

The analysis, summarized in the following table, considers the combined factors that would influence the effects that smoke from the project area would have on non-attainment areas, Class I air sheds and other local communities. To simplify the analysis, a unit size of 40 acres, with a fuel loading of 60 tons per acre and an average wind speed of 16 miles per hour was used. The NFSPuff model was used to determine expected average surface and maximum surface concentration of PM10 particulates. Since the concentrations, shown below for each point of interest, are below the annual arithmetic mean of 50 micrograms/cubic meter, it is very unlikely that smoke, from burning related to this project, would result in loadings above these values unless the ambient particulate load is near to the maximum value. In such a case the cumulative effects of this project and other unrelated sources could result in exceeding these standards. However, since all burning associated with this project would be done in compliance with the Montana Airshed Group's regulation, this result is unlikely.

Area of concern and reason for concern.	Transport wind direction, from WP to location of potential impact.	Distance from WP to area of concern in miles.	Percent Probability of wind direction occurrence. Based on ave. annual wind direction.	NFSPuff Max surface concentration of PM10 at the area of interest.	NFSPuff Average surface concentration of PM10 at the area of interest.
Libby, MT, Non-attainment area	S	44 (71 kilometers)	4%	1-15 $\mu g/m^3$	.01-1 $\mu g/m^3$
Whitefish, MT, Non-attainment area	SW	71 (115 kilometers)	18%	1-15 $\mu g/m^3$	.01-1 $\mu g/m^3$
Kalispell, MT, Non-attainment area	SWS	64 (103 kilometers)	21%	1-15 $\mu g/m^3$	.01-1 $\mu g/m^3$
Coeur d' Alene, ID, Non-attainment area	ENE	58 (94 kilometers)	2%	1-15 $\mu g/m^3$	.01-1 $\mu g/m^3$
Sandpoint, ID, Non-attainment area	SE	60 (97 kilometers)	1%	1-15 $\mu g/m^3$	.01-1 $\mu g/m^3$
Thompson Falls, MT, Sensitive area	NNW	14 (23 kilometers)	4%	1-15 $\mu g/m^3$	1-15 $\mu g/m^3$
Eureka, MT, Sensitive area	SSW	82 (132 kilometers)	8%	.01-1 $\mu g/m^3$	.01-1 $\mu g/m^3$
Cabinet Mt. Wilderness, Sanders Co. MT, Class I Airshed	S	14 (23 kilometers)	4%	1-15 $\mu g/m^3$	.01-1 $\mu g/m^3$
Glacier National Park, Class I Airshed	SW	84 (135 kilometers)	18%	.01-1 $\mu g/m^3$	.01-1 $\mu g/m^3$
Bob Marshall Wilderness, Class I Airshed	WSW	84 (135 kilometers)	21%	.01-1 $\mu g/m^3$	.01-1 $\mu g/m^3$

Effects Analysis of Potential Impacts to Class I Air Sheds.

Certain wilderness areas and National Parks established before August of 1977 were designated as Class I areas. A Class I 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 I Wilderness Areas, General Technical Report RM-168). The Bob Marshall Wilderness, Glacier National Park and the Cabinet Mountains Wilderness are all Class I areas.

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

Cabinet Mountains Wilderness

10th percentile	50th percentile	90th percentile
88 kilometers (55 miles)	160 kilometers (99 miles)	228 kilometers (141 miles)

(http://www.fs.fed.us/r6/aq/natarm/r1/cabinet_mtns_ct.htm)

Bob Marshal Wilderness

10th percentile	50th percentile	90th percentile
97 kilometers (60 miles)	178 kilometers (110 miles)	249 kilometers (154 miles)

(http://www.fs.fed.us/r6/aq/natarm/r1/bob_marshall.htm)

The interpretation of these percentile figures is as follows. For the Cabinet Mountains Wilderness, on 10% of the days monitored, visibility was 55 miles or less, which also means that on 90% of days monitored visibility was greater than 55 miles. On 50% of the days monitored visibility was 99 miles or less, which also means that on 50% of days monitored visibility was greater than 99 miles. On 90% of days visibility was 141 miles or less, which also means that on 10% of the days monitored visibility was greater than 141 miles.

The degree of visual impairment and the amount of airborne pollutants, resulting from the burning of wildland fuels, is undoubtedly less than it was prior to the advent of effective fire suppression. Conversely, pollutants from other human related sources, has increased during the same timeframe. There is no historic data for comparing the existing situation to the historic situation.

Effects resulting from the implementation of one of the action alternatives would be considered indirect effects since none of these areas are within close proximity to the project area.

The analysis presented in table above indicates that transport winds, from a direction that would carry smoke toward the Cabinet Mountains Wilderness Area, would occur on about 4% of days. If burning occurs on one of these days, smoke would impact visual quality and would also deliver air borne pollutants to this class I air shed. The effects of visual impairment would be less noticed during spring weather because wilderness use is very limited then due to deep snow. The overall probability of impacting the air quality of Cabinet Mountains Wilderness is considered to be low.

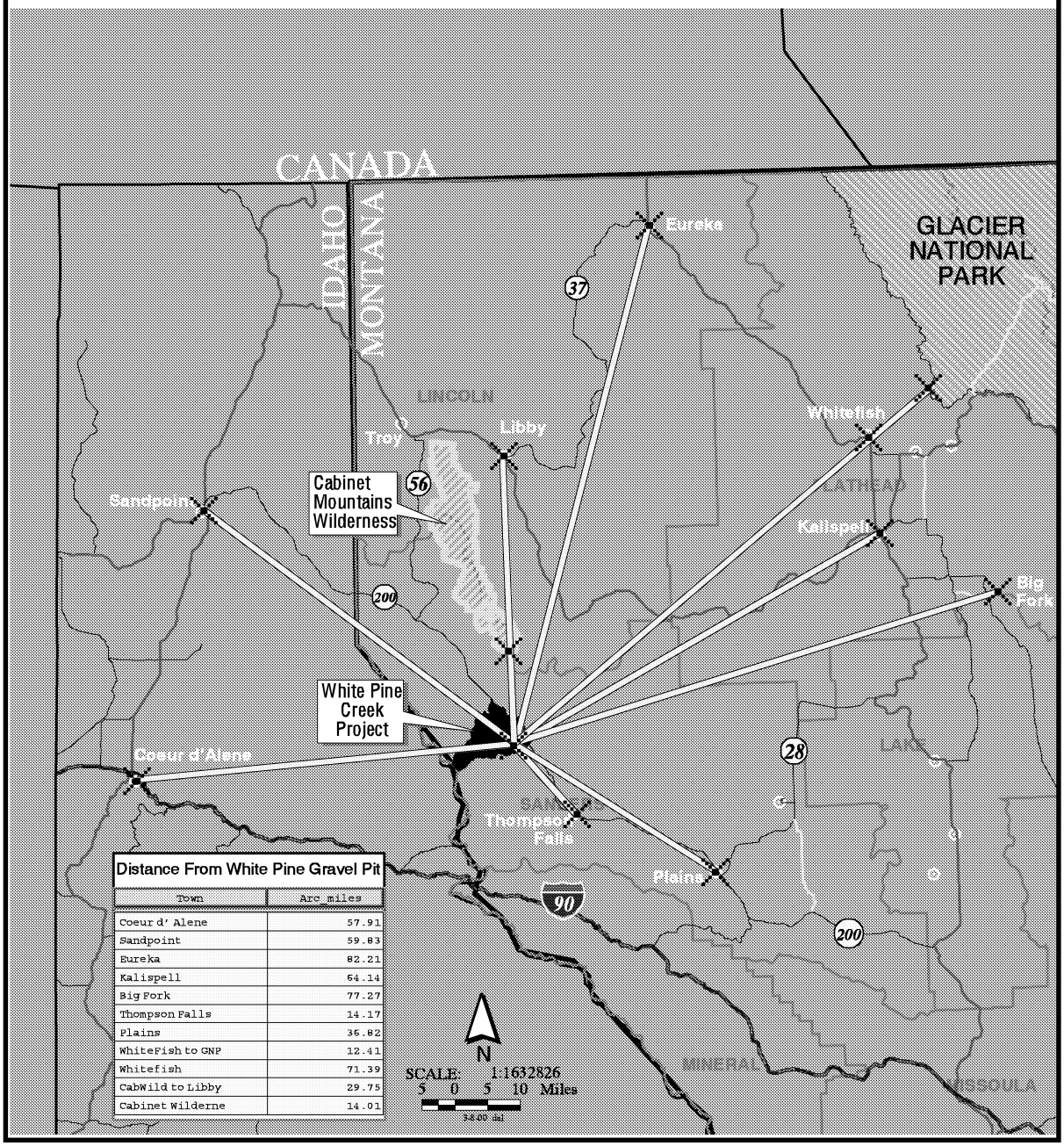
The analysis shown in the table above indicates the probability that transport winds from a direction that would carry smoke toward the Bob Marshal Wilderness Area and Glacier National Park, would occur on about 20% of days. If burning occurs on one of these days, smoke could impact visual quality and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

The cumulative effects on class I air sheds from the implementation of one of the action alternatives and other present 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.

Recently, IMPROVE Air Quality Monitoring Equipment was installed on Green Mountain, near Noxon, Montana, to monitor air quality for the Cabinet Mountain Wilderness Area. It is anticipated that data from this facility would be available prior to any burning which might occur if an action alternative were selected for implementation. This data would represent the cumulative effects on air quality from all sources.

White Pine Creek Project Area

Sensitive Airsheds

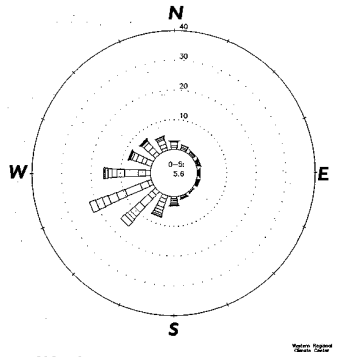


Distance From White Pine Gravel Pit

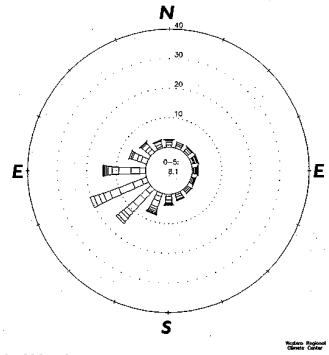
Town	Arc miles
Coeur d' Alene	57.91
Sandpoint	59.83
Eureka	82.21
Kalispell	64.14
Big Fork	77.27
Thompson Falls	14.17
Plains	36.82
WhiteFish to GNP	12.41
Whitefish	71.39
CabWild to Libby	29.75
Cabinet Wilderne	14.01

Wind Roses Produced From Spokane, Washington Radiosonde Data

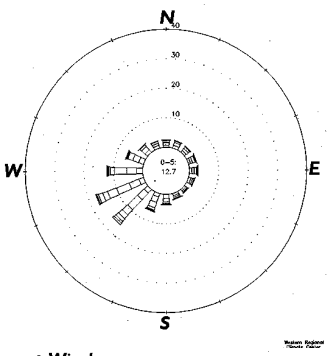
March Windrose



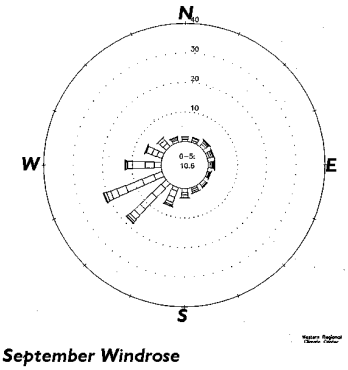
April Windrose



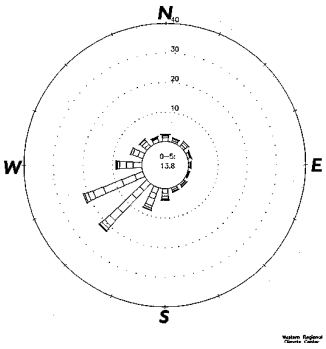
May Windrose



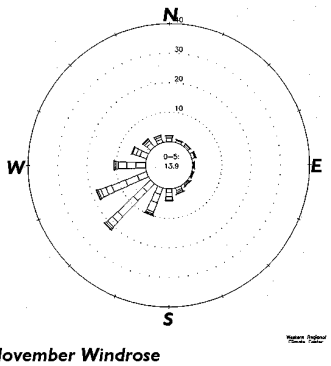
June Windrose



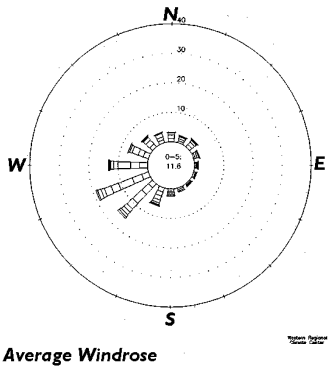
July Windrose



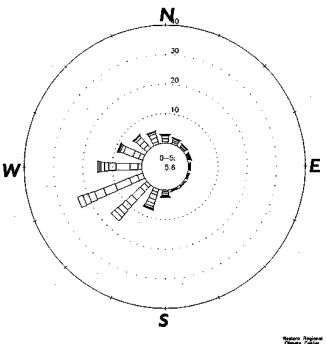
August Windrose



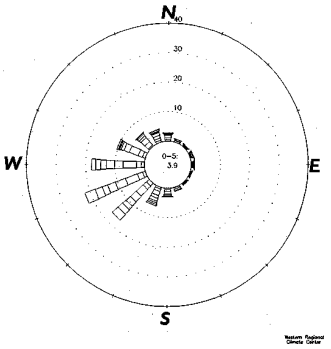
September Windrose



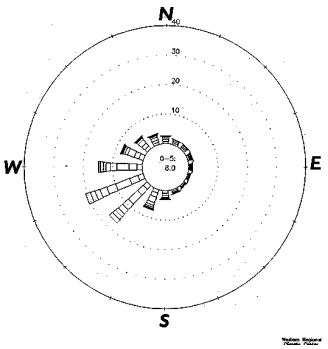
October Windrose



November Windrose



Annual Average Windrose



Windrose Interpretation: Each component block of a direction arrow corresponds to a range of windspeeds. The block nearest the center represents a range of 0 to 5.5 mph. The next block represents 5.5 to 10.5 mph and so on.
The wind arrow points toward the direction FROM which the wind is blowing.
The concentric circles of dotted lines show the percent probability of wind direction with the innermost circle representing 10%, the second is 20% and so on. Consult the corresponding wind table for more detailed data.