Air Quality and Smoke Management

INTRODUCTION

The Southwest Idaho Ecogroup can summon images of cool clear streams, forested mountains, birds, wildlife, or perhaps a special place that has a spectacular view of distant mountainous ridges or deep valleys. Viewing scenery is one of the most often-cited reasons for visiting national forests (USDA Forest Service 1996). Good air quality has increasingly become a public priority, and national forests are usually seen as having a positive effect on air quality. At the same time, forest ecologists have identified a need to return fire to its historical role in the ecosystem as an important ecological process (Morgan et al. 1994). Prescribed fire and wildland fire use (for resource benefit) can accomplish a variety of management objectives. However, there is concern that an increase in fire use may adversely affect air quality through the release of pollutants. Therefore, appropriate management direction is needed to minimize or resolve conflicts between managing the Forests using fire and maintaining and improving air quality for public health and visibility.

Regulatory Framework

Federal Clean Air Act

Air quality is protected under the Clean Air Act (CAA) passed by Congress in 1955 and amended in 1967, 1970, 1977, and 1990. The CAA has served as the primary legal instrument for air resource management. It requires the Environmental Protection Agency (EPA) to, among other things, identify and publish a list of common air pollutants that could have an impact on public health or welfare. These are referred to as "criteria pollutants". Criteria pollutants are sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide, and particulate matter. Particulate matter has two standards, one for coarse particulates (PM 10) and one for finer particulates (PM 2.5). PM 10 stands for particulate matter less than 10 micrometers in aerodynamic diameter, which is equivalent to $1/25{,}000^{th}$ of an inch. PM 2.5 stands for particulate matter less than 2.5 micrometers in aerodynamic diameter, which is one-quarter the size of PM 10. Finer particulate matter (PM 2.5) makes up about 85 percent of the coarse particulate matter (PM 10).

Public Health--The EPA and states designate concentration levels for the criteria pollutants to protect public health. Federally designated maximum concentration levels are called National Ambient Air Quality Standards (NAAQS) and are defined as the amount of pollutant above which detrimental effects to public health (or welfare) may result (Table AQ-1). NAAQS are set at a conservative level with the intent of protecting even the most sensitive members of the public including children, asthmatics, and people with cardiovascular disease. If an area violates the NAAQS, that area becomes federally designated as a "non-attainment" area. An area that was one time in non-attainment, but has since met the NAAQS and other requirements, is called a maintenance area.

Table AQ-1. National and State Ambient Air Quality Standards

Pollutant	Time Period Average	Federal	Idaho and Utah
Carbon Monoxide (CO)	One hour 8 hour	35 [1]ppm 9 ppm	35 ppm 9 ppm
Lead (Pb)	Calendar Quarter 90-day	1.5 [2]µg/m^3 --	1.5 µg/m^3
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean Hourly Average	0.053 ppm ----------	0.053 ppm ----------
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean 24-hour 3-hour Hourly Average	0.03 ppm 0.14 ppm 0.50 ppm ----------	0.03 ppm 0.14 ppm 0.50 ppm ----------
Ozone	8 hour Hourly Average	0.12 ppm 0.08 ppm	0.12 ppm 0.08 ppm
PM 10	Annual Arithmetic Mean 24-hour	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3
PM 2.5	Annual Arithmetic Mean 24-hour	15 µg/m^3 65 µg/m^3	[*]------- -------

[1]ppm=parts per million
[2]micrograms per cubic meter
[*]As of November 2002, Idaho and Utah had not adopted PM 2.5 standards different than the federal standard.

Criteria pollutants such as sulfur dioxide and nitrogen dioxide are of concern because of their potential to cause adverse effects on plant life, water quality, aquatic species, and visibility. However, sources of these pollutants are generally associated with urbanization and industrialization rather than with natural resource management activities or wildfire. Wildfire and natural resource management activities such as timber harvest, road construction, site preparation, mining, and fire use can generate ozone, carbon monoxide, and particulate matter. While ozone is a byproduct of fire, potential ozone exposures are infrequent (Sandberg and Dost 1990). Carbon monoxide is rapidly diluted at short distances from a burning area, as fires are generally spatially and temporally dispersed, and pose little or no risk to public health (Sandberg and Dost 1990). The pollutant of most concern to public health and visibility within and downwind of the Ecogroup area is particulate matter. Even though particulate matter has no serious effects on ecosystems because fire and smoke are an ecological process (ICBEMP 2000a), it does affect human health, and visibility. Because of its smaller size, PM 2.5 poses greater health risks than PM 10. Large volumes of particulate matter can be produced from fire and, depending on meteorological conditions, may affect large areas for extended periods of time.

Each day, concentrations of various air pollutants are measured in areas across the States. After the amount of pollution is measured, it is compared to the federal standard. To make it easy to compare all the different pollutants and determine the air quality, the EPA (US EPA June 2000) developed the Air Quality Index (AQI) to relate all criteria pollutants to the same scale. Table AQ-2 displays the 24-hour AQI breakpoints for PM 10 and PM 2.5. When concentrations reach "Unhealthy for Sensitive Groups", cautionary statements are issued to suggest that people with respiratory conditions or heart disease, the elderly and children, and those who work, exercise, or spend time outdoors, should limit prolonged exertion.

Table AQ-2. Air Quality Index (AQI) and Particulate Matter (PM) 10 and 2.5 Breakpoints

AQI Value	Health Concern	PM 10 Breakpoints [1] $\mu g/m^3$	PM 2.5 Breakpoints $\mu g/m^3$
0 – 50	Good	0 – 54	0 – 15.4
51 – 100	Moderate	55 – 154	15.5 – 40.4
101 – 150	Unhealthy for Sensitive Groups	155 – 254	40.5 – 65.4
151 – 200	Unhealthy	255 – 354	65.5 – 150.4
201 – 400	Very Unhealthy	355 – 424	150.5 – 250.4
> 400	Hazardous	> 424	> 250.5

[1] micrograms per cubic meter

While the NAAQS evaluate smoke impacts related to public health, smoke often causes public concern at levels below the NAAQS. One study compared the number of complaints about smoke to the measured PM 10 concentrations (Acheson et al. 2000). Complaints increased when PM 10 concentrations were as low as 30 micrograms per cubic meter. The 24-hour threshold for the PM 10 NAAQS is 150 micrograms per cubic meter (Table AQ-1). The Air Quality Index for a concentration of 30 micrograms per cubic meter would be rated as "Good" indicating no health concerns (Table AQ-2).

Visibility Impairment (Mandatory Class I Areas) – Class I areas are set aside under the Clean Air Act to receive stringent protection from air quality degradation. Mandatory Class I areas are those with certain Federal designations in existence prior to the 1977 amendments to the Clean Air Act. These include 1) international parks, 2) national wilderness areas that exceed 5,000 acres in size, 3) national memorial parks that exceed 5,000 acres in size, and 4) national parks that exceed 6,000 acres in size.

The 1977 amendments to the Clean Air Act established a national goal of "the prevention of any future, and the remedying of any existing impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution". Fine particles (PM 2.5) are the primary cause of visibility impairment in Class I areas although gases also contribute. Visual range is one indicator of pollution concentrations in the air. Visibility variation occurs as a result of the scattering and absorption of light by particles and gases in the atmosphere. Without pollution effects, an estimated natural visual range is 90 miles in the eastern U.S. and up to 140 miles in the western U.S. (US EPA November 2001).

In 1980 EPA's visibility regulations were developed to protect mandatory Class I areas from human-caused impairments reasonably attributable to a single or small group of sources. In contrast, EPA proposed in 1997 a new regulatory program to protect mandatory Class I areas from visibility impairment produced by a multitude of sources that emit fine particles and their precursors across a broad geographic area. This Regional Haze Rule (40 CFR, Part 51), addresses impacts from numerous and broad based sources that cannot be easily pinpointed. The rule calls for states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing emission of air pollutants that cause visibility impairment. Fire use is one of the sources addressed by the regulations. Idaho and Utah are in

the preliminary stages of developing State Implementation Plans for regional haze and the Forest Service will be actively involved with the states as they develop their implementation plans.

Interim Air Quality Policy on Wildland and Prescribed Fires

On May 15, 1998, the EPA issued the *Interim Air Quality Policy on Wildland and Prescribed Fires* (referred to as the *Interim Policy*) to address impacts to public health and welfare. This policy was prepared in response to anticipated increases in fire use that were expected to occur as a result of implementing the *1995 Fire Management and Policy Review*, which outlined a need to restore fire as an ecosystem process into many wildlands. The *Interim Policy* was prepared in an effort to integrate the goals of allowing fire to function in its ecological role for maintaining healthy ecosystems balanced with protecting public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility. The policy was developed with the active involvement of stakeholders including the U.S. Department of Agriculture. The *Interim Policy* is Federal policy that reconciles the competing needs to use fire and maintain clean air to protect public health. The *Interim Policy* is interim only because it does not yet address agricultural burning or regional haze (US EPA 1998). It is not interim with regard to how States, Tribes, and Federal land managers are expected to address smoke from prescribed fires.

The *Interim Policy* suggests that air quality and visibility impact evaluations of fire activities on Federal lands should consider several different items during planning (US EPA 1998). We considered, and addressed to the extent practical, those appropriate for a programmatic scale evaluation. Items discussed in detail in this EIS include a description of applicable regulations, plans, or policies, identification of sensitive areas (receptors), and the potential for smoke intrusions in those sensitive areas. Other important considerations also discussed are applicable smoke management techniques, participation in a basic smoke management program, and potential for emission reductions. Two *Interim Policy* planning items mentioned below in this section will not be explained to the same level of detail as those listed above. These include ambient air quality and visibility monitoring plans, and the cumulative impacts of fires on regional and subregional air quality. In addition to these listed items, issues regarding public (transportation) safety are also discussed.

Ambient Air Quality and Visibility Monitoring - The State of Idaho has one of the best ambient air monitoring networks in the nation. The Idaho Department of Environmental Quality (IDEQ) has recently developed a statewide monitoring network for PM 2.5. In addition, an expansion of the Interagency Monitoring of Protected Visual Environments (IMPROVE) network, which monitors effects to visibility in Class I areas, is underway through cooperative efforts of EPA, state regulatory agencies, and federal land managers. Objectives of this monitoring are to establish current conditions, to track progress toward the national visibility goal by documenting long-term trends, and to determine the types of pollutants and sources primarily responsible for visibility impairments (US EPA March 2001). The IMPROVE network has been undergoing expansion since 2000 to add to the number of sites that have modules to determine types of pollutants causing or contributing to visibility impairment.

Regional and Subregional Air Quality - Only a few analyses have been conducted at a regional scale or provide a mechanism to evaluate cumulative impacts to air quality that are applicable to the Southwest Idaho Ecogroup. The Interior Columbia Basin Ecosystem Management Project

(ICBEMP) estimated the potential for air pollution from industrial sources to reach Class I wilderness areas in the Pacific Northwest (Ferguson and Rorig in press). The ICBEMP area includes the Ecogroup Forests. The Regional Pollution Potential is based on monthly averaged emission concentrations from industrial stacks, winds at different elevations, and mixing heights. Pollution trajectories were plotted by vertical level, per pollutant parameter, per season. Climate information, including mixing heights, and upper level and surface trajectory winds was also developed as part of the ICBEMP assessment (Ferguson 1998).

Smoke Management Program – The *Interim Policy* calls on states (and tribes) to develop smoke management programs and for federal land managers to participate in them. Basic elements of a smoke management program include 1) a process to authorize burns; 2) a requirement that land managers consider alternatives to burning to reduce air pollutant emissions; 3) a requirement that burn plans include smoke management components such as actions to minimize fire emissions; evaluation of smoke dispersion; actions that will be taken to notify populations and authorities prior to burns to reduce the exposure of people in sensitive areas if smoke intrusions occur; and air quality monitoring especially in sensitive areas; 4) a public education and awareness program; 5) a surveillance and enforcement program; and 6) periodic review of its program for effectiveness. In exchange for states (and tribes) proactively implementing smoke management programs, EPA intends to exercise its discretion not to re-designate an area as non-attainment if convincing evidence shows that fire use caused or contributed to violation of the daily or annual PM 10 or PM 2.5 standards. The state (or tribe) must certify to EPA that at least a basic program has been adapted and implemented. The Montana/Idaho Airshed Group operates Idaho's smoke management program. This group is composed of members that include federal, tribal, state, and local governments and forest products companies who conduct the majority of the forestry or rangeland prescribed burning in the state. It also includes the health agencies that regulate this burning. Members belonging to the Group agree to 1) a smoke management plan for reporting and coordinating burning operations on all forest and rangelands; 2) develop alternative methods to open burning when possible; 3) review and evaluate the program at the end of each burning season in order to improve the smoke management plan where feasible. The State of Idaho has certified to EPA that the operations of the Montana/Idaho Airshed Group meet the requirements of a basic smoke management program. Utah's smoke management program is similar to that of the Montana/Idaho Airshed Group and has been certified to EPA. These coordinated burning operations provide an essential tool for minimizing smoke impacts.

Alternatives To Burning And Emission Reductions - Even though the *Interim Policy* acknowledges that fire is a necessary and non-replaceable treatment to meet certain objectives, land management agencies are encouraged to consider whether there are alternatives to burning in order to reduce emissions. In general, mechanical treatments are considered the most viable means of reducing emissions though in some ecosystems chemicals may be an option. However, the *Interim Policy* also acknowledges that considering alternatives to burning is not without tradeoffs and limitations. The policy states that mechanical opportunities are most normally limited to:

- Accessible areas (those with roads, harvest systems, etc)
- Terrain that is not excessively rough

- Slopes equal to or less than 40 percent
- Areas not designated as National Parks or Wilderness
- Areas without listed species
- Areas without cultural or paleological resources.

In addition to the items listed above, Forest Plan direction including land allocations, desired conditions, goals, objectives, standards, and guides may also limit opportunities for mechanical treatments.

Global Climate Change

Global climate change is a natural and human-driven process. Ecosystems have evolved across the landscape in part in response to changes in climate. Humans affect changes in ecosystems by modifying landscapes and emitting gases and particles into the atmosphere. Management decisions on national forest systems lands can affect global climate because significant change can occur as an accumulation of many smaller changes. However, Global Climate Change and carbon sequestration are beyond the scope of this analysis and scale of decisions made in a Forest Plant. Global Climate Change is addressed as part of the Forest and Rangeland Renewable Resources Planning Act (RPA) Assessment and in the Forest Service Strategic Plan prepared in response to the Government Performance and Results Act (GPRA).

Issue and Indicators

Issue Statement: Forest Plan management strategies may affect air quality based on the amount of smoke produced by fire use and wildfire.

Background to Issue: Need for Change related to air quality and smoke was identified in the *Preliminary AMS for the Southwest Idaho Ecogroup Summary* (USDA Forest Service 1997) and is summarized here. Identified were concerns that the role of fire as an ecological process was not fully considered during the development and analysis of the existing Forest Plans. In addition, the use of fire as a management tool was described for some resources; however fire over large areas was not considered. The potential impacts on other resources including air quality from fire use and wildfire were not analyzed. Finally, there is a need to incorporate consistent air quality and smoke management direction, desired conditions, and monitoring plans into the revised Forest Plans based on new air quality requirements at the federal, state, and local levels, including new Forest Service direction.

Since the original forest plans were developed, resource managers have recognized the importance of fire as an ecological process in the maintenance of sustainable ecosystems. Forest plan revision offers the opportunity to define and resolve issues that involve fire use, its relationship to vegetative conditions, and its environmental impacts and benefits on air resources.

Indicators: Estimated smoke emissions were used as an indicator of effects to air quality by comparing emissions for alternatives to historical (pre-settlement) emissions by Forest or Administrative Unit. This includes emissions generated from fire use or wildfire in forested and non-forested vegetative communities. The comparison units were derived from estimates of PM 10. PM 2.5 emissions were derived from the PM 10 estimates assuming approximately 85

percent of the coarse particulate matter (10) is made up of fine particulate matter (2.5) (Reinhardt et al. 1997). However, in all cases the amount of emissions estimated for an area indicates only the risk of an effect on ambient air concentrations. Whether or not the emissions actually produced from any one alternative would violate NAAQS for any one area cannot be determined at this scale.

Historical emissions were estimated based on the number of acres that may have burned under historical fire regimes (see the *Fire Management* section) to provide a consistent context for comparing amounts from various sources. Fire use emissions were based on the outcomes of acres treated from SPECTRUM (for the forested vegetation) and VDDT (for the non-forested vegetation) models (see *Appendix B* for more details regarding the modeling). These models estimated the number of acres treated with fire or mechanically to achieve desired vegetative conditions. Emissions estimated from mechanically treated acres were used to represent activity fuel treatments. Acres potentially burned by wildfire for the forested vegetation were derived from uncharacteristic wildfire hazard ratings and represent the emissions that could be produced from uncharacteristic wildfire. In addition, the wildfire emissions for forested vegetation include the "background wildfire" acres estimated directly from SPECTRUM (see the *Vegetation Hazard* section for an explanation of uncharacteristic wildfire hazard and background wildfire). For the non-forested vegetation, acres of failed fire suppression and background wildfire were used to estimate potential wildfire emissions (see the *Vegetation Hazard* section).

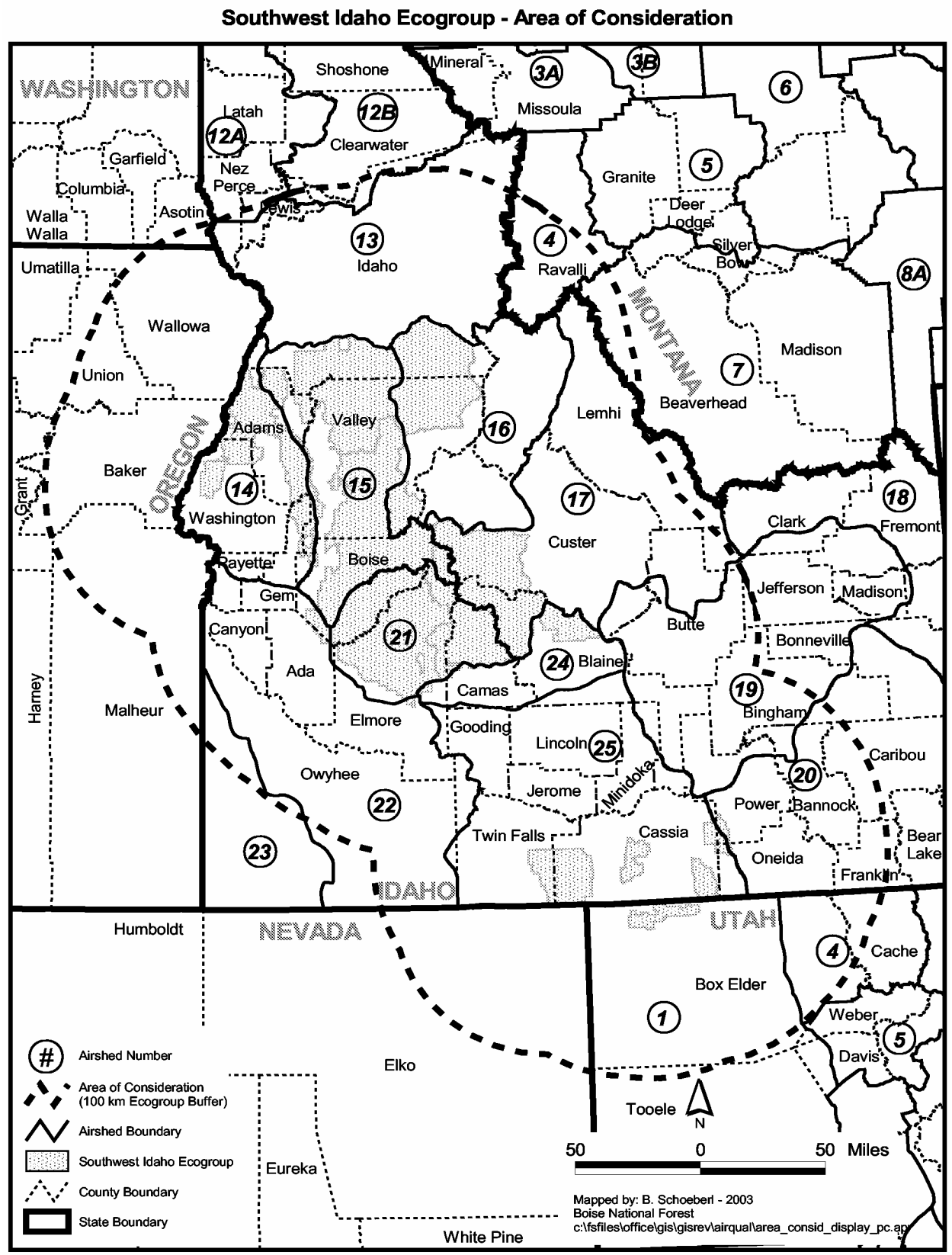
The actual amount of smoke produced and the impacts of that smoke are too variable to predict. Implementation of fire use to manage vegetation or treat activity fuels will vary from these estimates depending on the results of future project analysis, evaluation of other kinds of fuels treatment, available prescription windows, budgets, and numerous other factors. Potential emissions from wildfires are also unpredictable, as they vary depending on site-specific vegetative and fuels conditions, ignitions, weather, and available suppression resources. The comparison described here is intended to show how smoke emissions may vary based on the theme, Management Prescription Categories, and desired conditions for an alternative.

Affected Area

Airsheds and Counties

The Southwest Idaho Ecogroup area of consideration includes sensitive areas within a 100-kilometer (approximately 62-mile) perimeter from the administrative boundaries of the Ecogroup Forests (Figure AQ-1). This distance was chosen based on National and Regional guidance as it covers a potential impact zone that corresponds to the distance smoke may influence surrounding areas (USDA Forest Service 2000). The Ecogroup also falls partially or wholly into airsheds identified or recognized by the states. Airsheds are geographical areas in which dispersion characteristics are similar. Two sets of airsheds have been identified for Idaho but for purposes of this analysis, we used those designated by the Montana/Idaho Airshed Group. Ecogroup administered lands fall within nine Idaho and one Utah airsheds for a total of ten in the area of consideration. The airsheds with Ecogroup Forest administered lands in Idaho are 14, 15, 16, 17, 20, 21, 22, 24, and 25, and the one in Utah is 1.

Figure AQ-1. Southwest Idaho Ecogroup Area of Consideration for Air Quality Effects



Counties within the airsheds were used to provide a geographic context of potential impacts to sensitive areas since available air quality information is generally collected or summarized at this level. Though the entire area of consideration encompasses forty-four counties in six states (Idaho, Utah, Nevada, Oregon, Washington, and Montana), the airsheds occur over 25 counties in Idaho and Utah. Table AQ-3 displays the percentage of county area contained within the airsheds. Of these, sixteen counties contain lands administered by the Ecogroup. Table AQ-4 displays the percentage of Ecogroup administered lands in these sixteen counties. County-level information will be presented for the counties that contain Ecogroup administered lands, as these are the areas within the 100-kilometer area of consideration where emissions may be directly attributable to Ecogroup activities.

Table AQ-3. Percentage of County Area Within Each Airshed

County	Airsheds									
	14	**15**	**16**	**17**	**20**	**21**	**22**	**24**	**25**	**1**
State of Idaho										
Ada[1]						1	99			
Adams	75	25								
Blaine								40	17	
Boise	4	61		21		29	6			
Butte				33						
Camas						49		49		
Canyon							100			
Cassia									99	
Clark				11						
Custer			22	72						
Elmore						52	41	3		
Gem	58						42			
Gooding									96	
Idaho		10	8							
Jerome									100	
Lemhi			39	61						
Lincoln									96	
Minidoka									83	
Oneida					85					
Owyhee							61		15	
Payette	48						52			
Power					56					
Twin Falls							11		89	
Valley		61	37							
State of Utah										
Box Elder										81

[1]Grey shaded boxes are counties that contain Ecogroup administered lands.

Sensitive Areas

Air Quality sensitive areas include places that may experience smoke related impacts to health, visibility, and public (transportation) safety. For this EIS, we considered population centers and Impact Zones, non-attainment areas/maintenance areas, Class I areas, and major travel routes and

airports as sensitive areas appropriate to address for this coarse-scale analysis. All of these types of areas are represented within the 100-kilometer area of consideration (Figure AQ-2). Non-attainment and mandatory Class I areas are designated through federal and state processes. Other sensitive areas have been identified through other processes. Evaluation of smoke impacts during finer scale or project-level analysis may include other types of sensitive areas such as hospitals, airstrips, and campgrounds, but these are too fine-scale to be evaluated for this EIS.

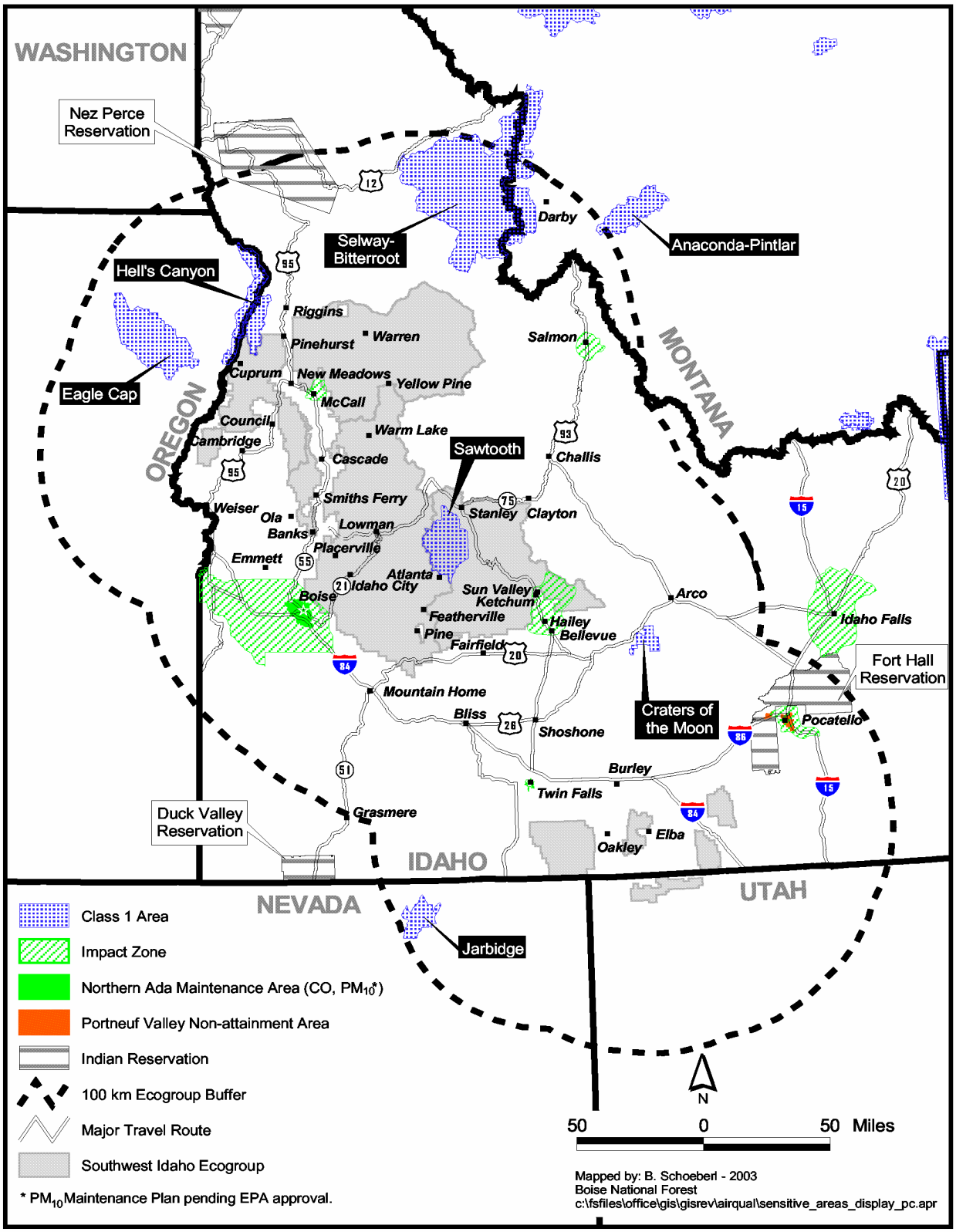
Table AQ-4. Percentage of Ecogroup Administered Lands Within each County by Forest

County	Forest			
	Boise	**Payette**	**Sawtooth**	**Total**
State of Idaho				
Ada	0.5			0.5
Adams	0.1	55		55.1
Blaine			29	29
Boise	65		6	71
Camas			46	46
Cassia			24	24
Custer			15	15
Elmore	32		8	40
Gem	17	0.1		17.1
Idaho		15		15
Oneida			1.9	1.9
Power			3.2	3.2
Twin Falls			7.5	7.5
Valley	33[1]	38		71
Washington		13		13
State of Utah				
Box Elder			1.7	1.7

[1]Does not include Frank Church – River of No Return Wilderness contained within the administrative boundary of the Boise Forest

Public Health – There are two non-attainment/maintenance areas in the area of consideration. The Northern Ada County Non-attainment/Maintenance Area that includes Boise, and the Portneuf Valley Non-attainment Area near Pocatello, are two locations that do not currently meet, or have violated in the past, NAAQS for some of the criteria pollutants (e.g., particulate matter). All other non-attainment areas surrounding the Ecogroup are beyond the 100-kilometer area of consideration and only wildfires would have the magnitude to contribute to existing pollutant levels in these areas. The Montana/Idaho Airshed Group has also defined several population centers as "Impact Zones" (Montana/ Idaho Airshed Group 2003). These are special protection areas that have been determined to be smoke sensitive. There are six Impact Zones identified within the airsheds. These include Boise, McCall, Salmon, Sun Valley/Ketchum, Twin Falls, and Pocatello. In addition, there are many other population centers within the area of consideration including two Indian Reservations; the Nez Perce Reservation north of the Payette Forest, and the Fort Hall Reservation east of the Sawtooth Forest. The Duck Valley Reservation lies to the south and west of the Boise and Sawtooth Forests outside the area of consideration.

Figure AQ-2. Representative Sensitive Areas within the Southwest Idaho Ecogroup Area of Consideration for Air Quality Impacts



Visibility Impairment (Mandatory Class I Areas) – The Sawtooth Wilderness and Hells Canyon Wilderness are two mandatory Class I areas adjacent to or surrounded by lands administered by the Ecogroup. In addition, there are five other Class I areas within the 100-kilometer area of consideration. These include the Eagle Cap Wilderness (Oregon), Craters of the Moon National Monument (Idaho), Selway-Bitterroot Wilderness (Idaho-Montana), Anaconda-Pintlar Wilderness (Montana), and Jarbidge Wilderness (Nevada).

Public (Transportation) Safety – Public safety, which considers the impacts of smoke on transportation safety including roads and airports, is another potential concern. Smoke can affect visibility on roads creating hazardous conditions for travelers. Smoke can be especially hazardous in low-lying areas where fog can form, further reducing visibility. Several traffic accidents have occurred on highways in Oregon and the Southeast U.S. from visibility reductions due to smoke. Hazy conditions can also affect aviation operations at airports by reducing visibility. There are several primary travel routes (e.g. highways) and airports throughout the area of consideration. Potential impacts of smoke effects on visibility and impacts to transportation safety depend on amount, timing, and location of fire use, and the meteorological conditions that influence dispersion. Potential effects of smoke on specific areas related to transportation safety cannot be evaluated at this scale because of the spatial and temporal nature of this concern. They will not be discussed or analyzed further in this document. Mitigations for these areas are considered as part of project-level planning and implementation.

Direct, Indirect, and Cumulative Effects Analysis and Areas

The affected areas for direct and indirect effects to air quality are the Ecogroup airsheds. Direct and indirect effects can occur at sensitive areas within airsheds from activities or actions on Ecogroup administered lands alone. Cumulative effects can occur based on activities or actions on Ecogroup administered lands in combination with effects from other sources. Cumulative effects are also described for some sensitive areas contained within the 100-kilometer perimeter. Although pollutants (particulate matter) can travel distances farther than 100-kilometers, it is difficult to evaluate potential impacts on sensitive areas beyond the area of consideration.

At the scale of this EIS, it is also not possible to predict the direct and indirect effects on NAAQS, visibility impairment, or regional haze. Rather the effects are qualitatively discussed by alternative in terms of seasonality, frequency, duration, and magnitude (amount of emissions). Emissions information at the county level is used to provide a context for risks to air quality based on what occurred in the past, the sources of the emissions, and what may occur in the future. Counties also provide the context for how much smoke may be produced by Ecogroup activities based on the amount of area managed by the Ecogroup and the types of vegetation that occurs. Though estimated emissions for the alternatives are modeled Forest-wide, the amount of Ecogroup area, the types of burning expected to take place for an alternative, and meteorological patterns can be used to determine the risk of effects on sensitive areas within an airshed.

CURRENT CONDITIONS

The words "air pollution" call up images of smog hanging over cities, smoke coming from a stack at a factory, or a dark cloud from a car's tailpipe. This is not the case for the Ecogroup. Current air quality is generally good to excellent for the Ecogroup airsheds, with visibility interrupted at certain times by smoke from wildfires and fire use (IDEQ 2001). In historical times, air quality was determined by lightning events and occasional smoke from human-caused fires. Smoke, dust, and chemicals can adversely affect air quality. Though all of these pollutants occur naturally, human activities have elevated the levels of some of these pollutants above historical levels in some areas.

Historically smoke produced from fire is suspected to have reduced visibility more than currently occurs from wildfire and fire use during some summer months (Greater Yellowstone Area 1999). No information is available on how the distribution of visibility conditions at present differs from the profile under "natural" conditions, but currently, the cleanest 20 percent of the days probably approach natural conditions (GCVTC 1996).

Designated Sensitive Areas

Non-attainment and Maintenance Areas

Ambient air monitoring for health-based state and National Ambient Air Quality Standards has been centered on larger urban populations in Idaho. In some cases monitoring has shown exceedances of standards in several areas. An area that is found to be in violation of a primary NAAQS is labeled a non-attainment area. An area once in non-attainment but recently meeting NAAQS, and with appropriate planning documents approved by EPA, is called a maintenance area. Northern Ada County, including the area surrounding the city of Boise, was designated as a non-attainment area for carbon monoxide, and is currently in non-attainment status for particulate matter (PM 10). The non-attainment for carbon monoxide occurred starting in 1977. Due to control measures instituted, many of them related to new vehicle emissions standards, carbon monoxide standards had not been violated since 1991. IDEQ, Air Quality Division, finalized a Maintenance Plan that explained how the area would ensure that carbon monoxide levels remain below the standard in the future. EPA approved the Carbon Monoxide Maintenance Plan in December 2002, which demonstrates that the area is now in attainment of the carbon monoxide standard. It also outlines steps to ensure that the area will remain so.

Northern Ada County was designated as non-attainment for particulate matter (PM 10) in 1987. Again, standards for this pollutant have not been violated since 1991. In September 2002, IDEQ submitted the Northern Ada County PM 10 Maintenance Plan to EPA. This plan demonstrates compliance with the PM 10 standard through 2020. EPA is expected to approve this plan in the summer of 2003. When approved, Northern Ada County will return to attainment status for PM 10 (be designated a PM 10 maintenance area).

Originally Portneuf Valley PM 10 Non-attainment Area was part of the Power/Bannock Counties Non-attainment Area, but this area was split into two areas. The Portneuf Valley PM 10 Non-attainment Area covers slightly over 96 square miles near Pocatello, Chubbuck, and surrounding areas. The last exceedance in this area from 1989 through 1998 was in 1993. Through 1997 the

area generally had a favorable trend, but levels had increased in 1998. Like the Northern Ada County Non-attainment Area, areas tend to experience the highest concentrations of pollutant levels in the winter months (December, January, and February) when dispersion is reduced.

No areas within Idaho have been designated yet for PM 2.5 status. The IDEQ began establishing PM 2.5 network across the state in 1998 near larger urban centers. Data from this time period shows levels below the NAAQS. However, there has not been a serious weather stagnation event that could result in a build up of this pollutant since monitoring began. In 2001, IDEQ expanded their PM 2.5 monitoring network to include more rural areas such as Idaho City and McCall. These monitors were established as part of a special purpose network and therefore are not used to determine attainment status. However, beginning in 2003 additional monitors will be added to the state's network to start this process. During this same year, it is expected that attainment status for PM 2.5 will begin for those areas where monitoring has been in place for at least 3 years.

Visibility Impairment (Mandatory Class I Areas)

Current visual conditions for Class I areas adjacent to or surrounded by the Ecogroup area are among the best in the western U.S (IDEQ 2003, US EPA November 2001). Visibility in the West is generally better than in the East due in part to the lower relative humidity, as visibility conditions are affected by the scattering and absorption of light by particles and gases. In addition, the types and levels of pollutants vary from west to east. The five main types of pollutants that affect visual range are sulfate, nitrate, organic carbon, elemental carbon (soot), and crustal material (soil). In the east, the greatest contributor to visibility impairment is sulfates primarily from fossil fuel combustion. In the west, however the main contributors vary more by season and location, but generally organic carbon is the main contributor (US EPA November 2001, Malm et al. 2000).

For sites in and near the Ecogroup area, elemental carbon contributes the least amount of impairment annually and seasonally. Organic carbon, followed by crustal material, is the next greatest annual and seasonal contributor. Organic carbon and crustal material contribute to the most impairment, relative to other pollutant types, during summer and fall.

The assessment conducted by Ferguson and Rorig (in press) regarding the potential for pollution from industrial sources to reach wilderness areas found that the pollution exposure of the Ecogroup is generally low. This is because the largest sources of industrial emissions affecting the Ecogroup are a long distance to the north and west. Pollutant trajectories are generally north and south of the airflow patterns traveling through the Ecogroup. Most industrial emissions from point sources in Washington, Oregon, California, and western Idaho are well dispersed before entering the Ecogroup area. The Sawtooth Wilderness has the most exposure in the Ecogroup from relatively low levels of particulate matter emitted by industrial sources during the summer months. Although some mapped trajectories indicate impacts from sources that are a long distance from Class I areas, topography of the region and simplicity in the modeling used suggest the greatest threats to air quality are primarily from nearby sources.

Visibility conditions in Class I areas are monitored using the IMPROVE network. Visibility indices are calculated for Class I areas based on this monitoring information. Standard visual

range estimates have been derived from camera, aerosol, and optical data from Class I areas. Standard visual range (SVR) is the greatest distance at which an observer can just see a black object viewed against the horizon sky. SVR estimates for the Class I wilderness areas within or adjacent to the Ecogroup are similar. Table AQ-5 displays these data by Class I areas that occur within the area of consideration.

Table AQ-5. Calculated Visibility Indices[1] for Class I Areas Within the Area of Consideration

Class I Area	Visibility Indices					
	Clear (90th percentile)		Median (50th percentile)		Hazy (10th percentile)	
	SVR[2] (miles)	Fine Mass[3]	SVR[2] (miles)	Fine Mass[3]	SVR[2] (miles)	Fine Mass[3]
Eagle Cap Wilderness	191	No data	114	No data	53	No Data
Hells Canyon Wilderness	197	No data	110	No data	60	No Data
Selway-Bitterroot Wilderness	153	.7 – 1.1	115	2.0 – 2.3	71	4.7 – 8.4
Anaconda-Pintlar Wilderness	170	n/a	103	n/a	52	n/a
Sawtooth Wilderness	161	.9 – 1.3	109	1.9 – 2.8	53	4.0 – 8.2
Craters of the Moon National Monument	n/a	1.0 – 1.7	n/a	2.3 – 3.5	n/a	5.2 – 8.0
Jarbidge Wilderness	169	1.0 – 1.6	106	2.1 – 3.7	65	4.4 – 7.5

[1]Data from National Air Resource Management Program Web Page
[2]SVR=Standard Visual Range
[3] Fine mass=PM 2.5

Fine mass concentrations can be correlated to visual range by season using this data. Visibility indices can be used to reveal seasonal and annual variation. The season with the best visibility occurs most often in the winter whereas the season with the worst visibility is in the summer (Malm et al. 2000, US EPA 2001). Visibility impairment in the spring and fall is generally similar. Preliminary data from the Sawtooth Wilderness follows this seasonal pattern for best and worst periods of visibility in that winter is best and summer is worst (Copeland 2001). Although monitoring data indicates the types of pollutants that impact visibility, additional data collection and analysis is necessary to determine the sources of these pollutants, especially since many sources emit similar types of pollutants. In addition, it is often unknown if the source of the pollutant is close to or far away from the monitor since fine particulates can travel hundreds of miles from their origination point.

Other Sensitive Areas

Because emissions information is collected at the county level, counties were used as an indicator of potential impacts to sensitive areas. Counties are nested within airsheds, which provide the geographic context of where potential fire use activities may take place based on vegetative types (fire regimes) and kinds of fire use. Counties within the larger area of consideration were used to evaluate the current condition and as a relative gauge for potential concerns regarding particulate matter transport. Counties containing or adjacent to Ecogroup administered lands were used to evaluate the existing condition and emission sources.

Existing Sources and Emission Levels for Counties

Summary of Emission Levels and Sources of Particulate Matter

Nationally in 1998 Idaho ranked 14th highest for PM 10 and 17th for PM 2.5 from anthropogenic (human-caused) sources (US EPA March 2000). Montana ranked higher for PM 10 and PM 2.5 (6th and 12th respectively). Oregon, Washington and Utah ranked lower than Idaho. Nevada was ranked among the lowest nationally for PM 10 and PM 2.5 at 44th.

Sources of Particulate Matter (PM 10 and PM 2.5) Emissions by Counties

Information from the EPA National Emissions Trend (NET) database was used to develop trends and annual averages based on a 5-year period (1995 through 1999) for PM 10 and PM 2.5. This database was also used to determine contribution toward the total PM 10 or PM 2.5 emissions from various sources based on 1999 data (US EPA undated).

The NET system is a national repository database compiled by EPA. The NET blends state and local-supplied data with EPA-derived data to form a comprehensive national inventory of criteria and toxic pollutants (US EPA 1999). Estimates are added to the inventory each year, with increasing levels of detail in the more recent years. As a result, the NET reflects the latest information available. However the NET inventory does not always include state data for any particular source or pollutant. The NET database contains an aggregate of annual emissions of criteria air pollutants from all types of sources by county. Sources of particulate matter come from any number of point, mobile, or area sources. Point sources are stationary sources of emissions, such as an electrical power plant that has a name and location. Area sources are small point sources or diffuse stationary sources that do not qualify as a point source. Mobile sources are any kind of vehicle or equipment that has a gasoline or diesel engine. Mobiles sources are combined with area sources within the NET database. A NET Tier report includes emissions from area sources such as vehicles, residences, and wildfires. Areas sources are not identified individually either, but rather their emissions are estimated in aggregate. Area source categories are nested under "Miscellaneous" and are further broken down by types of activities that generate particulate matter. Sub-categories for "Miscellaneous" are "Agriculture and Forestry", "Other Combustion", and "Fugitive Dust". The sub-category Agriculture and Forestry generally include emissions from activities such as agricultural crops or tilling and feedlots. The sub-category Fugitive Dust generally includes estimates for dust generated by activities such as travel on unpaved roads and construction. The sub-category Other Combustion includes estimates primarily from wildfires and may include prescribed burning or other "managed" burning. It is difficult to tell from the data how much of the emissions estimates included managed burning for various purposes such as forest and rangeland and/or agriculture. Wildfires are also estimates

aggregated to the county level, but errors can be introduced due to the methods used to apportion wildfire acres burned and therefore emissions.

The amount of emissions in an area is only an indicator of the potential to have an effect on ambient air concentrations and cannot be directly related to the NAAQS. However, the amount of emissions can be used as a relative indicator to identify areas of concern. Areas of concern would be any area that has existing high levels of emissions and where fire use activities are expected to greatly increase emissions. Additional concern would exist if increased emissions, along with topographic or meteorological conditions, could hinder dispersion. Several of the non-attainment areas within the area of consideration have these kinds of compounding effects, which increase ambient air concentrations to a level that can exceed standards.

Of interest are the trend and amount as well as the sources of particulates emitted and the spatial relationship of the emissions. Figures AQ-3 and AQ-4 display the PM 10 and PM 2.5 emissions for the counties within and around the area of consideration. The sixteen counties with Ecogroup administered lands within their boundaries are among the lowest for total tons of PM 10 and PM 2.5 emissions.

Tables AQ-6 and AQ-7 display the relative ranking of annual average particulate matter emissions from 1995 through 1999 and describe the trend over that period (US EPA undated). Counties highlighted in gray are those that contain Ecogroup administered lands. Idaho counties are ranked relative to the counties within the area of consideration. The Sawtooth National Forest has administered lands within one county in Utah (Box Elder). One other Utah county (Cache) is within the area of consideration but was not included due to the small amount of area captured by the boundary. The tables also indicate which counties have non-attainment or maintenance areas within them. However, this does not mean that the entire county has been designated as non-attainment/maintenance.

Table AQ-6. PM 10 Emissions Data Summary (1995 – 1999) for Idaho and Utah Counties

State – County	Sensitive Area Within County		Relative Rank	PM 10 Trend Description	PM 10 Annual Avg. (tpy)[1]
	Non-attainment or Maintenance	Impact Zone			
Idaho – Canyon	N	Boise	1	Improving	47,612
Idaho – Ada[2, 3]	PM 10 Non-attainment, CO Maintenance (Northern Ada Co.)	Boise	2	Improving	28,395
Idaho – Bingham	N		3	Improving	25,610
Idaho – Twin Falls	N	Twin Falls	4	Improving	25,564
Idaho – Idaho	N		5	Improving	16,678
Idaho – Jefferson	N		6	Improving	15,804
Idaho – Clearwater	N		7	Improving	15,148
Idaho – Cassia	N		8	Improving	14,550
Idaho – Nez Perce	N		9	Improving	13,163
Idaho – Minidoka	N		10	Improving	11,802
Idaho – Bannock	PM 10 (Portneuf Valley)	Pocatello	11	Improving	11,742

State – County	Sensitive Area Within County		Relative Rank	PM 10 Trend Description	PM 10 Annual Avg. (tpy)[1]
	Non-attainment or Maintenance	Impact Zone			
Idaho – Owyhee	N		12	Improving	11,391
Idaho – Jerome	N		13	Improving	10,710
Idaho – Payette	N		14	Improving	10,413
Idaho – Elmore	N		15	Improving	9,415
Idaho – Valley	N	McCall	16	Improving	9,365
Idaho – Gooding	N		17	Improving	9,098
Idaho – Blaine	N	Sun Valley/ Ketchum	18	Improving	8,928
Idaho – Power	PM 10 (Fort Hall)	Pocatello	19	Improving slightly	8,249
Idaho – Gem	N		20	Improving	7,749
Idaho – Caribou	N		21	Improving	6,052
Idaho – Lewis	N		22	Improving	6,034
Idaho – Franklin	N		23	Improving	5,845
Idaho – Camas	N		24	Improving	5,556
Idaho – Washington	N		25	Improving	4,805
Idaho – Boise	N		26	Improving	4,803
Idaho – Lemhi	N	Salmon	27	Improving	4,562
Idaho – Oneida	N		28	Improving	4,523
Idaho – Adams	N		29	Improving	4,426
Idaho – Custer	N		30	Improving	3,939
Idaho – Lincoln	N		31	Improving	3,667
Idaho – Butte	N		32	Improving	3,291
Idaho – Clark	N		33	Improving slightly	1,442
Utah – Box Elder	N	N/A	9b	Improving	13, 162

[1]tpy = tons per year
[2]The maintenance plan for PM 10 is expected to be approved by EPA in summer of 2003
[3]Gray-shaded boxes are counties that contain Ecogroup Forest administered lands.

Table AQ-7. PM 2.5 Emissions Data Summary (1995 – 1999) for Idaho and Utah Counties

State – County	Sensitive Area Within County		Relative Rank	PM 2.5 Trend Description	PM 2.5 Annual Avg. (tpy)[1]
	Non-attainment or Maintenance	Impact Zone			
Idaho - Clearwater	N/A		1	Increasing Slightly	9,490
Idaho – Canyon	N/A	Boise	2	Constant	8,872
Idaho – Idaho[2]	N/A		3	Constant	6,798
Idaho – Ada	N/A	Boise	4	Improving Slightly	6,155
Idaho – Twin Falls	N/A	Twin Falls	5	Improving Slightly	5,298
Idaho – Nez Perce	N/A		6	Constant	5,196
Idaho – Bingham	N/A		7	Improving Slightly	4,568
Idaho – Valley	N/A	McCall	8	Constant	4,158
Idaho – Camas	N/A		9	Improving [3]	4,041

State – County	Sensitive Area Within County		Relative Rank	PM 2.5 Trend Description	PM 2.5 Annual Avg. (tpy)[1]
	Non-attainment or Maintenance	Impact Zone			
Idaho – Owyhee	N/A		10	Constant	3,871
Idaho - Jefferson	N/A		11	Improving Slightly	2,903
Idaho – Power	N/A	Pocatello	12	Constant	2,865
Idaho – Cassia	N/A		13	Constant	2,814
Idaho – Bannock	N/A	Pocatello	14	Improving Slightly	2,490
Idaho – Minidoka	N/A		15	Constant	2,151
Idaho – Blaine	N/A	Sun Valley/ Ketchum	16	Constant	2,122
Idaho – Elmore	N/A		17	Constant	2,120
Idaho – Jerome	N/A		18	Constant	1,939
Idaho – Gem	N/A		19	Improving Slightly	1,870
Idaho – Boise	N/A		20	Constant	1,839
Idaho – Payette	N/A		21	Constant	1,821
Idaho – Lewis	N/A		22	Constant	1,682
Idaho – Adams	N/A		23	Constant	1,622
Idaho – Gooding	N/A		24	Improving	1,618
Idaho – Caribou	N/A		25	Improving Slightly	1,334
Idaho – Lemhi	N/A	Salmon	26	Improving	1,069
Idaho – Franklin	N/A		27	Constant	1,019
Idaho – Washington	N/A		28	Constant	911
Idaho – Oneida	N/A		29	Improving Slightly	873
Idaho – Custer	N/A		30	Constant	746
Idaho – Lincoln	N/A		31	Constant	662
Idaho – Butte	N/A		32	Constant	600
Idaho – Clark	N/A		33	Constant	303
Utah – Box Elder	N/A	N/A	10b	Constant	3,515

[1] tpy = tons per year
[2] Grey shaded boxes are counties that contain Ecogroup administered lands.
[3] While Camas County show improvement over the 5-year period, estimated emissions are actually increasing when a large spike caused by wildfire in 1996 is removed.

Figure AQ-3. Annual average PM 10 emissions from 1995 through 1999 for counties within the Southwest Idaho Ecogroup Area of Consideration for Air Quality Effects

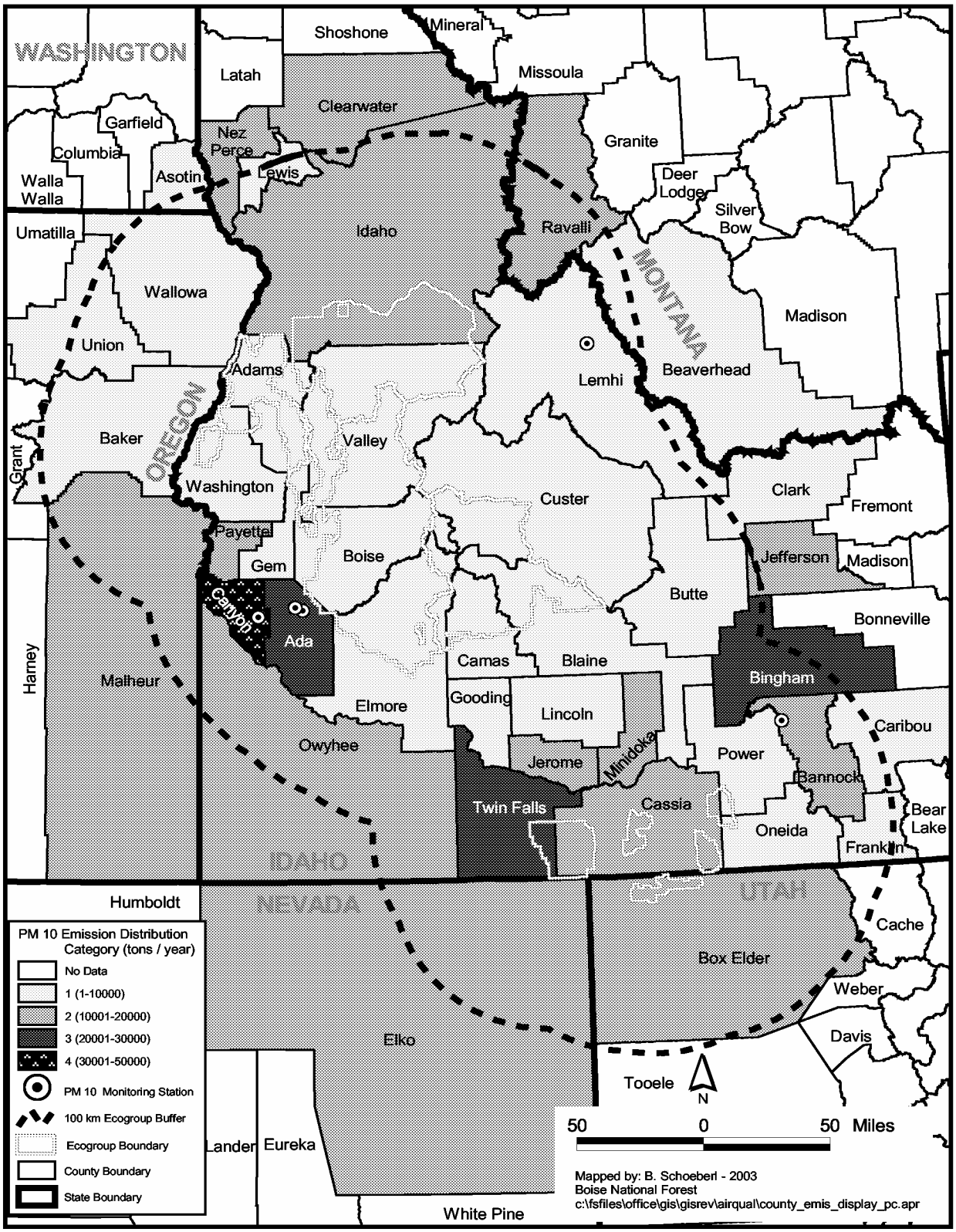
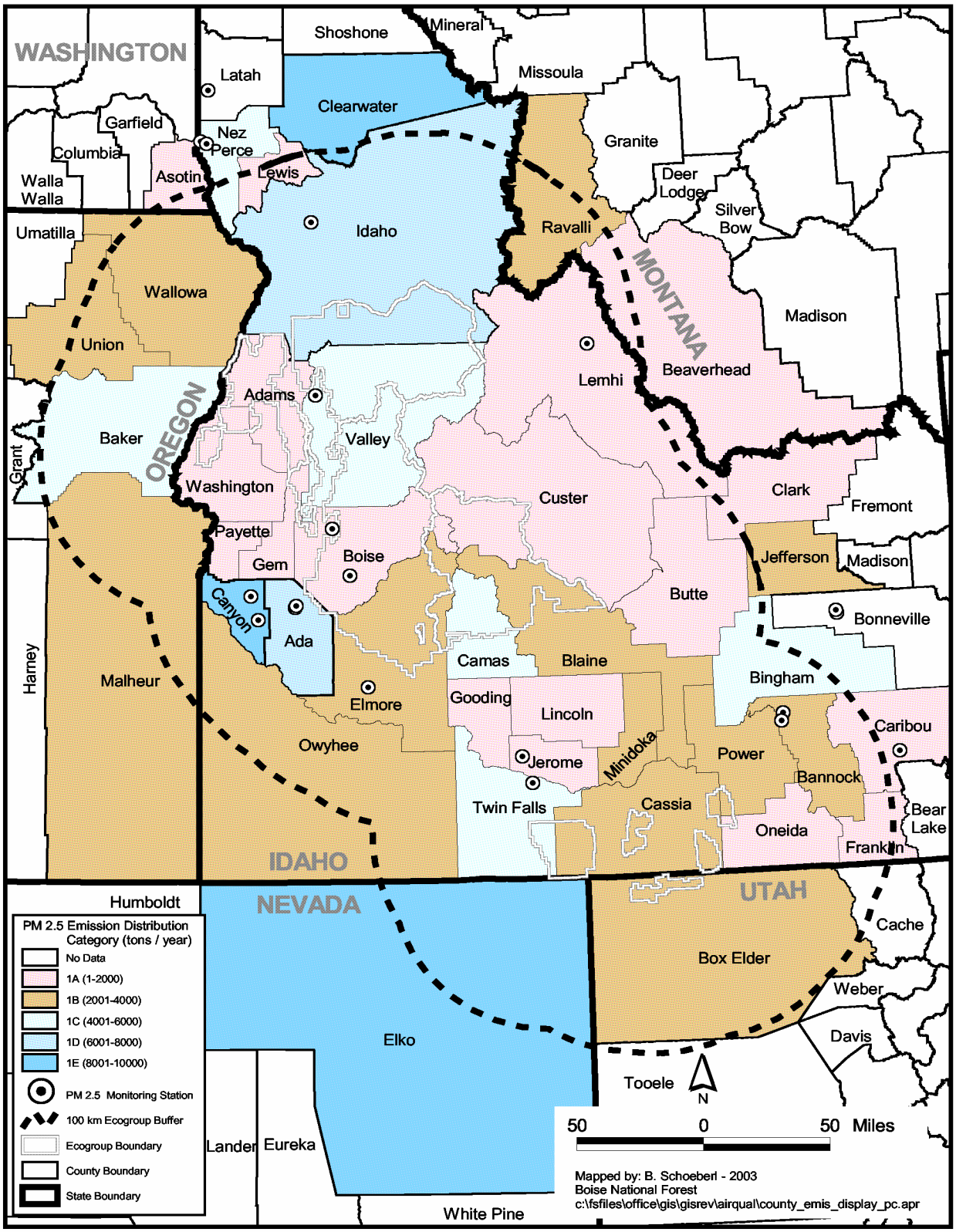


Figure AQ-4. Annual average PM 2.5 emissions from 1995 through 1999 for counties within the Southwest Idaho Ecogroup Area of Consideration for Air Quality Effects



The counties with the highest PM levels are often associated with urban population centers such as Canyon and Ada and/or agricultural activities such as tilling in counties like Twin Falls or Bingham. Tilling, along with road construction and use of unpaved roads, contribute to estimates of Fugitive Dust. Fugitive Dust estimates for many counties account for greater than 50 percent of total annual PM 10 emissions.

Few point sources exist in counties that have Ecogroup administered lands within their boundaries. Counties with point sources include Gem, Elmore, Twin Falls, and Power. Power and Gem have the highest levels of emissions from point sources. Point sources in Power County contribute about 2,000 tons per year of PM 10. These sources, which are often located in close proximity to population centers, can contribute to air quality concerns when combined with local topographic influences and weather patterns (e.g. inversions).

In general, most counties with Ecogroup administrative areas within their boundaries have an improving trend in emissions largely due to reductions in Fugitive Dust. While Fugitive Dust is a large proportion of reported emissions, it is also a source that may travel only a few kilometers from its origin (US EPA March 2000). The effects to ambient air quality and visibility impairment would most likely be localized. There are exceptions during unusual episodes where dust can be transported thousands of miles. In the spring of 1998 and 2000 widespread events in the western U.S. were attributed to dust originating in China and Mongolia combined with special meteorological conditions. PM 2.5, because it is smaller than PM 10, can travel greater distances. Therefore, sources that produce more PM 2.5 than PM 10 can have impacts farther away.

Fire is also used for other purposes including crop residue disposal and weed abatement. This type of open burning is more prevalent in rural counties where agriculture is common. Table AQ-8 displays the acres and tons of residue burned by county from a survey conducted for 15 western states (ERG and Enviro-Tech 2002). While this information is not intended to show average annual amounts since the data is based on a single year, it allows for a county-to-county relative comparison. Comparison ratings range from very low to very high.

Table AQ-8. Acres Burned, Crop Residue Burned (in tons), and Relative Rating of Counties in the Area of Consideration

County[1] - State	Totals		Relative Rating
	Acres Burned	Residue Burned (tons)	
Ravalli, MT	15	30	Very Low
Beaverhead, MT	80	150	Very Low
Boise, ID	81	216	Very Low
Elko, NV	144	[2]	Very Low
Adams, ID	589	1,614	Very Low
Valley, ID	581	1,811	Very Low
Baker, OR	[2]	1,998	Very Low
Clearwater, ID	1,794	3,341	Very Low
Lemhi, ID	1,270	3,455	Very Low

County[1] - State	Totals		Relative Rating
	Acres Burned	Residue Burned (tons)	
Custer, ID	1,528	3,667	Very Low
Gem, ID	1,912	4,069	Very Low
Wallowa, OR	[2]	4,113	Very Low
Payette, ID	2,401	5,156	Low
Clark, ID	2,832	5,978	Low
Asotin, WA	2,950	6,431	Low
Camas, ID	3,003	6,178	Low
Blaine, ID	3,495	6,981	Low
Washington, ID	3,302	7,235	Low
Gooding, ID	4,069	8,459	Low
Butte, ID	4,376	8,464	Low
Ada, ID	3,929	8,526	Low
Owyhee, ID	4,042	8,864	Low
Lincoln, ID	4,635	9,374	Low
Elmore, ID	5,010	10,346	Mod Low
Franklin, ID	7,247	14,757	Mod Low
Union, OR	[2]	18,144	Mod Low
Jerome, ID	9,304	18,837	Mod Low
Box Elder	9,672	18,891	Mod Low
Bannock, ID	9,515	19,918	Mod Low
Oneida, ID	10,118	20,808	Moderate
Canyon, ID	10,097	21,118	Moderate
Idaho, ID	13,441	25,704	Moderate
Malheur, OR	[2]	25,731	Moderate
Minidoka, ID	13,023	25,812	Moderate
Jefferson, ID	14,098	27,552	Moderate
Fremont, ID	15,779	30,053	Mod High
Twin Falls, ID	14,861	30,461	Mod High
Nez Perce, ID	17,614	33,603	Mod High
Caribou, ID	18,719	36,078	Mod High
Lewis, ID	19,951	38,387	Mod High
Power, ID	21,813	44,738	High
Cassia, ID	22,515	45,929	High
Bingham, ID	26,196	52,729	Very High

[1] Counties highlighted indicate Ecogroup administered lands within the county boundary
[2] Data was not provided from the cited source so totals were omitted

Ecogroup Airsheds

Recent Wildfire and Fire Use Summaries

Recent Wildfire (1981 - 2000) - Wildfires most often occur in July and August in the Ecogroup. In many cases, wildfires remain small and are quickly suppressed. However, occasionally storms ignite multiple fires. Under certain circumstances, particularly in areas with hazardous vegetative conditions, these fires can overwhelm suppression resources. Such fires sometimes become large and burn with high intensities and severities often for weeks, sometimes until

snowfall. Fires like these can result in the majority of acres burned by wildfire in any one decade. Smoke from these events can migrate and accumulate in populated or sensitive areas, remaining for several days to weeks, depending on the location and duration of the wildfire.

In a 20-year period some of the airsheds have been greatly affected by wildfires occurring on Ecogroup administered lands (Table AQ-9, Figure AQ-5 and AQ-6). Within the most recent decade (1991-2000) Airsheds 15, 16, and 21 have had the most acres burned by wildfire. Since 1981, 30 percent of the acres in Airshed 21 have been burned by wildfire on Ecogroup administered lands. Most of the acres burned during large events that occurred in the same year, for example in 1994 and 2000.

Table AQ-9. Airshed Size and Percent of Airshed Burned by Large Wildfires (greater than 300 acres) on Ecogroup Administered Lands During Two Decadal Time Periods

Idaho Airsheds	Airshed Size		Percent of Airshed		
	Acres	Square Miles	Most Recent Decade (1991-2000)	Second Decade (1981-1990)	20 - Year Total
14	2,083,640	3,256	2	2	3
15	2,953,870	4,615	13	6	19
16	3,156,400	4,932	14	7	21
17	5,018,750	7,842	N/A[1]	N/A	N/A
21	1,726,160	2,697	28	2	30
24	1,092,370	1,707	N/A	N/A	N/A
25	5,297,680	8,277	1	1	2

[1]N/A designates that there were no wildfires greater than 300 acres

Recent Fire Use (1981-2000) - Fires used to manage resources are generally conducted when weather conditions allow for quick smoke dispersal. Prescribed fires are currently most often implemented in the spring or late fall when weather conditions are better for smoke dispersal while still meeting burning objectives. Weather is a primary factor in determining if an area can be burned under conditions that will meet fire use and air quality objectives. When weather and vegetative conditions (the prescriptive window) are favorable for prescribed burning, the favorable conditions typically extend over several airsheds. Therefore, burners across the airsheds may all be seeking to implement projects at the same time.

Forests within the Ecogroup conduct prescribed fires through the coordinated operations of the Montana/Idaho Airshed Group. Table AQ-10 shows the percentage of area in Idaho airsheds that is managed by federal and state members of the Montana/Idaho Airshed Group. Some airsheds, for example 16, 17, and 21 are managed primarily by member agencies. In Airshed 21, the Ecogroup is the primary land manager, administering 80 percent of the airshed. In Airsheds 14 and 24, only about half the area is managed by Airshed Group members.

Figure AQ-5. Areas Affected by Wildfires Greater than 300 acres on the Northern Portion of the Ecogroup from 1981 through 2000 by Two Decadal Periods

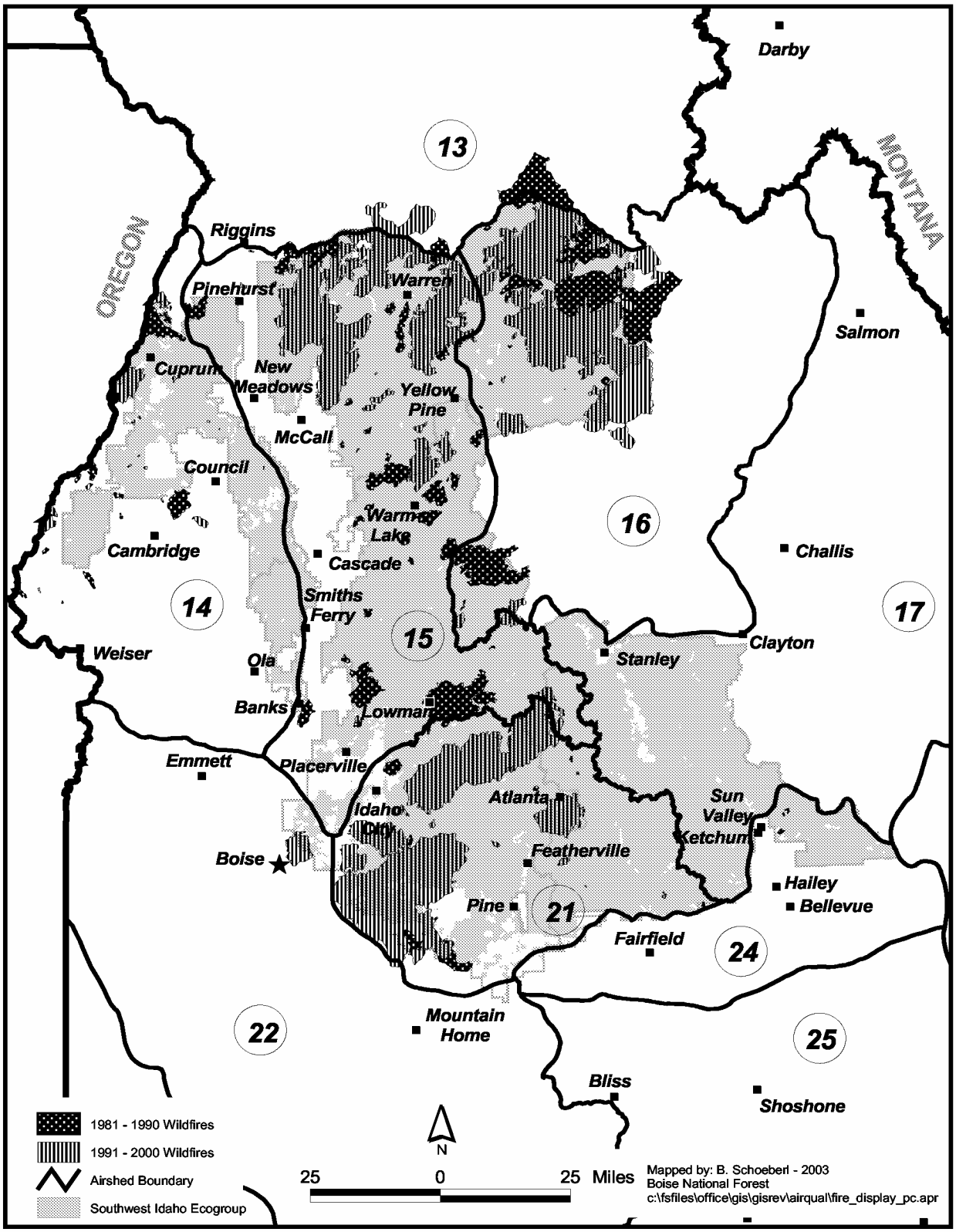


Figure AQ-6. Areas Affected by Wildfires greater than 300 acres on the Southern Portion of the Ecogroup from 1981 through 2000 by Two Decadal Periods

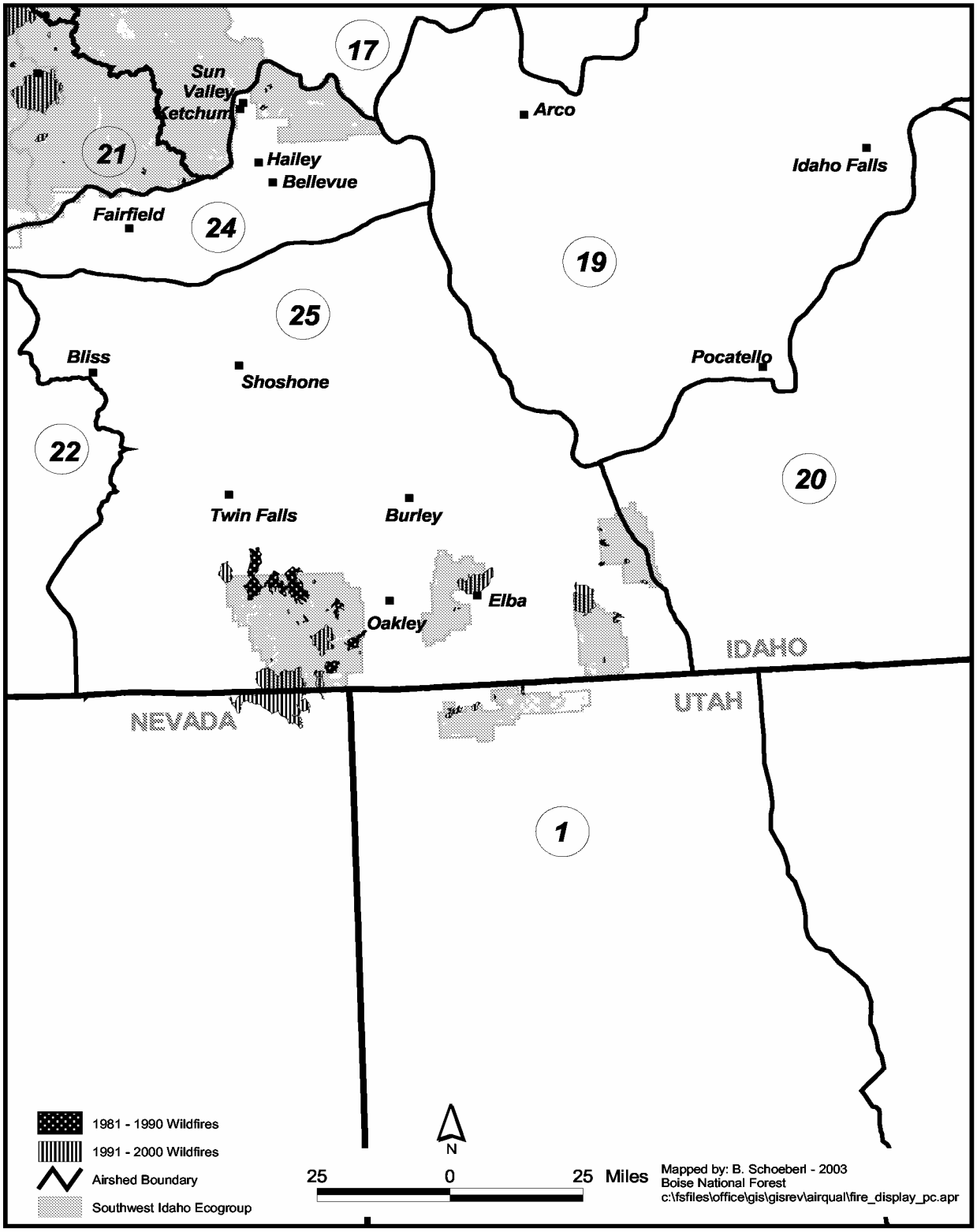


Table AQ-10. Percentage of Lands in Idaho Airsheds Managed by Airshed Group Members

Airshed[1]	Percent within Airshed				
	Boise	Payette	Sawtooth	Ecogroup Total	All Members
14	5	23	0	28	52
15	37	35	2	74	83
16	4	25	<1	29	98
17	0	0	16	16	92
20	0	0	< 1	< 1	48
21	52	0	28	80	89
24	<1	0	14	15	50
25	0	0	10	10	60

[1]Does not include members of the Airshed Group who are private landowners

The amount of burning, and therefore, emissions have varied annually because burn windows or prescriptions to achieve resource management objectives are tied to seasonal and daily weather conditions. The range of prescribed fire acres accomplished by the Ecogroup from 1995 through 1999 reflects this annual variability (Table AQ-11). The Payette and Boise Forests have focused most of the prescribed burning in Airshed 15. Airshed 14, which is primarily the Payette Forest, is the second most active airshed (Figure AQ-7). Though Airshed 21 has had relatively minor amounts of prescribed burning, it has been the airshed most impacted by wildfire in the recent past. Airshed 16 contains part of the Frank Church – River of No Return Wilderness. Resource management burning here has primarily been from wildland fire use, which is not displayed in Table AQ-11.

Table AQ-11. Range and Annual Average Acres Prescribed Burned by the Ecogroup from 1995 – 1999 by Airshed

Airshed	Acres	
	Range over 5 years	Annual Average
14	1,640 – 6,460	3,800
15	1,175 – 21,470	10,955
16	N/A	< 100
17	N/A	< 100
21	0 – 2,620	1,340
24	0 – 500	< 100
25	N/A	< 100
1	N/A	< 100

The amount of prescribed burning conducted in southern Idaho by all Montana/Idaho Airshed Group members is displayed in Figure AQ-8 (Montana/Idaho Airshed Group 2001, 2002). During 2000 and 2001 prescribed burning declined in part due to a moratorium on prescribed fire and the impact of the severe wildfire season. In 2002, the total amount of burning accomplished by member burners was slightly more than what was accomplished in 1999. Over the last four years the number of proposed or planned acres for any given year has remained relatively static.

Figure AQ-7. Acres of Prescribed Burning for the Ecogroup from 1991 through 2000

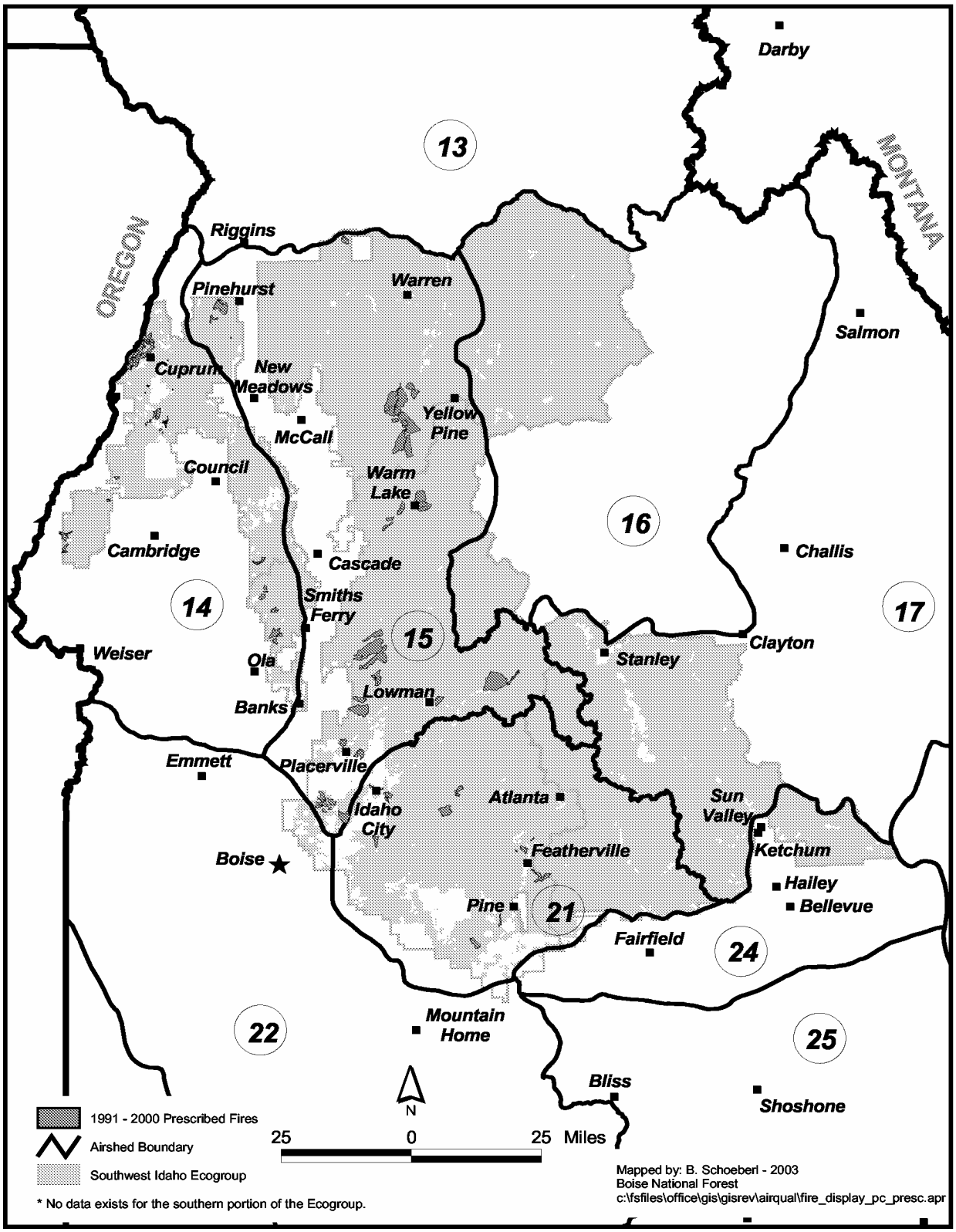
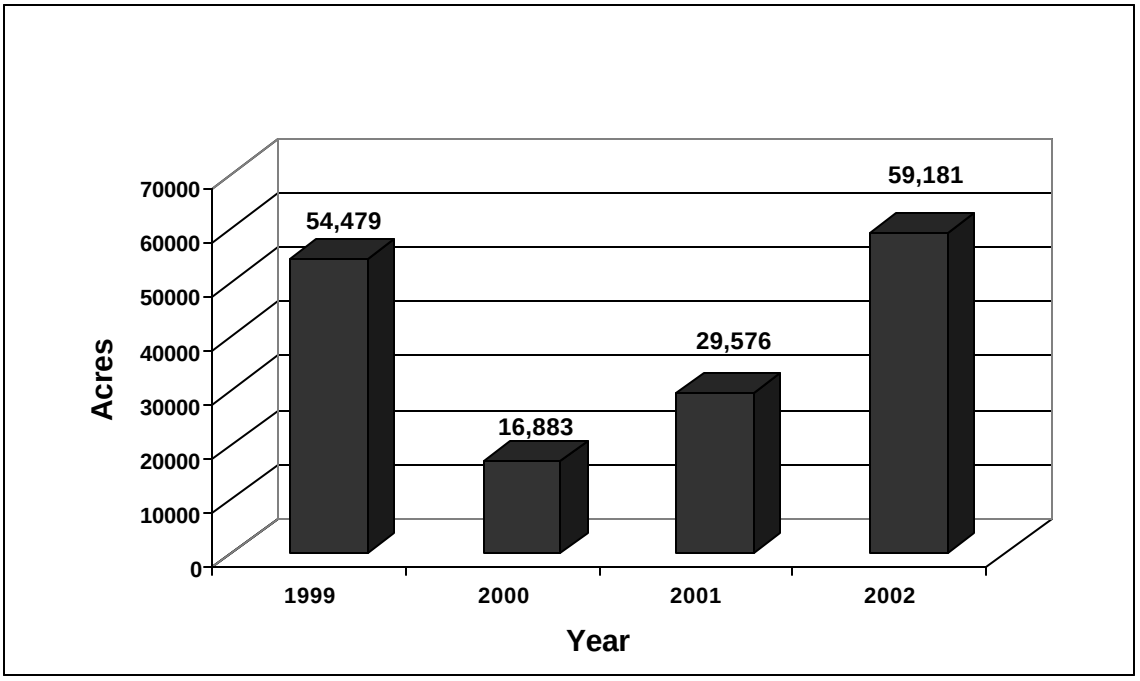


Figure AQ-8. Acres of Prescribed Fire Accomplished by all Members of the Montana/Idaho Airshed Group in South Idaho Airsheds from 1999 through 2001[1]

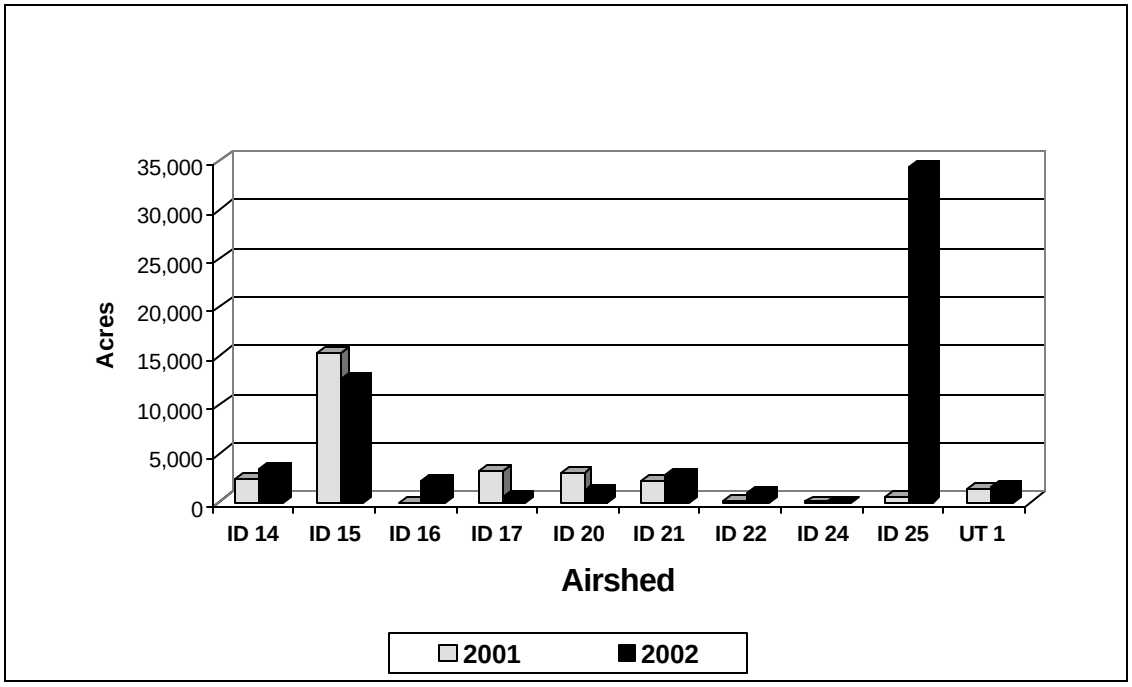


[1]The number of acres accomplished in 2000 is lower, in part, due to the moratorium on the use of prescribed fire placed on federal land management agencies

Figure AQ-9 displays the number of prescribed fire acres accomplished by all member burners in the Airsheds 14, 15, 16, 17, 20, 21, 22, 24, 25, and 1in 2001 and 2002 (Montana/Idaho Airshed Group annual report; Zschaechner 2001, 2002). In airsheds where the Ecogroup manages a large percentage of the area (for example 15 and 21), the amount of burning is within the range of acres accomplished from 1995 through 1999. In the past, the Ecogroup has implemented only a small number of prescribed fire acres in Airshed 25. In 2002, the Bureau of Land Management accomplished burning on a large number of acres in this airshed. In any given year the amount accomplished by all members in some airsheds will vary compared to others. Other National Forests and land management agencies including the Bureau of Land Management will likely implement prescribed burning in airsheds where the Ecogroup manages a small proportion of the airshed.

Currently, only two areas within the Ecogroup have approved plans for wildland fire use. The Frank Church – River of No Return Wilderness has had a fire management plan for wildland fire use since 1985. The Sawtooth Wilderness has had an approved plan since 1997. Like prescribed burning, wildland fire use occurs within a prescriptive window. In the case of wildland fire use, individual fires may be large, or several fires may be managed at one time. Wildland fires, ignited by lightning, usually occur in mid-summer to early fall when weather conditions are more stable. Decisions to allow these fires to burn are based on potential impacts to air quality and benefits to vegetation and other resource conditions.

Figure AQ-9. Number of Prescribed Fire Acres Accomplished by Montana/Idaho Airshed Group Members in 2001 and 2002 by Airshed



Dispersion Meteorology - Topography of the Ecogroup ranges from rolling foothills, to deep canyons, to steep rugged glaciated mountain peaks. The meteorology influenced by prevailing westerly winds affects the two distinctive climatic zones, Northern Rockies and the Snake River Plateaus (see the *Introduction*, Chapter 3). Some general meteorological information regarding smoke dispersion for the Ecogroup is described below.

The diverse nature of the terrain and climate can result in variable dispersion characteristics. Mountainous terrain can provide shelter from prevailing winds and severely limit wind in one area while funneling high winds into other areas. Temperature inversions, which trap pollutants, are common throughout the year, but the depth, duration, and intensity vary widely from the steep mountains to the deep canyons. Inversions on steep mountain slopes seldom persist past noon and usually become weaker with increasing altitude. Inversions in deep canyon areas are usually much stronger and can persist for several days during the fall and winter. Surface-level wind speed and direction patterns in the mountains are affected by terrain, and generalizations or comparisons to any existing measurements at other sites are impractical.

The impact of smoke at any sensitive area depends on the proximity of the fire use activities and the magnitude of the emissions. The greatest risk of smoke impacts occur when a sensitive area lies downwind and close to fire use activities. Daily heating and cooling, in combination with weather, influence the direction and dispersion of smoke. The farther away an area is from the fire, the less likely the impact. However, as the amount of emissions increases, the potential

impact also increases. Large fires that produce a lot of emissions (such as uncharacteristic wildfire) can impact a much larger area than a smaller fire at the same location.

Seasonal mixing heights, upper level, mid-level, and surface trajectory winds were described by Ferguson (1998) for the ICBEMP area including the Ecogroup. Information from April, July, and October was used to provide a relative representation of spring, summer, and fall surface, upper level, and morning and afternoon mixing heights (Figures AQ-10, AQ-11, and AQ-12). Mixing height is a level in the atmosphere above which vertical exchange of air is inhibited. As such, average monthly mixing heights can be used to approximate the elevations at which pollutants will disperse downwind. Mixing heights at or below 500 meters (1,640 feet) indicate potentially stagnate air which traps pollutants (USDA Forest Service 1976). Morning and afternoon mixing heights by season for selected communities were used to determine potential risks of trapping smoke.

During summer, smoke emissions within the Snake River Plateaus experience consistently high mixing heights because the summer sun efficiently warms this inland area. Summer mixing heights for smoke emissions within the Northern Rockies are generally not as high, and mid-level winds prevailing from the northwest steer smoke emissions. The range of mixing heights varies in lower elevations, especially adjacent to Boise, where topographic constraints from the Snake River Valley are even more dominant than the overall basin topography. In the fall, mixing heights for smoke emissions are much lower than in spring, but not as low as in winter. They frequently drop to the lower range of the mid-level winds that prevail from the west to slightly northwest for both climatic zones. Upper-level winds are relatively strong, so smoke emissions higher in the atmosphere disperse within reasonably short distances downwind of the source. Slightly weaker mid-level winds allow smoke emissions to be carried somewhat farther downwind compared to upper-level winds. Smoke emissions in the spring are generally steered by upper-level winds that prevail from the west to slightly northwest within the Snake River Plateaus, and by mid-level winds for the Northern Rockies, which prevail from the northwest. Upper-level winds during the summer prevail from the southwest, steering smoke emission trajectories.

Alternatives to Burning and Emissions Reduction - Some of the criteria identified in the *Interim Policy* regarding conditions where mechanical treatments to reduce emissions would be feasible can be evaluated at the scale of this analysis. Of these, some do not change by alternative. This includes areas not designated as Wilderness, and areas with slopes equal to or less than 40 percent. The accessibility of an area is in part determined by Management Prescription Category assignments, which determine availability of roads and will vary by alternative. Therefore this criterion will be discussed in the Effects section. Terrain that is not excessively rough, and areas with Threatened and Endangered species, or cultural and paleological resources are too fine scale to consider in this analysis. These would be evaluated during project-level planning in areas that meet the other criteria for use of mechanical treatments.

Figure AQ-10. Thirty-Year Average Surface Winds for April

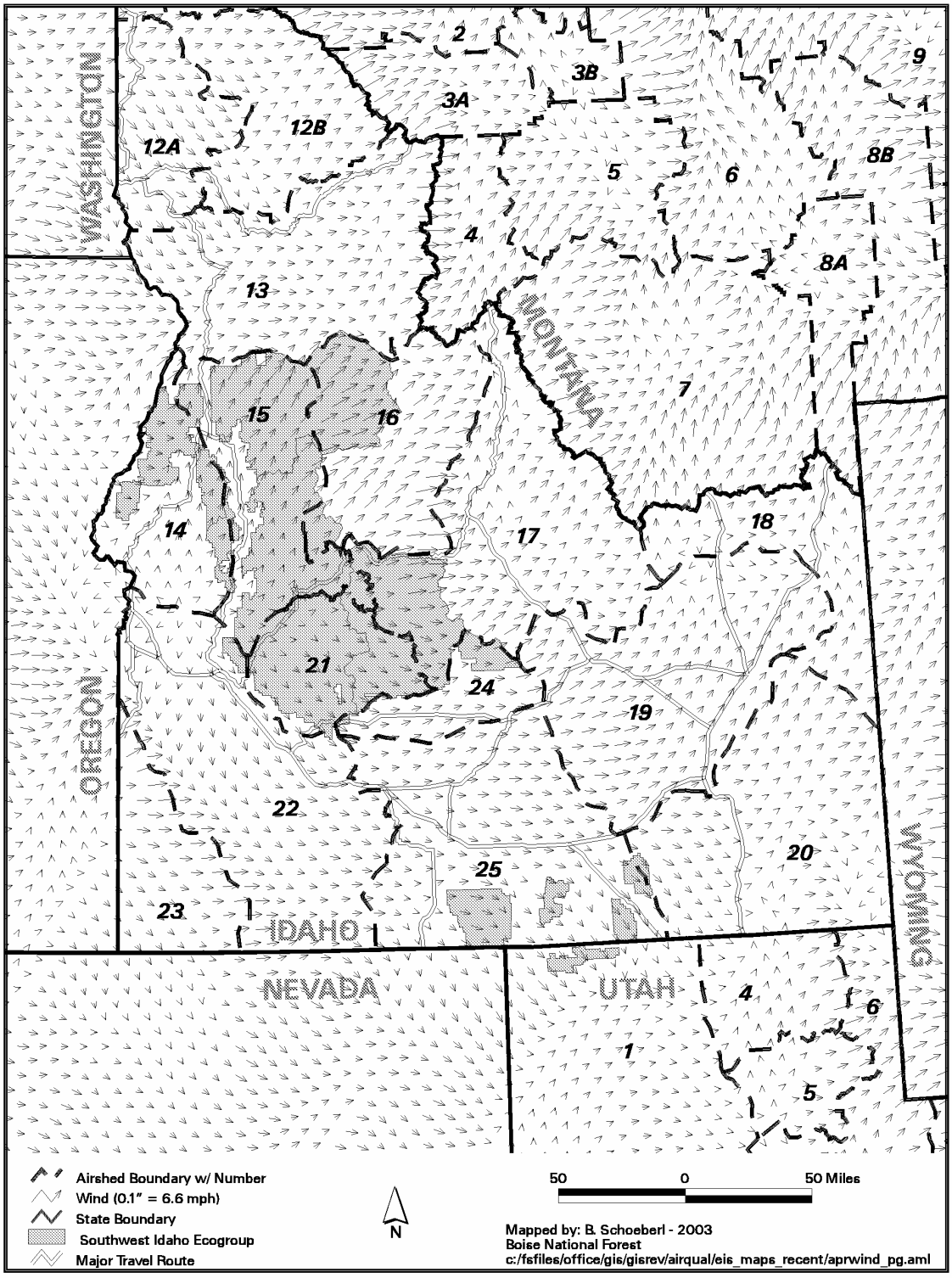


Figure AQ-11. Thirty-Year Average Surface Winds for July

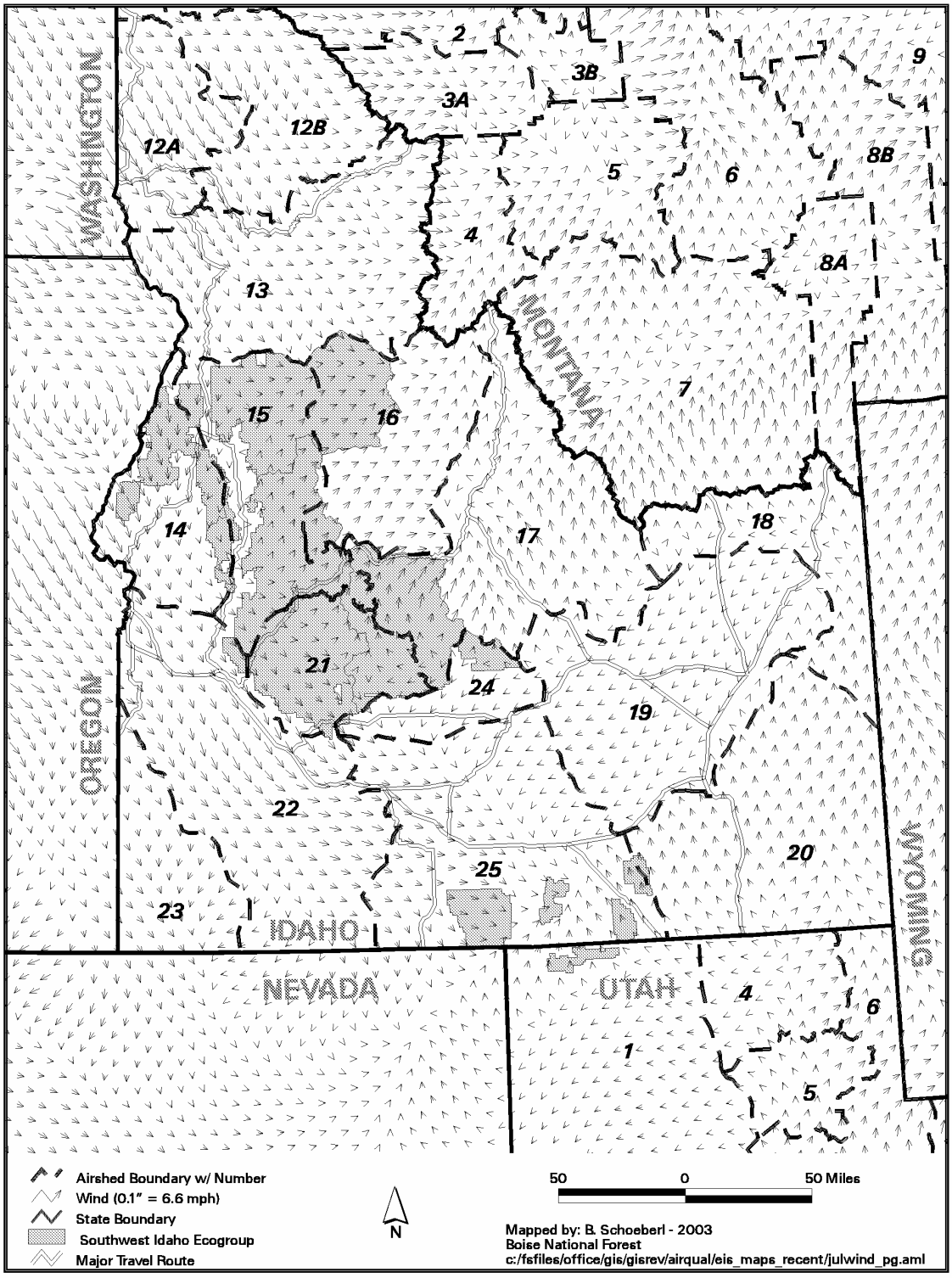


Figure AQ-12. Thirty-Year Average Surface Winds for October

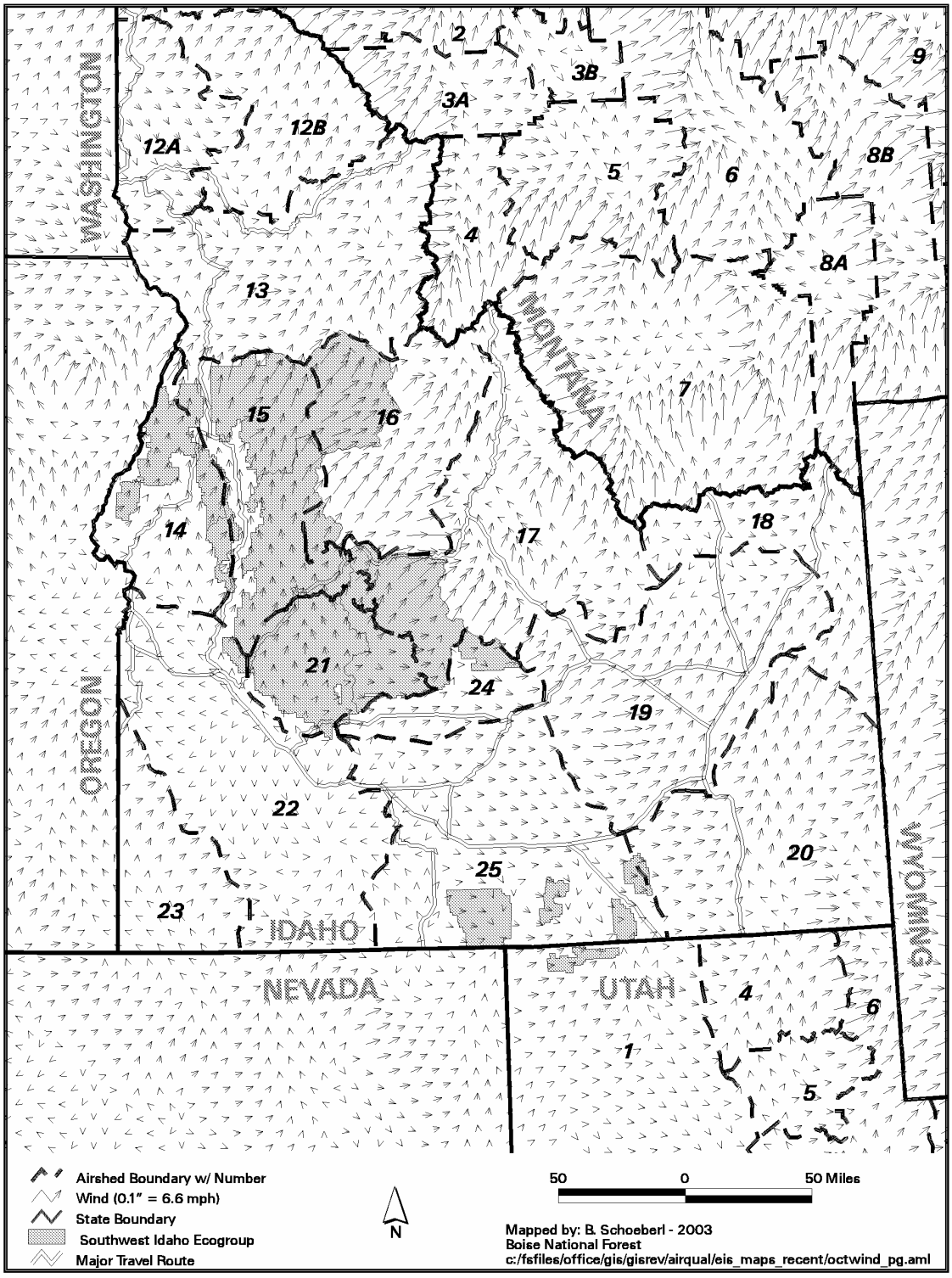


Table AQ-12 displays the percentage of each airshed administered by the Ecogroup that is in designated Wilderness, has slopes greater than 40 percent or slopes less than or equal to 40 percent. Opportunities for use of mechanical treatments on Ecogroup administered areas vary by airshed based on the amount of area with these various attributes. For example, the Ecogroup administers a large share (67 percent) of the acres in Airshed 16. However, 61 percent of these acres are in the Frank Church – River of No Return Wilderness. Much of Airshed 21 (80 percent) is administered by the Ecogroup but more than half of this (44 percent) is designated Wilderness or too steep for mechanical treatments. Airshed 15 has the most area that is Ecogroup administered lands with slopes amenable to mechanical treatments.

Table AQ-12. Percent of Airsheds Administered by the Ecogroup, Designated as Wilderness, with Slopes Greater than 40 Percent, and with Slopes Less Than or Equal to 40 Percent

Airshed[1]	Size of Airshed (Acres)	Percent of Airshed Administered by the Ecogroup	Percent of Airshed Ecogroup Acres Designated as Wilderness	Percent of Airshed Ecogroup Acres with Slopes greater than 40 percent	Percent of Airshed Ecogroup Acres with Slopes less than or equal to 40 percent
14	2,083,636	31	3	8	20
15	2,953,873	76	6	29	41
16	3,156,400	67	61	2	4
17	5,018,746	16	1	7	8
21	1,726,163	80	5	39	36
24	1,092,371	14	0	9	5
25	5,297,682	10	0	2	8
1	8,345,500	<1	0	<1	<1

[1]Airsheds 19 and 22 omitted from table due to the minor amounts of Ecogroup administered lands

Airshed Characterizations

Airshed 14

Description - This airshed is located in the northwest portion of the Ecogroup area. It covers over 2.0 million acres including portions of Hells Canyon, Brownlee Reservoir, and the Weiser and Payette River watersheds. Four counties are partially or wholly within the boundaries. These include Adams (75 percent), Washington (100 percent), Gem (58 percent), and Payette (48 percent). Appropriately 52 percent of the airshed is under Federal or State management. Of this 28 percent is managed by the Ecogroup, 18 percent is other Federal, and 6 percent is State.

Sensitive Areas -This airshed contains portions of the Hells Canyon Wilderness, which is a Class I area administered by the Wallowa-Whitman National Forest. There are no non-attainment, maintenance, or Impact Zones. There are several small communities that occur in the airshed including Cambridge, Council, Cuprum, Evergreen, Fruitvale, Midvale, Ola, Sweet, and Weiser. All of these communities are listed as "Urban Wildland Interface Communities" under the National Fire Plan.

Sources and Levels of PM 10 and PM 2.5 Emissions - Three of the four counties that occur in the airshed have lands administered by the Ecogroup. This includes Gem, Adams, and Washington. Gem County includes one point source that produces PM 10 or PM 2.5 levels above 100 tons per year. However, there are sources in an adjacent airshed (22) that contributed 33 percent of the total PM 2.5 emissions to this airshed. For all counties, Fugitive Dust made up the majority of the PM 10 emissions. Fugitive Dust was the primary emissions source for PM 2.5 in Payette and Washington Counties. In Adams County, Other Combustion contributed the most. In Gem County, Fugitive Dust and the point source were the primary contributors.

Of the three counties containing lands administered by the Ecogroup, Gem has the highest existing levels of PM 10 and PM 2.5. Gem ranks 18th for PM 10 and 17th for PM 2.5 relative to the other counties (TablesAQ-6 and AQ-7). PM 10 levels have been improving (going down), and PM 2.5 has shown slight improvement. Adams County ranks 26th for PM 10 and 20th for PM 2.5. PM 10 is improving slightly and PM 2.5 is constant. Washington County ranks 22nd for PM 10 and 25th for PM 2.5. PM 10 levels are improving and PM 2.5 is constant. For all three counties, Fugitive Dust is the primary contributor to PM 10 and PM 2.5 levels. Reductions of either are due to decreases in Fugitive Dust.

Payette County, which occurs in this airshed but does not contain Ecogroup administered lands, has emissions over 10,000 tons per year. This county ranks 12th for PM 10 and 19th for PM 2.5. Fugitive Dust is the primary contributor. As there are no managed lands within this county, Ecogroup activities would likely not contribute to PM 10 or PM 2.5 levels.

Agricultural Burning – The use of fire for crop residue disposal is relatively minor in this airshed. Counties that occur here have some of the lowest relative ranks of the counties in the area of consideration. Adams and Gem Counties rank very low and Washington and Payette Counties rank low (Table AQ-8). Counties in Oregon upwind of this airshed also contribute minor amounts.

Dispersion Potential and Transport – Average morning mixing heights for spring, summer, and fall indicate that residual smoke could be trapped until afternoon heating increased mixing heights around some communities in the airshed. Based on the proximity of National Forest Lands, residual smoke could affect Cuprum, Evergreen, Fruitvale, and potentially Council. However, in general, winds for spring and fall carry smoke away from most sensitive areas (Figures AQ-10, AQ-11, AQ-12). The exception is the Hells Canyon Wilderness in the fall; though surface winds carry smoke away from communities, the wind direction is toward the Wilderness. In the summer, surface winds shift and could transport smoke into the lower portions of river drainages, impacting the communities of Weiser, Cambridge, and Midvale. Upper level winds vary little in wind speed and direction during any season. Smoke lofted into upper level transport winds would generally be carried into Airshed 15, potentially impacting communities like McCall and Cascade that occur in valleys.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup are a mix of forested and non-forested. Thirty-eight percent of the area is forested nonlethal fire regimes (see the *Introduction* Table 3-2 and the *Fire Management* section for an explanation of fire regimes).

The same amount of area (38 percent) is forested mixed and lethal fire regimes. The remainder (24 percent) is in non-forested mixed fire regimes.

Airshed 15

Description - This airshed is located in the northern portion of the Ecogroup area. It covers over 2.9 million acres and includes all or parts of the following watersheds: Lower South Fork and Little Salmon River; North, South, and Middle Forks of the Payette; and a small portion of Boise-Mores. Four counties are partially within the boundaries. These include Adams (25 percent), Idaho (10 percent), Valley (61 percent), and Boise (61 percent). Appropriately 83 percent of the airshed is under Federal or State management. Of this 74 percent is managed by the Ecogroup, 5 percent is other Federal, and 4 percent is State.

Sensitive Areas - This airshed contains small portions of the Hells Canyon and Sawtooth Wildernesses both of which are Class I areas. The Wallowa-Whitman National Forest administers the Hells Canyon Wilderness, and the Sawtooth National Forest administers the Sawtooth Wilderness. There are no non-attainment or maintenance areas in this airshed. However, the McCall is identified as an Impact Zone. There are several communities, most of which are listed as "Urban Wildland Interface Communities" under the National Fire Plan. These include New Meadows, Warren, McCall, Lake Fork, Donnelly, Yellow Pine, Warm Lake, Cascade, Smiths Ferry, Banks, Crouch, Garden Valley, Lowman, Horseshoe Bend, Pioneerville, Placerville, Centerville, and New Centerville.

The McCall Impact Zone surrounds the community of McCall. In 2001 a PM 2.5 monitor was established in McCall. Preliminary data from 2001 indicates that air quality conditions (24-hour concentrations) during spring and fall burning seasons are in the "good" range for the Air Quality Index. In August of 2002, the McCall site recorded elevated levels of PM 2.5. Although it does not appear that an exceedance of the NAAQS occurred, the concentrations for PM 2.5 between August 19th and 21st were in the "moderate" to "unhealthy" Air Quality Index categories. The elevated levels were attributed to wildfires locally and smoke transported from Oregon along with stagnant weather conditions.

In addition, there is a monitoring site at the southern end of the airshed in Garden Valley. Data from 2001 showed patterns that were similar to McCall. Air quality levels would fall in the "good" range during spring and fall burning seasons. In 2002, air quality levels varied by season following the same pattern as that seen for McCall. PM 2.5 levels were lowest during the spring with one 24-hour spike reaching "moderate". During the summer, levels reached "moderate" in July and August most likely due to a local wildfire (the Garden Valley Complex).

Sources and Levels of PM 10 and PM 2.5 Emissions – All four counties in the airshed have lands administered by the Ecogroup. There are no point sources in any of the counties. Fugitive Dust makes up the majority of the PM 10 emissions followed by Other Combustion. For PM 2.5, Other Combustion makes up the majority followed by Fugitive Dust.

Idaho County has highest PM 10 emissions levels within the airshed and is the only one that has an annual average above 10,000 tons per year (Tables AQ-6 and AQ-7). This county ranks 5th for PM 10 and 2nd for PM 2.5. PM 10 trends are improving primarily from reductions in Fugitive

Dust as well as Other Combustion. PM 2.5 has shown no change over the past 5 years. Valley County ranks 14th for PM 10 and 6th for PM 2.5. As with Idaho County, the trends for PM 10 are improving. The improvement has been primarily from decreases in Fugitive Dust. However, the next largest contributor, Other Combustion, has been increasing. PM 2.5 has shown no change. Boise County ranks 23rd for PM 10 and 18th for PM 2.5. The trend is improving largely due to reductions in Fugitive Dust. Adams County ranks 26th for PM 10 and 20th for PM 2.5. PM 10 has shown slight improvement from reductions in Fugitive Dust. PM 2.5 emissions have shown no change.

Agricultural Burning – The use of fire for crop residue disposal is mostly low in this airshed. Adams, Valley, and Boise are all very low (Table AQ-8). Idaho County ranks moderate but most of the burning occurs to the north of the Ecogroup.

Dispersion Potential and Transport – Morning mixing heights vary for communities in the northern versus the southern portion of the airshed. Average morning mixing heights for spring, summer, and fall indicate that residual smoke could be trapped until afternoon heating increased mixing heights around many communities in the southern portion of the airshed. These include Cascade, Lake Fork, McCall, and New Meadows. Morning mixing heights in spring, summer, and fall for communities to the north, including Warm Lake, Warren, and Yellow Pine are higher, indicating that the risk of trapping residual smoke in the morning is lower.

In general, surface winds are favorable for transporting smoke away from sensitive areas in the airshed (Figures AQ-10, AQ-11, AQ-12). Wind directions in the western half of the airshed are north to south, and in the eastern half are south to north-northwest. In summer, wildfire or wildland fire use smoke would most likely be carried into Airshed 21, which lies to the south-southeast of Airshed 15. Smoke lofted into the upper level winds would most likely be transported to the east, primarily into Airshed 16 and 17.

From 1991 through 2000 this airshed averaged the greatest number of burning restrictions compared to the other airsheds with 22 per year. Forty-one of the restricted days occurred in 2000, a year in which numerous wildfires occurred in the airshed. All but one of the restrictions occurred for areas below 5,000 feet elevation. All were in the fall (October and November). This is generally the time of year coinciding with the burning season when mixing heights begin to decline.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup are primarily forested. Sixty-nine percent of the area is forested mixed and lethal fire regimes. Forested nonlethal fire regimes make up 23 percent. Non-forested mixed regimes account for 8 percent of the Ecogroup administered area.

Airshed 16

Description - This airshed is located in the northeast portion of the Ecogroup area. It covers over 3.1 million acres and includes in total or parts of the following watersheds: Upper and Lower Middle Fork of the Salmon River; Middle Salmon-Chamberlain; Middle Salmon – Panther and Upper Salmon; and a small portion of the South Fork Salmon. Four counties are partially within the boundaries. These include Idaho (8 percent), Custer (22 percent), Lemhi (38

percent), and Valley (37 percent). Appropriately 99 percent of the airshed is under Federal management. Of this the Ecogroup manages about 30 percent. Other Forests manage the remainder.

Sensitive Areas - This airshed contains no Impact Zones, or Class I, non-attainment, and maintenance areas. Big Creek is the only population center in the airshed.

Sources and Levels of PM 10 and PM 2.5 Emissions – All four counties in the airshed have lands administered by the Ecogroup as well as lands administered by the Salmon-Challis Forest. There are no point sources in any of the counties. Fugitive Dust makes up the majority of the PM 10 emissions followed by Other Combustion. For PM 2.5, Other combustion makes up the majority in Idaho and Valley Counties, and Fugitive Dust makes up the majority in Custer and Lemhi Counties.

Idaho County has highest PM 10 emissions levels within the airshed and is the only one that has an annual average above 10,000 tons per year (Tables AQ-6 and AQ-7). This county ranks 5th for PM 10 and 2nd for PM 2.5. PM 10 trends are improving primarily from reductions in Fugitive Dust as well as Other Combustion. PM 2.5 has shown no change over the past 5 years. Custer County PM 10 and PM 2.5 emissions are among the lowest in the area ranking 30th for both PM 10 and PM 2.5. PM 10 is improving and PM 2.5 shows no change. PM 10 improvements are primarily the result of reductions in Fugitive Dust. Lemhi County ranks 27th for PM 10 and 26th for PM 2.5. PM 10 levels are improving and PM 2.5 shows slight improvement. Changes are the result of declines in Fugitive Dust. Valley County ranks 14th for PM 10 and 6th for PM 2.5. Trends for PM 10 are improving primarily from decreases in Fugitive Dust. However, the next largest contributor, Other Combustion, has been increasing. PM 2.5 has shown no change.

Agricultural Burning – The use of fire for crop residue disposal is mostly low in this airshed. Custer, Lemhi, and Valley County are all very low (Table AQ-8). Idaho County ranks moderate but most of the burning occurs to the north of the Ecogroup.

Dispersion Potential and Transport – Morning mixing heights in this airshed for spring, summer, and fall indicate residual smoke could be trapped until afternoon heating increased mixing heights.

In general, surface winds transport smoke in the same direction in all months, which would carry smoke away from sensitive areas (Figures AQ-10, AQ-11, and AQ-12). Wind speeds are lower in summer compared to spring and fall. Upper level winds would carry smoke lofted higher towards the east, into Airshed 17 in Idaho, or airsheds in Montana. Large events like wildfire or wildland fire use could impact Salmon, Idaho, which is an Impact Zone in Airshed 17, or areas within the Bitterroot Valley in Montana.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup are primarily forested. Sixty-two percent of the area is forested mixed and lethal fire regimes. Forested nonlethal fire regimes make up 29 percent. Non-forested mixed regimes account for 9 percent of the Ecogroup administered area.

Airshed 17

Description - This airshed is located in the eastern portion of the Ecogroup area. It covers over 5.0 million acres and includes in portions of several watersheds in the Upper and Middle Forks of the Salmon River, Big Wood River, and Lost River drainages. Five counties lie partially within the boundaries. These include Custer (72 percent), Blaine (21 percent), Lemhi (61 percent), Butte (33 percent), and Clark (11 percent). However, there are Ecogroup administered lands in only Custer and Blaine Counties. Appropriately 92 percent of the airshed is under Federal or State management. Of this 16 percent is managed by the Ecogroup, 74 percent is other Federal, and 2 percent is State.

Sensitive Areas – Portions of the Sawtooth Wilderness, which is a Class I area occur in this airshed. There are no non-attainment or maintenance areas. The airshed contains one Impact Zone around the community of Salmon, Idaho. There are several other small communities in the airshed including Stanley, Sunbeam, Clayton, Challis, Mackay, North Fork, and Leadore. All of these areas are listed as "Urban Wildland Interface Communities" under the National Fire Plan.

The Salmon Impact Zone surrounds the community of Salmon. This community, while not designated as a non-attainment area, has been a concern for particulate matter (PM 10). IDEQ has been monitoring PM 10 since 1990, but there has only been one exceedance, which occurred in 1997. Up until the summer of 2000, PM 10 levels in Salmon were on a downward trend, in part due to the loss of a local particulate matter source in the early 1990s. However, during the fire season of 2000, several instances were recorded in August that exceeded the 24-hour PM 10 standard. However, because these were from wildfire, these exceedances do not contribute towards designating this area as non-attainment because of EPA's Natural Events Policy. IDEQ prepared a Natural Events Action Plan to document that wildfires caused the exceedances. The IDEQ finalized their Wildfire Natural Events Action Plan in 2002. A total of eleven "excursions" were recorded during the fire season of 2000 with the highest 24-hour values reaching 281 micrograms per cubic meter (IDEQ undated), which rates as "unhealthy" based on the Air Quality Index. Wildfires on the Payette and Salmon-Challis National Forests were the main contributors to high PM 10 levels in Salmon.

Sources and Levels of PM 10 and PM 2.5 Emissions – There is only one point source for any of the counties that occur in the airshed in Butte County. However, it appears that it is outside the airshed boundary near Arco, Idaho, which is located in Airshed 19. It contributes approximately 5 tons per year of emissions, which is relatively minor. Fugitive Dust makes up the majority of the PM 10 and PM 2.5 emissions.

Blaine County ranks 18th for PM 10 and 16th for PM 2.5 (Table AQ-6 and AQ-7). Both particulate matters show improving trends. The reductions have been primarily from Fugitive Dust. Butte County ranks 33rd for PM 10 and 32nd for PM 2.5, which is among the lowest for this area. PM 10 levels have been improving and PM 2.5 has remained constant. Like with Blaine County, reductions in PM 10 have been from Fugitive Dust. Custer County ranks 30th for PM 10 and PM 2.5. PM 10 trends have been improving and PM 2.5 has remained constant. Again the change in PM 10 has been from Fugitive Dust. Lemhi County ranks 27th for PM 10 and 26th for PM 2.5. PM 10 shows improvement and PM 2.5 slight improvement.

Agricultural Burning – The use of fire for crop residue disposal is mostly low in this airshed. Custer, and Lemhi, Counties are all very low (Table AQ-8). Blaine, Butte, and Clark rank low.

Dispersion Potential and Transport – Average morning mixing heights for spring, summer, and fall indicate that residual smoke could be trapped until afternoon heating increased mixing heights around many communities in the airshed. These include Challis, Clayton, Leadore, North Fork, Salmon, and Stanley.

In general, surface winds for all seasons would carry smoke away from the Sawtooth Wilderness and population centers in the local vicinity (Figures AQ-10, AQ-11, and AQ-12). Surface winds are generally strong and wind speeds indicate good dispersion potential over most of the area except the Stanley Basin. Wind speeds are generally lower here. Surface winds in the spring are predominately westerly carrying smoke across the airshed. In summer and fall, surface winds surface winds move primarily south to north, or south to northeast. Smoke produced at the southern end of the airshed has potential to be carried toward the Sun Valley/Ketchum Impact Zone located in adjacent Airshed 24.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup are primarily forested. Eighty percent of the area is forested mixed and lethal fire regimes. Forested nonlethal fire regimes make up less than 1 percent of the area. Non-forested mixed regimes account for 20 percent.

Airshed 21

Description - This airshed is located in the central portion of the Ecogroup area. It covers over 1.7 million acres and includes most of the Boise River drainage. Four counties are partially within the boundaries. These include Ada (1 percent), Boise (29 percent), Camas (48 percent), and Elmore (52 percent). Appropriately 89 percent of the airshed is under Federal or State management. Of this the Ecogroup manages about 80 percent. Other Federal agencies manage 4 percent, and the State 5 percent.

Sensitive Areas - This airshed contains small portions of the Sawtooth Wilderness, which is a Class I area. The Sawtooth National Forest administers the Sawtooth Wilderness. There are no non-attainment, maintenance areas, or Impact Zones in this airshed. There are several communities, most of which are listed as "Urban Wildland Interface Communities" under the National Fire Plan. These include Idaho City, Atlanta, Rocky Bar, Featherville, Prairie, and Pine.

Sources and Levels of PM 10 and PM 2.5 Emissions – All four counties in the airshed have lands administered by the Ecogroup though the amount of area in Ada County is minor.

Elmore County is the only county with point sources. However, the amount contributed is less than 100 tons per year. Fugitive Dust makes up the majority of the PM 10 emissions in Boise and Elmore Counties. In Camas County, the primary contributor is Other Combustion. For PM 2.5, Other Combustion makes up the majority of the emissions in Boise and Camas Counties. Fugitive Dust followed by Agriculture and Forestry combined comprise the majority.

Boise County ranks 23rd for PM 10 and 18th for PM 2.5 (Tables AQ-6 and AQ-7). Boise has the lowest emissions of the three counties that make up the majority of the area in the airshed. PM 10 trend is improving, primarily from reductions in Fugitive Dust. PM 2.5 trends have not changed. Camas County ranks 24th for PM 10 and 9th for PM 2.5. Trends for both emissions are improving. The ranking of this county, particularly for PM 2.5, was caused by a single year spike in particulate emissions in 1996, likely from wildfires. Elmore County ranks 15th for PM 10 and 17th for PM 2.5. PM 10 levels have been improving while PM 2.5 has been constant. The improvement in PM 10 has been due to declines in Fugitive Dust.

Agricultural Burning – The use of fire for crop residue disposal is mostly low in this airshed. Boise ranks very low, Camas low, and Elmore moderately low (Table AQ-8).

Dispersion Potential and Transport – Average morning mixing heights for spring, summer, and fall indicate that residual smoke could be trapped until afternoon heating increased mixing heights around many communities in the airshed. These include Atlanta, Featherville, Idaho City, Pine, and Prairie. However, morning mixing heights in all seasons are generally good in some areas including Rocky Bar.

Surface wind speeds and direction vary greatly for this airshed and are difficult to generalize (Figures AQ-10, AQ-11, and AQ-12). On the Boise Forest, surface winds for April and October more often carry smoke away from the majority of sensitive areas located in the western half of the airshed and nearby population centers in Airshed 15. However, smoke would potentially be carried toward the Class I area. In July, smoke could potentially be carried north-northwest into Airsheds 17 and 16. On the Sawtooth Forest, smoke produced in April and October could be carried toward the Sun Valley/Ketchum Impact Zones located in Airshed 24, which is to the east of this airshed. Smoke lofted high enough to be transported by upper level winds would be carried into adjacent airsheds to the east.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup are a mix of forested and non-forested. Forty-two percent of the area is forested mixed and lethal fire regimes. Forested nonlethal fire regimes make up 25 percent. Non-forested mixed regimes account for 33 percent of the Ecogroup administered area.

Airshed 24

Description - This airshed is located south and east of the contiguous portions of the Ecogroup area. It is the smallest of the South Idaho Airsheds covering about 1.0 million acres. It includes portions of the Camas Creek, and Little Wood and Big Wood River drainages. Three counties are partially within the boundaries. These include Blaine (40 percent), Camas (49 percent), and Elmore (3 percent). Appropriately 56 percent of the airshed is under Federal or State management. Of this the Ecogroup manages about 14 percent. Other Federal agencies manage 36 percent, and the State manages 6 percent.

Sensitive Areas - This airshed contains no Class I areas. However, Craters of the Moon National Monument lies to the east in Airshed 19. There are non-attainment or maintenance areas. There is an Impact Zone that includes the communities of Sun Valley, Ketchum, Hailey, and Bellevue. There are other small communities in the airshed including Bellevue, Fairfield,

and Hill City. All these areas are listed as "Urban Wildland Interface Communities" under the National Fire Plan.

At this time, the Sun Valley/Ketchum Impact Zone does not have an ambient air monitor for particulate matter or other criteria pollutants. However, IDEQ did have an ambient air monitor for PM 10 in Ketchum from 1995 to 1998 (IDEQ March 2001). No exceedances were recorded during that period. During the four-year period, maximum values were recorded twice in March, and once in July and February. The second highest values recorded occurred during the winter months between December and February, with one in June. The highest 24-hour value occurred in 1998, but was characterized in the "moderate" range for the Air Quality Index.

Sources and Levels of PM 10 and PM 2.5 Emissions – Elmore County makes up only a small portion of the airshed and will not be discussed here. The other two counties contain only minor amounts of Ecogroup managed lands, particularly Camas County. There are no point sources in these two counties.

Blaine County ranks 18th for PM 10 and 16th for PM 2.5 (Tables AQ-6 and AQ-7). Fugitive Dust makes up the majority of the both emissions, which are showing improving trends, primarily from reductions in Fugitive Dust. Camas County ranks 24th for PM 10 and 9th for PM 2.5. Other Combustion is the primary contributor to both particulate matters. The ranking of this county, particularly for PM 2.5, was caused by a single year spike in particulate emissions in 1996, likely from wildfires.

Agricultural Burning – The use of fire for crop residue disposal is mostly low in this airshed. Blaine and Camas Counties rank low, and Elmore ranks moderately low (Table AQ-8).

Dispersion Potential and Transport – Average morning mixing heights for spring, summer, and fall indicate that residual smoke could be trapped until afternoon heating increased mixing heights around some communities in the airshed. Morning mixing height in spring, summer, and fall are generally poor for Fairfield, Ketchum, and Sun Valley. Around Hailey mixing heights are above the stagnation level in the spring, and below in summer and fall. Average morning mixing heights in all seasons are good for Bellevue and Hill City.

In general, surface winds for April are the strongest and would carry smoke toward the east, potentially impacting the Craters of the Moon National Monument, the Class I area in Airshed 19 (Figures AQ-10, AQ-11, and AQ-12). Surface winds in July shift to the opposite direction and would transport smoke to the west. During this season, smoke not lofted into the upper levels could be transported into population centers in the airshed. Wind speeds are also low during July, which indicates smoke would not be transported far within or outside of the airshed. Surface winds shift again in October, potentially carrying smoke to the east, but slightly more east-southeast than the spring months. Smoke lofted into the upper level winds would be carried eastward toward Craters of the Moon but away from population centers in the airshed.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup are a mix of forested and non-forested. Fifty-one percent of the area is non-forested mixed fire regimes.

Forested mixed2 and lethal fire regimes make up 44 percent. Forested nonlethal regimes account for only 5 percent.

Airsheds 20, 25, and 1

Description - These airsheds cover the southern portion of the Ecogroup area and contain the southern Divisions of the Sawtooth Forest. Most of the Divisions occur in Airshed 25. Part of the Sublett Division occurs in Airshed 20. Airshed 1 contains the Raft River Division of the Sawtooth Forest. In total these airsheds cover 18.5 million acres. Of this 8.3 million is Airshed 1, 5.3 is Airshed 25, and 4.9 million is Airshed 20. This area covers portions of several watersheds including Lake Walcott, Raft River, Goose Creek, Upper Snake-Rock, Salmon Falls, and Curlew Valley. There are also portions of several counties in each airshed. Airshed 25 contains parts of Twin Falls (89 percent), Gooding (100 percent), Cassia (99 percent), Jerome (100 percent), Minidoka (83 percent), and Lincoln (99 percent). Airshed 20 has Oneida (85 percent), Power (56 percent), Franklin (100 percent), and a portion of Bannock. Airshed 1 is mostly Box Elder County (81 percent). The Ecogroup manages 10 percent of the area in these three airsheds. Other Federal, primarily Bureau of Land Management manages 47 percent. Three percent is managed by the State.

Sensitive Areas - There are no Class I areas in any of the airsheds. There are two non-attainment areas, the Portneuf Valley PM 10 and the Fort Hall PM 10, and no maintenance areas. There are also two Impact Zones. The Twin Falls Impact Zone is within Airshed 25 and the southern tip of the Pocatello Impact Zone is in Airshed 20. This area includes the Portneuf Valley PM 10 Non-attainment Area described above. There are also several population centers including Gooding, Heyburn, Burley, Elba, Declo, Albion, Malta, Oakley, Almo, Shoshone, Dietrich, Rockland, Fort Hall Reservation, Preston, Yost, Clear Creek, and Park Valley. All of these communities are listed as "Urban Wildland Interface Communities" under the National Fire Plan.

Twin Falls Impact Zone surrounds the Twin Falls area. From 1995 to 1998 no exceedances were recorded; the annual average over this timeframe remained below 25 micrograms per cubic meter. Peak concentrations over a 24-hour period would be characterized as "good" to "moderate" based on the Air Quality Index. This monitoring location, unlike other monitoring sites in other impact zones, showed more peak concentrations occurring in spring and fall months in addition to winter months.

Sources and Levels of PM10 and PM 2.5 Emissions - Only the counties with lands administered by the Sawtooth are discussed in detail in this section. These include Twin Falls and Cassia in Airshed 25, Power and Oneida Counties that border Airsheds 25 and 20; and Box Elder in Airshed 1.

Several counties within the three airsheds have point sources that produce over 100 tons per year of PM 10 and PM2.5. Of these, three have lands administered by the Sawtooth Forest. They include Twin Falls, Power, and Box Elder Counties. Point sources in Twin Falls County are located near the community of Twin Falls, but contribute relatively low amounts to the total PM 10 and PM 2.5 annual emissions. Point sources in Power County contribute the greatest amount of particulate matter. However these sources are located near Pocatello. Box Elder County in

Utah also has point sources that contribute to particulate matter emissions. Approximately 7 percent of the PM 10 and 22 percent of PM 2.5 annual emissions are from these points sources. However these sources are not close to the Raft River Division.

For most of the counties with Ecogroup Forest lands, the majority of the PM 10 emissions are from Fugitive Dust. One exception is Power County where Agriculture and Forestry, and Fugitive Dust together make up the majority. For PM 2.5, the majority for all but two counties is also Fugitive Dust. Here, the exceptions are Cassia County where Fugitive Dust, and Agriculture and Forestry make up the majority. In Power County, point sources comprise the majority of the emissions.

Twin Falls County ranks 4th for PM 10 and 5th for PM 2.5 (Tables AQ-6 and AQ-7). This is among the highest of all the counties over the Ecogroup. PM 10 trends are improving and PM 2.5 improving slightly. Cassia ranks 8th for PM 10 and 13th for PM 2.5. Trends for PM 10 are improving; PM 2.5 shows no change. Power ranks 19th for PM 10 and 12th for PM 2.5. PM 10 levels show slight improvement and PM 2.5 is constant. Oneida ranks 28th for PM 10 and 29th for PM 2.5. Pm 10 levels are improving and PM 2.5 improving slightly. Box Elder ranks 9th for PM 10 and 10th for PM 2.5. Neither PM 10 nor PM 2.5 levels have changed. Trends for PM 10 in the five counties with Ecogroup lands have mostly been improving. Box Elder shows no change in emissions levels. Improvements in emissions trends in the Idaho counties are primarily due to reductions in the annual amounts from Fugitive Dust.

Agricultural Burning – The counties in these airsheds have the highest levels of burning for crop residue disposal though some of the counties rank low (Table AQ-8). These include Gooding and Lincoln. Franklin, Jerome, and Box Elder rank moderately low. Minidoka and Oneida rank moderate and Twin Falls ranks moderately high. Cassia and Power are high.

Dispersion Potential and Transport – Average morning mixing heights for spring, summer, and fall indicate that residual smoke could be trapped until afternoon heating increased mixing heights around some communities in the airshed. Morning mixing height in spring, summer, and fall are generally poor for Burley, Dietrich, Malta, Oakley, and Twin Falls. Around Declo mixing heights are above the stagnation level in the spring, and below in summer and fall. Average morning mixing heights in all seasons are good for Albion, Almo, and Elba.

The Snake River Plain dominates a large portion of Airshed 25. Surface winds in April are relatively strong and would carry smoke across the airshed in an easterly direction potentially impacting the Craters of the Moon National Monument (Figures AQ-10, AQ-11, and AQ-12). Over the South Hills Units, however, the wind speeds are slightly less and smoke would carry predominately in a southeasterly direction towards Airshed 1. During July wind speeds drop. The wind in the west half of the airshed continues to travel in an easterly direction. Surface winds over the South Hills Units are more complex in wind speed and direction. Surface winds over the Cassia Division could carry smoke back towards population centers in Airshed 25. In October the surface wind direction pattern is similar to spring, but wind speeds are less. The units on the border of Airsheds 25 and 20 would most likely have smoke transported easterly into Airshed 20. The relatively slow wind speeds in the valley bottoms suggest poorer transport away from population centers within Airshed 25. Upper level wind speed and direction vary little in

the representative months. Smoke columns lofted into the upper level winds would be transported to the east primarily into Airsheds 20 and 19.

Fire Regimes - Vegetative communities on lands administered by the Ecogroup Forests are primarily non-forested including sagebrush and pinyon-juniper communities. These mixed2 to lethal fire regimes account for 79 percent of the area administered by the Ecogroup. Climax aspen, which is a lethal fire regime, makes up 5 percent. Forested mixed and lethal fire regimes make up 17 percent.

Southwest Idaho Ecogroup Historical Versus Current Smoke Emissions

Levels of smoke declined as fire was excluded from forests, particularly after the advent of organized fire suppression in the late 1930s. Wildfires today tend to produce higher levels of smoke emissions than they did historically due to an increase in fuel loadings and stand densities. Brown and Bradshaw (1994) found the emissions are greater from wildfires today, even when they burn fewer acres than historical fires, because consumption of fuel per unit burned has been greater in current times.

Historically (pre-settlement), about 1.6 million acres per decade may have burned over the Ecogroup in the forested and non-forested communities (Figure AQ-13). This is about 28 percent of the total Ecogroup acres (Table AQ-13). This amount of burning was estimated to produce about 225,500 tons of PM 2.5 (266,000 tons of PM 10) per decade. Of this, more than half of the estimated emissions (63 percent) came from the nonlethal fire regimes in the forested communities (Fire Regime I) while the smallest amount (1 percent) was from the non-forested areas (Fire Regimes II or IV) (Table AQ-13).

Table AQ-13. Estimated Percentage of Total Historical Acres Burned and Emissions Produced by Fire Regime

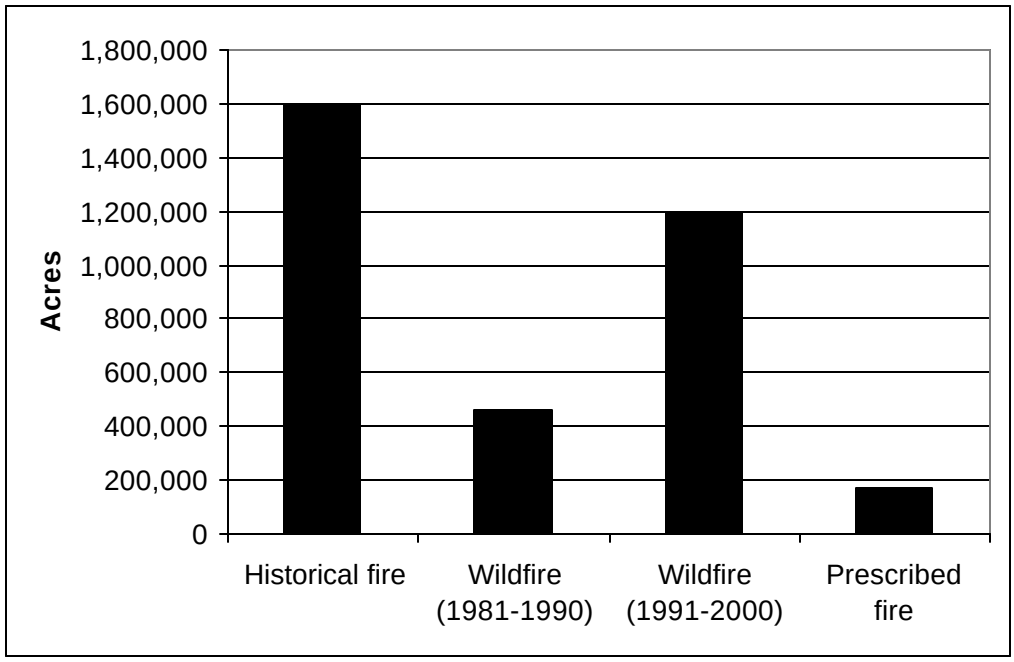
Fire Regime	Percentage of total Ecogroup acres estimated to have burned each decade	Percentage of total estimated emissions produced from burned acres
I (forested, nonlethal)	13	63
III or V (forested, mixed or lethal)	9	36
II or IV (non-forested, mixed or lethal)	6	1
Total	28	100

From 1995 through 1999, on the average about 16,000 acres per year was burned using prescribed fire (Table AQ-11). This rate of burning equates to approximately 160,000 acres or three percent of the total Ecogroup acres per decade (Figure AQ-13). Smoke produced from fire use, particularly prescribed fire, generally disperses quickly as these fires are conducted when meteorological conditions are best for mixing and dispersal.

Approximately 1,200,000 acres were burned by wildfire from 1991 through 2000; the previous decade burned about 460,000 acres (Figure AQ-13). This amounts to about 21 percent of the

total acres in the Ecogroup over the most recent decade and 8 percent over the previous decade. Currently, about 48 percent of the forested acres and 23 percent of the non-forested are in a condition that could contribute to large, uncharacteristic wildfires like some of those experienced in the past two decades (see the *Vegetation Hazard* section, Tables VH-3 and VH-6).

Figure AQ-13. Acres Burned per Decade in the Southwest Idaho Ecogroup Historically and by Wildfire and Prescribed Fire



ENVIRONMENTAL CONSEQUENCES

Methodology and Assumptions

Emissions Levels and Characteristics

Ecogroup Fire Use Treatments and Effects - Combinations of Management Prescription Categories (MPCs) and Potential Vegetation Groups (PVGs) define fire use treatments. Therefore, an MPC and PVG combination applied from one alternative to another assumes the same kind of fire use and emissions. Treatment of activity fuels is a ratio of the acres treated mechanically to the acres treated with fire to reduce activity fuels. What varies between the alternatives is the number of acres treated directly with fire or mechanically to achieve desired conditions and other goals.

Smoke Modeling Variables - Fuel loading estimates, consumption ratios, and emission factors were assigned to combinations of PVGs based on similar vegetation types and types of fire. The types of fire included wildland fire use, prescribed fire used to achieve vegetative desired conditions and to treat fuels generated from mechanical activities, and wildfire. Variables for the

different types were compiled from a variety of references. This information was used to develop a smoke model that estimated emissions from the various sources for each alternative. Fuel loadings, consumption factors, emission factors, and conversion ratios were the same for all alternatives. Smoke emissions varied between alternatives based on the number of acres treated from different smoke sources.

Risks to Sensitive Areas - Season, frequency, duration, and magnitude (amount of emissions) determine the potential effects of smoke at sensitive areas. Project-level analysis generally evaluates duration and magnitude. At the scale of this programmatic analysis, season and frequency are also important considerations since the effects of implementing alternatives to achieve desired conditions occurs over the temporary, short, and long-term.

Season is defined as the time of year when certain types of fire activities generally take place across the Ecogroup (Table AQ-14). While the actual timing of activities depends on prescription windows that vary year to year depending on weather and other factors, fire use activities most often occur from spring to early fall. Windows for prescribed fire usually occur in the spring and again in the fall. Lightning ignites fires that may be implemented for wildland fire use; in the Ecogroup lightning ignitions that result in a fire are most common in July and August (Rorig and Ferguson 2002). This is the same time period that wildfires occur. However, human-caused ignitions can create a wildfire season that starts earlier and/or lasts longer than the wildland fire use season. The typical season of various types of fire can indicate possible conflicts with activities that also have a generalized season such as agricultural burning or big-game hunting. Ambient air monitoring sites in Idaho, especially in the non-attainment areas, show that the incidence of elevated concentrations most often occurs in the winter. This is correlated with the inversions that more often develop in the winter than during other times of the year. These inversions can last several days to several weeks.

Table AQ-14. Summary of Relative Seasonality, Frequency, Duration and Magnitude from Fire Use and Wildfires

Type of Fire	Season (Spring, Summer, Fall, Winter)	Frequency (Annually or decadal)	Duration (Days, weeks, months)	Magnitude (Size of Area Burned)
Prescribed fire for treatment of activity fuels	Primarily Fall	Annually	Days to weeks	5 to 40 acres
Prescribed fire for treatments other than activity fuels	Spring, Fall	Annually	Days to weeks	10 to 1000's of acres
Wildland Fire Use	Summer, early Fall	Variable depending on weather, etc. (only for FCRONR and	Days to weeks	10 to 10,000's of acres

Type of Fire	Season (Spring, Summer, Fall, Winter)	Frequency (Annually or decadal)	Duration (Days, weeks, months)	Magnitude (Size of Area Burned)
		Sawtooth Wilderness areas)		
Wildfire	Summer, early Fall	Wildfires occur annually. Large events occurring more frequently within decadal periods	During large wildfire events like in 1992, 1994, 2000 can be weeks to months	Majority of wildfires are less than 100 acres. Events greater than 10,000 acres with some single wildfires greater than 100,000 acres.

Frequency indicates how often certain types of fire activities usually take place (Table AQ-14). Prescribed fire, whether for treatment of activity fuels or to meet other objectives, usually takes place each year, though unusual circumstances, such as the fire use moratorium in 2000, can occur. Implementation of wildland fire use is much less predictable as it depends on a lightning ignition and a host of other factors including location, expected size and extent, effects, personnel available to manage the ignition, and air quality, all of which are too variable to predict. The same is true for wildfire. While wildfires occur annually, (see Table VH-7 in *Vegetation Hazard*), very large wildfires like those that occurred in 1992, 1994, and 2000 occur less predictably.

Risk to sensitive areas increases with frequent fire use particularly if the magnitude of the emissions have the potential to contribute to an exceedance of the daily or annual NAAQS. Vegetative communities were used to determine the potential for frequent fire use adjacent to or in close proximity to a sensitive area (Figures AQ-14 and AQ-15). We assumed that vegetative communities in the nonlethal fire regimes (Fire Regime I) would be targeted most often for burning. The lethal fire regimes (Fire Regime V) would be targeted for burning much less frequently. The National Fire Plan Fire Regimes were used to classify the vegetative communities and are defined as follows (see the *Introduction* and *Fire Management* sections for more detail regarding fire regimes):

I—Forested vegetation, nonlethal
II—Non-forested vegetation, mixed2 (includes small amounts of mixed1)
III—Forested vegetation, mixed1and mixed2
IV—Non-forested vegetation, lethal
V—Forested vegetation, lethal.

Duration indicates how long smoke may be expected to occur from the different types of fire (Table AQ-14). This is not the expected duration of any one fire use or wildfire, but rather is the

typical length of time smoke might be present from that type of fire activity. However, in some cases such as with wildfire, the duration may be from one single event that burns for a long time period. For prescribed fire, the duration indicated represents the burning window that most often occurs, during which several prescribed fires may be ignited.

Magnitude is the amount of emissions produced using potential fire size as an indicator (Table AQ-14). Generally, the more area burned, the greater the emissions. While all fire types are a similar size at the low end, activity fuel treatments represent the lowest end of potential emissions and large wildfires the highest end. We assumed that wildland fire use would fall intermediate to these two with wildland fire use implementation generally resulting in more acres burned than prescribed fire.

Population Centers - Several factors were used to evaluate the risk of smoke impacts to the various sensitive areas. Table AQ-15 and AQ-16 show the factors used to evaluate the risk of direct, indirect, and cumulative effects to population centers.

Table AQ-15. Qualitative Factors Considered to Evaluate the Risk of Direct and Indirect Effects from Smoke to Population Centers

Factors Considered	Indicates Increasing Potential or Relative Risk of Smoke-related Concerns	Type of Potential Impact and Rationale
Number of Ecogroup Forests within the same Airshed	Percent of airshed shared in about equal proportions when Ecogroup Forests occupy the majority of the airshed	Smoke accumulation from multiple burners (Ecogroup Forests) within the same airshed
Percent of Ecogroup administered lands within county	Relatively higher amounts of administered land: in particular, relatively higher amounts of Fire Regime I (forested, nonlethal), and II (non-forested, mixed and lethal)	Potential to cause a direct impact through increased emissions
Surface and upper level (850 mb) wind direction for representative seasons	Population centers potentially downwind of fire use	Increased likelihood of a smoke impacts at population centers
Potential proximity of burn to population centers (including Non-attainment/ Maintenance Areas)	Relative relationship of Fire Regime I (forested, nonlethal) and Fire Regime II (non-forested, mixed and lethal) to population centers in the airshed	Potential for more frequent burning in these vegetation types which increases the potential for smoke impacts
Seasonality (spring, summer, fall, winter)	Season(s) with poorer dispersion	Increases potential for smoke impacts due to unfavorable dispersion characteristics
Peak 24-hour Air Quality Indexes[1] and season of occurrence	Pattern of peak 24-hour values during fire use seasons (spring and fall for prescribed fire, summer for wildland fire use)	Could contribute to existing periods or levels of high ambient air concentrations

[1]From existing ambient air monitoring data when available for population centers. Peak values are first and second highest recorded PM 10 concentrations from IDEQ's 1998 Monitoring Report (March 2001)

Table AQ-16. Qualitative Factors Considered to Evaluate the Risk of Cumulative Effects from Smoke to Population Centers

Factors Considered for:	Indicates Increasing Potential or Relative Risk of Smoke-related Concerns	Type of Potential Impact and Rationale
Additional burning conducted by Airshed Group members	Percentage of airshed shared with member burners other than the Ecogroup when other members manage more or about equal amounts of the airshed[1]	Smoke accumulations from non-Ecogroup airshed members burning within the same window in the same geographical area
Additional Burning conducted by burners who are not Airshed Group members	Relative amounts (and season) of agricultural related burning within county and/or within airshed	Smoke accumulations from multiple burners
5-year Annual Average Trend (1995-1999)	Increasing trend in PM 10 and/or PM 2.5	Greater likelihood of conflict if fire use increases
Relative rank and/or total annual average emissions of particulate matter	High overall total emissions and/or already designated as Non-attainment/Maintenance Area	Increases in the amount of fire use over current may contribute to already high PM 10 or PM 2.5 levels
Presence or Absence and proximity of point sources	Presence of major point sources (greater than 100 tons per year)	Increases in the amount of fire use may contribute or compound air quality levels in combination with point sources that emit pollutants daily

[1]Though other land management agencies participate in smoke management programs for forest and rangeland burning to prevent exceedances of the NAAQS, smoke related impacts or accumulations may still occur

Class I Areas – The assessment of potential risks of smoke related impacts to Class I areas is much simpler. The risk of impacts of smoke to visibility was based on potential for smoke intrusions. Where Class I areas occurred within airsheds adjacent to or surrounded by Ecogroup administered lands (i.e. Hells Canyon and Sawtooth Wildernesses), surface winds were used to evaluate the potential risk of smoke impacts from Ecogroup fire use activities (Table AQ-17). For Class I areas within the area of consideration, upper level winds were used to evaluate potential direct/indirect effects from Ecogroup fire use activities. A direct effect was considered a potential impact from Ecogroup activities only rather than the potential impacts from Ecogroup activities in combination with other sources.

Cumulative effects were evaluated using seasonality. In general, the winter months (December, January, February) result in the best visibility (least impairment) (Malm et al. 2000, US EPA 2001). Other times of the year coincide with the fire use or wildfire "season" (Table AQ-14). Prescribed burning primarily occurs during the spring and fall. Wildland fire use would more often occur in the summer into the early fall.

Figure AQ-14. Historical Fire Regimes for the Northern Portion of the Ecogroup

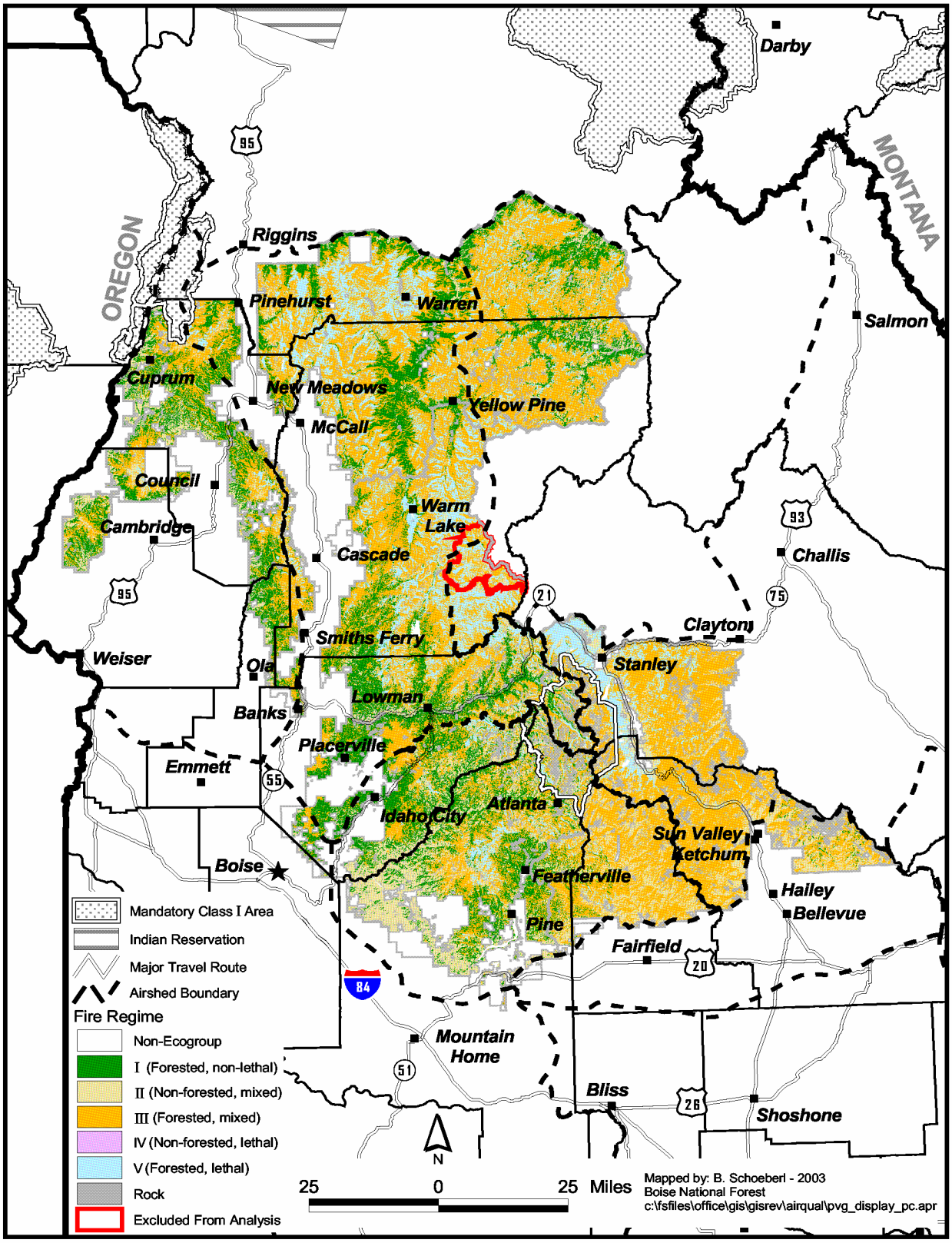


Figure AQ-15. Historical Fire Regimes for the Southern Portion of the Ecogroup

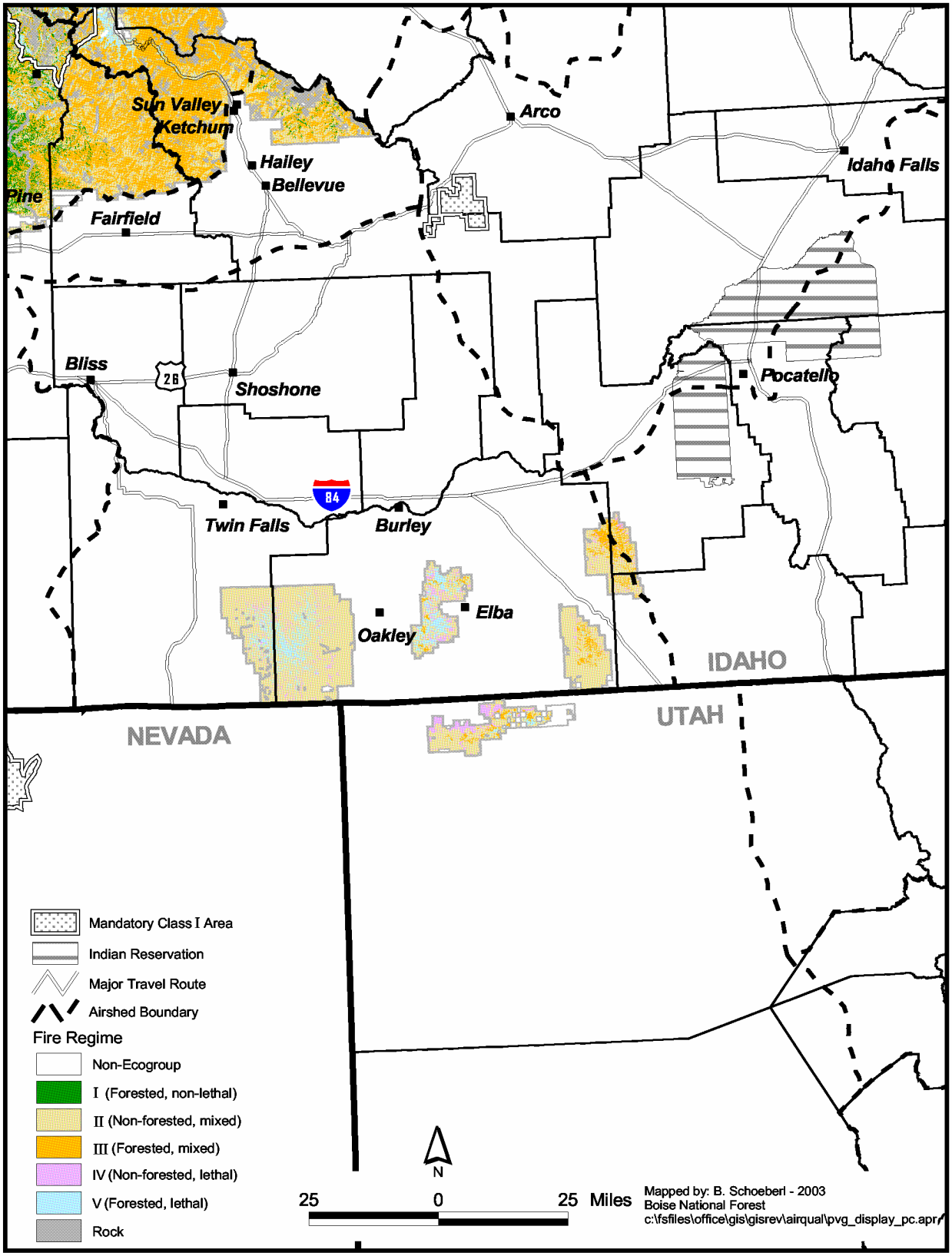


Table AQ-17. Factors Considered to Evaluate the Risk of Direct/Indirect and Cumulative Effects from Smoke to Class I Areas

Factors Considered for:	Indicates Increasing Potential or Relative Risk of Smoke-related Concerns	Type of Potential Impact and Rationale
Potential Risk of Direct/Indirect Effects		
Wind Direction (using prevailing direction from representative months)	Class I Area is in the same airshed and downwind of Ecogroup administered lands based on prevailing representative surface winds	Increased likelihood of smoke impacts to Class I area
	Class I Area is not in the same airshed as Ecogroup administered lands but is downwind based on prevailing representative upper level (850 millibar) winds	Increases likelihood of smoke impacts to Class I area
Potential Risk of Cumulative Effects		
Season (spring, summer, fall, winter)	Season of best/worst visibility	Increases in the amount of fire use may contribute to visibility impairment in areas or during seasons currently experiencing concerns

Elements Common to All Alternatives

Resource Protection Methods

Resource protection has been integrated into air quality and smoke management direction at various scales, from national to site-specific. The cumulative positive effect of the multi-dimensional direction described below is beneficial protection and mitigation for all resources or populations that may potentially be adversely affected by smoke-generating activities or events.

Laws, Regulations, and Policies – Numerous laws, regulations, and policies govern the use of fire or other sources of air pollutants on National Forest administered lands. The Federal Clean Air Act and amendments provide the main regulatory framework to protect air quality. A brief summary of key applicable sections is described below with more detailed description along with other important direction included in Appendix H in each Land Management Plan. The Clean Air Act is a legal mandate designed to protect public health and welfare from air pollution primarily through the National Ambient Air Quality Standards. States develop specific programs for implementing the goals of the Clean Air Act through their State Implementation Plans (SIP's). States may develop programs that are more restrictive than what the Clean Air Act requires but never less. National laws and regulations have also been interpreted for implementation in Forest Service Manuals, Handbooks, and Regional Guides. Fire use activities must comply with these laws, regulations, and policies, which are intended to provide general guidance for the implementation of a fire use program, while protecting air quality. In addition, federal agency actions must conform to applicable State Implementation Plans. Multi-state or jurisdictional groups have been formed in several areas around the country to address air pollution issues that are related to long-range transport of pollutants such as the regional haze.

Forest Plan Direction – Forest Plan management direction for air quality and smoke management does not vary by alternative. Direction was developed to reduce potential impacts from land management activities on National Forest administered lands to air quality. Direction was also developed to consider emissions from other sources as well as to address planning elements described in the *Interim Policy* that are appropriate to evaluate at the project level. Air quality goals and objectives have been designed to achieve desired air quality and smoke management conditions over the short and long term.

Forest Plan Implementation – Fire use planning depends on current and site-specific information about fuel and meteorological conditions, air movement patterns, timing and duration of use, the availability of ignition and suppression resources, etcetera. These factors are not easily addressed at the programmatic level, and are generally similar for all alternatives. The prescribed fire planning process, however, can and will address all of these factors at the project-level and during implementation. Through this process, which is the same for all alternatives, adjustments would be made to address resource concerns in a timely, effective, and site-specific manner that involves the Forest Service, cooperating agencies, and the public in land management actions. In addition, all prescribed burning in Idaho and Utah is coordinated through each state's Smoke Management Program to minimize or prevent smoke impacts.

Forest Plan Monitoring – The Forest Plan does not include monitoring for impacts to ambient air or visibility since these are regulated through the Clean Air Act as NAAQS, or are anticipated to have regulatory requirements in the future (regional haze). The state DEQ's have monitoring and enforcement responsibilities. In Idaho, the DEQ has developed a statewide monitoring network for PM 2.5 to determine attainment status and compliance with the NAAQS (Figure AQ-16). The Forests can, in partnership, with DEQ provide for additional monitoring for special purposes. One ambient air monitor has been installed in Garden Valley to monitor PM 2.5 levels. The purpose of this monitor is to provide additional information about ambient air and support prescribed burn decisions. The IDEQ also uses this monitoring as part of their network to inform the public of current conditions using Air Quality Indices. Additional monitoring could be employed during project implementation. This would primarily be observation of plume trajectories as a mitigation measure to ensure that during implementation, smoke would not unduly impact a sensitive area. This monitoring could also be used to mitigate effects by limiting the amount or length of time smoke is produced.

Monitoring the impacts of fire use activities on visibility in Class I Areas is conducted using the IMPROVE network. The network has been undergoing expansion since 2000 to add to the number of sites that have modules to determine types of pollutants causing or contributing to visibility impairment. All Class I Areas within the area of consideration have been or will be upgraded as part of this expansion (Figure AQ-16).

Effects Common to All Alternatives

Fire Use and Wildfire Effects - Fire has played a major role in the development and maintenance of most ecosystems within the Ecogroup. The long-term future of the Ecogroup is

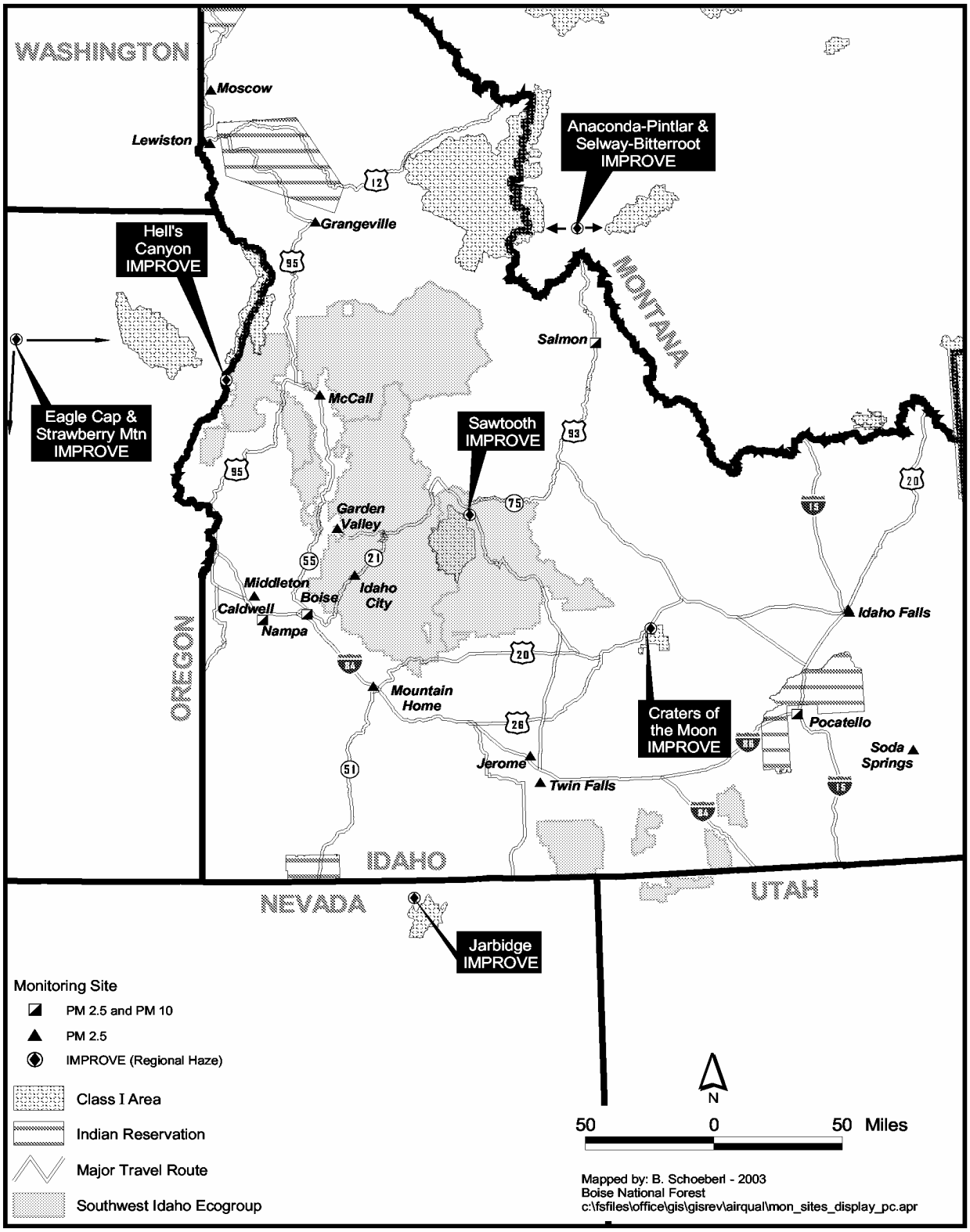
dependent on fully functioning ecosystems that are capable of sustaining ecological processes and human uses.

An increase in accumulated fuels over the Ecogroup has occurred because of past land management practices, including decades of fire exclusion. This is evident by ecosystem changes that include increased vegetative densities, altered structures, and disrupted nutrient cycling. As a result, wildfires are becoming larger in size, uncharacteristically lethal, and more dangerous and costly to suppress. Studies have shown that prescribed fire can reduce the size, frequency, and intensity of wildfires (Deeming 1990, Omi and Martinson 2002). Areas that have been treated with prescribed fire often support fewer crown fires resulting in a slowing of wildfire spread.

Fire is an essential component of most ecosystems, and the use of fire to maintain or restore ecosystem processes and functions is desirable. A substitute for the ecological role of fire has not been found in many ecosystems. One goal of the fire use program is to cooperatively meet land management objectives and concerns about public health and visibility. However, wildfire, in particular uncharacteristic wildfire, can have undesirable impacts both on resources and air quality.

Smoke Management Techniques – Land managers employ emission reduction and smoke management techniques to reduce air quality impacts from fire use, in particular from prescribed fire. Current smoke management techniques take into account the timing and location of fires so that impacts on human health are balanced with achieving resource management objectives. These techniques are applied based on-site specific factors to minimize impacts on visibility impairment and public health. When possible, ignitions are delayed due to social considerations like major community events. Although ignitions can be delayed when necessary to meet social considerations, delays may prevent burns being completed annually as planned. Often when restoring fire, "cool" prescriptions are needed to achieve resource objectives. These are usually accomplished using higher fuel moistures, which in turn reduces emissions. Higher fuel moistures most often occur in the spring and fall. Conducting burns in the spring compared to the fall produces seasonal advantages because spring weather patterns produce more days with better daytime dispersion, especially at lower elevations. Other techniques such as burning clean piles and biomass utilization (alternatives to burning) can also be used.

Figure AQ-16. Ambient Air and Visibility Monitoring Sites in and Adjacent to Portions of Idaho



Alternatives to Burning and Emissions Reduction – In addition to the areas with steep slopes (greater than 40 percent) or designated as wilderness, Management Prescription Categories provide different opportunities for the use of mechanical equipment. These limitations are based on standards and guides applied to meet the MPC themes. In some cases, mechanical treatments may be prohibited while in other cases opportunities may be limited due to lack of access. To determine how opportunities for alternatives to burning may vary by alternative, MPCs were categorized into three opportunity groups: Very Limited, Limited, and Not Limited. MPCs assigned to the Very Limited opportunity group were 1.2, 2.1 (Wild), 3.1, 4.1a, 4.1b, and 4.1c. There MPCs either have standards and guides that prohibit mechanical treatments, or are so constraining, due to very small expected volumes or lack of access, that they are essentially not feasible to consider for mechanically removing biomass as an alternative to burning. MPCs assigned to the Limited opportunity group were 3.2, 4.2, 5.1, and 6.1. In these MPCs, access, or conflicts with the theme of the MPC may limit opportunities. Examples are MPCs 5.1 and 6.1 in which restoration, including the use of fire, is the MPC theme. The Not Limited opportunity group is made up of MPCs 5.2 and 6.2. These MPCs emphasize producing goods and services, and provide the kinds of mechanical options, infrastructure such as roads, landings, etcetera, that facilitate biomass removal. However, even in areas where mechanical treatments are used alone, some prescribed fire may still be necessary. This is because mechanical treatments cannot replace fire in supporting certain ecosystem functions. In addition, fire is often used to reduce hazardous fuels created from mechanical treatments.

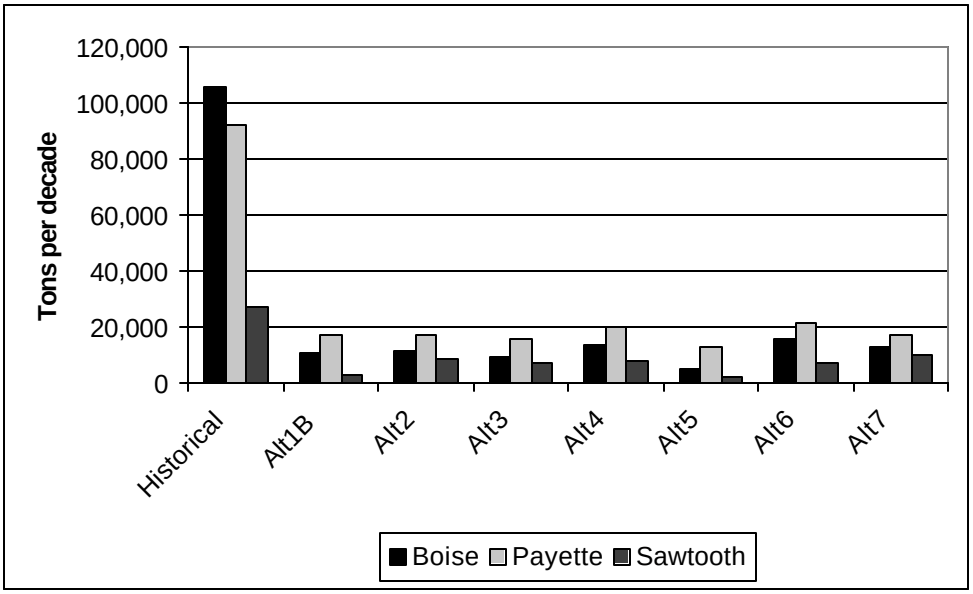
Direct and Indirect Effects by Alternative

Smoke Emissions From Fire Use for Vegetation Management

Fire use for vegetation management includes treatments used to move toward or maintain desired conditions for forested and non-forested vegetation, or to treat fuels associated with mechanical activities in forested vegetation (see the *Fire Management* section). Each alternative produced different potential levels of emissions based on various combinations of vegetative treatment activities. Figure AQ-15 displays the estimated tons per decade of historical PM 2.5 smoke emissions by Forest, and the average over the first 5 decades estimated for fire use by Forest and alternative. The levels for the Payette and Sawtooth include decadal projections of emissions from the Frank Church – River of No Return and Sawtooth Wildernesses based on their current Management Plans. Overall for the Ecogroup, no alternatives produced even a quarter of the emissions that may have occurred historically (Figure AQ-17). The closest was Alternative 6, which based on acres treated, burned about 20 percent of the historical acreage.

For all three Forests, Alternative 5 produced the least emissions. However, though Alternative 6 produced the most on the Boise and Payette, Alternative 7 produced the highest levels on the Sawtooth. The order of Alternatives on the Boise and Payette are the same. The Sawtooth exhibits a much different ranking due to the amount of area in the non-forested communities. The arrangement of the alternatives from most to least amount of fire use was different for non-forested compared to forested vegetation (see the *Fire Management* section). As the Sawtooth contains the greatest amount of non-forested vegetation, this influenced the arrangement of alternatives relative to smoke emissions.

Figure AQ-17. Average Estimated PM 2.5 Fire Emissions per Decade Historically and for Fire Use, by Alternative by Forest



Smoke Emissions by Fire Regime

In all but one alternative, fire use in Fire Regime III and V (forested, mixed and lethal) accounted for the largest source of total estimated PM 2.5 emissions (Table AQ-18). The only exception was on the Sawtooth for Alternative 5 where the emissions from Fire Regime II and IV (non-forested, mixed and lethal) exceeded those from fire use in forested communities.

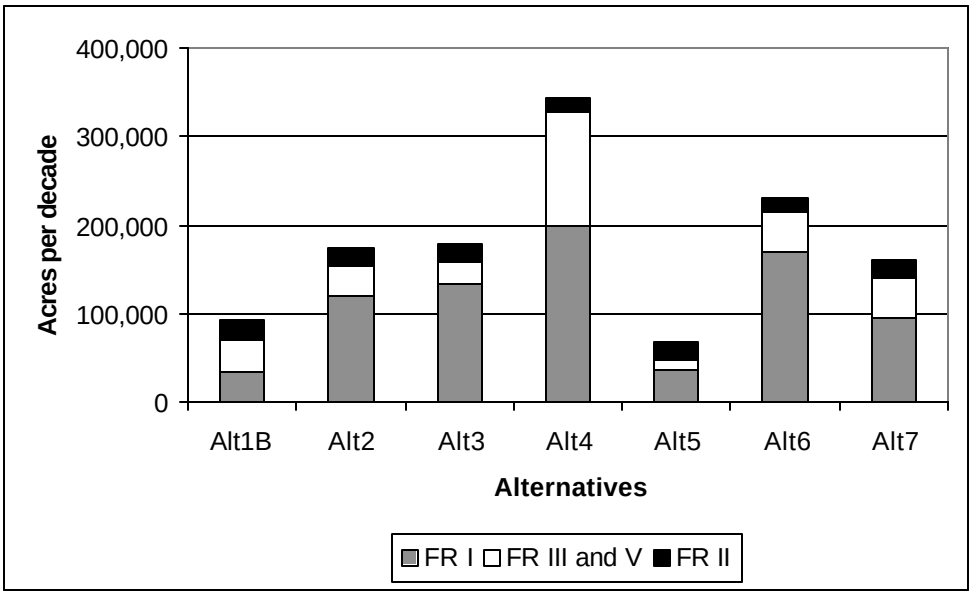
Table AQ-18. Percent of Total Estimated PM 2.5 Smoke Emissions From Fire Use by Forest and Alternative
(Average per decade over a 5-decade time period)

Forest and Indicator	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt.7
Boise National Forest							
Fire Regime I	11	23	32	41	16	43	17
Fire Regimes III and V	73	60	52	55	42	53	71
Fire Regimes II and IV	1	1	1	1	2	1	1
Activity Fuels	15	15	14	3	37	3	10
Payette National Forest							
Fire Regime I	23	29	28	33	25	31	23
Fire Regimes III and V	71	68	67	66	66	67	72
Fire Regimes II and IV	NA[1]	NA	NA	NA	NA	NA	NA
Activity Fuels	5	4	5	1	9	2	5
Sawtooth National Forest							
Fire Regime I	0	3	3	3	4	5	2
Fire Regimes III and V	51	78	72	79	34	77	79
Fire Regimes II and IV	38	16	21	17	48	16	16
Activity Fuels	10	3	4	1	14	1	3

[1]Non-forest vegetation not modeled on Payette Forest

The large amount of estimated PM 2.5 emissions from Fire Regimes III and V (forested, mixed and lethal) are not necessarily due to the more burning in this fire regime. In most cases, alternatives treat more acres in Fire Regime I (forested, nonlethal) in order to reduce uncharacteristic wildfire hazard (Figures AQ-18, AQ-19, AQ-20). More emissions are produced from Fire Regimes III and V (forested, mixed and lethal) due to greater fuel loadings and the expectation that for all alternatives except 1B, burning in this fire regime will more often be from wildland fire use than prescribed fire. Emissions from wildland fire use in these fire regimes are expected to produce greater emissions than prescribed burning in nonlethal fire regimes as Fire Regimes III and V generally accumulate greater fuel loadings. In addition, wildland fire use burning is expected to occur under drier conditions than prescribed fire. This would increase the amount of consumption and subsequently the amount of emissions.

Figure AQ-18. Average Fire Use Acres per Decade for the Boise Forest by Historical Fire Regime[1] and Alternative



[1]Non-forest vegetation (Fire Regimes II) modeled only on southern portions of the Boise Forest

Figure AQ-19. Average Fire Use Acres per Decade for the Payette Forest by Historical Fire Regime and Alternative

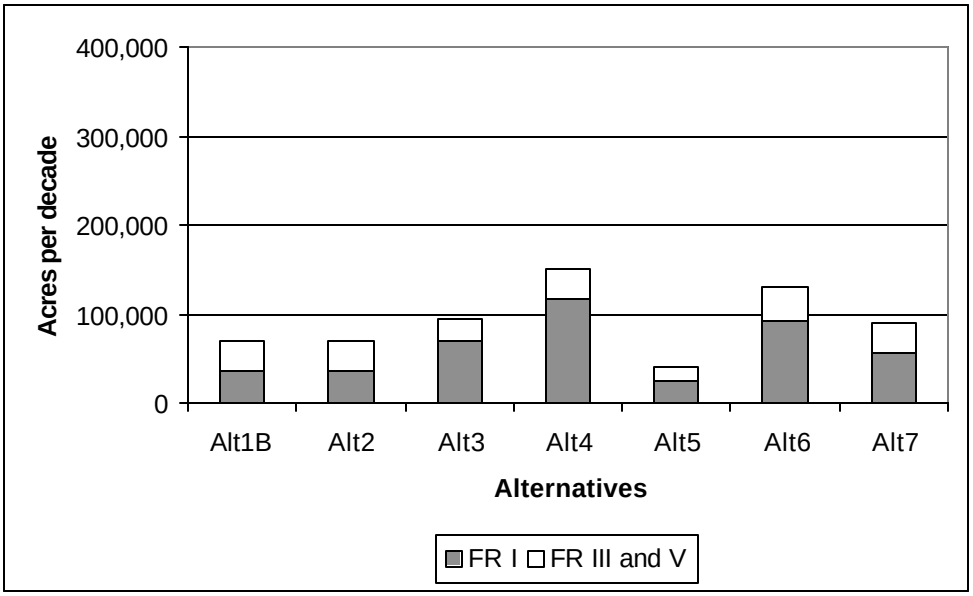
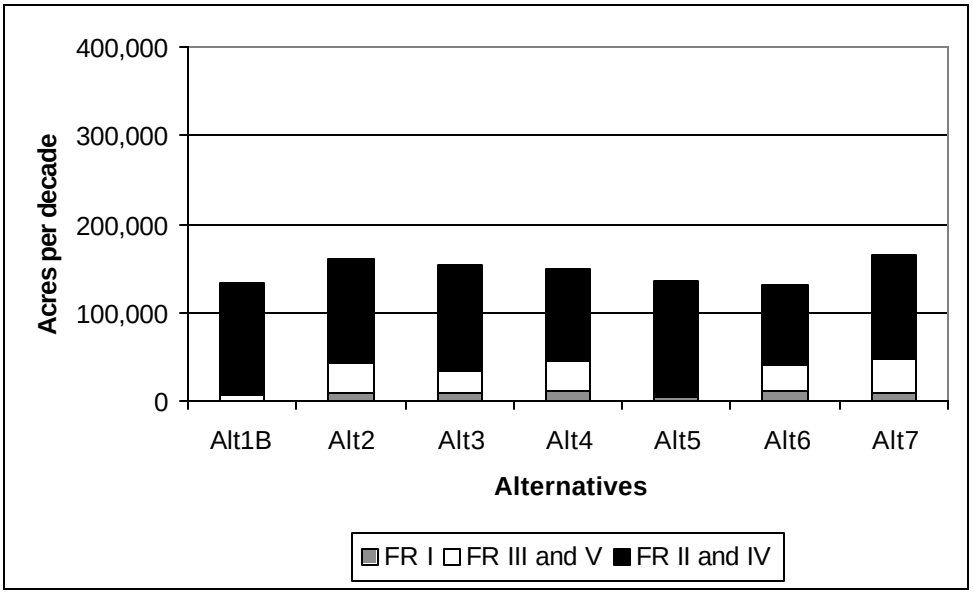


Figure AQ-20. Average Fire Use Acres per Decade for the Sawtooth Forest by Historical Fire Regime and Alternative



Acres treated in the various fire regimes vary across the three Forests in the Ecogroup. This reflects the vegetation/fire regime changes that occur over the area in response to a variety of factors including climate, elevation, soils, topography, and latitude (see the *Vegetation Diversity* section for more explanation of vegetative distributions). The Boise has a greater amount of area Fire Regime I (forested, nonlethal) than either the Payette or Sawtooth and the number of acres

treated by alternatives in this Fire Regime is highest on the Boise. The Sawtooth has a much greater extent of area in Fire Regimes II and IV (non-forested, mixed and lethal). Subsequently this area treats the most acres in this Fire Regime.

Wildfire

Two different modeling approaches were used for the forested and non-forested vegetative communities to represent wildfire (See Appendix B). Forested vegetation was modeled using SPECTRUM, which does not provide a mechanism for handling large-scale stochastic events. This is in contrast to the VDDT modeling used for the non-forested communities. This model was developed to represent small and large-scale stochastic events.

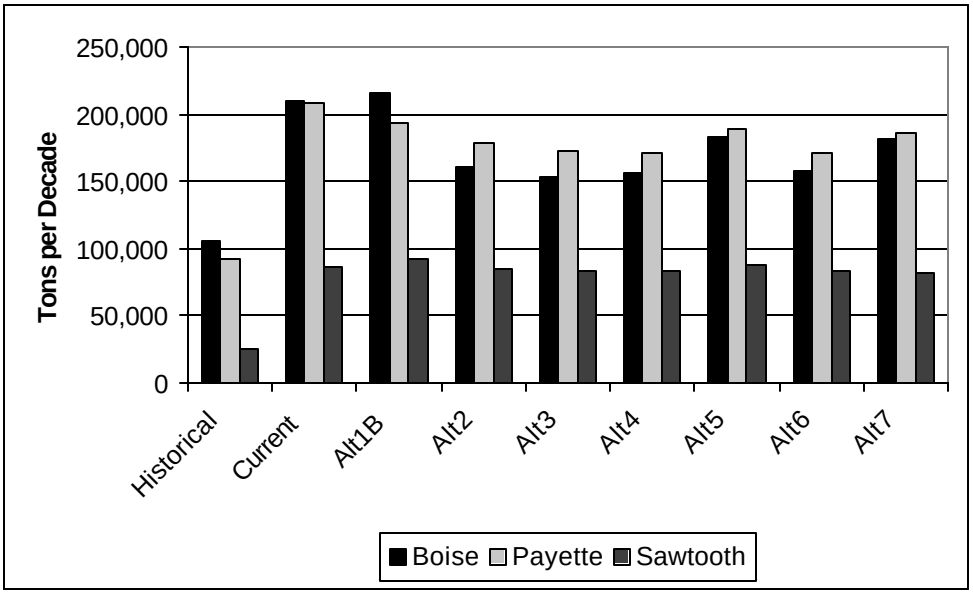
Forested Vegetation – Wildfire smoke estimates include potential emissions from acres burned from the "background wildfire" and acres of hazardous vegetative conditions (see the *Vegetation Hazard* section). Vegetation in hazardous conditions is assumed to contribute to the risk of wildfires, particularly uncharacteristic wildfires. The SPECTRUM modeling does not account for large-scale, stochastic events like uncharacteristic wildfires. In this case, vegetative hazard was used as a mechanism for representing the potential for these kinds of wildfires. Background wildfires were included in the SPECTRUM modeling and were assumed to be recurring events that produced constant low amounts of emissions.

These estimates do not attempt to display how much smoke may be produced from a single wildfire event, but rather represent the total average over five decades of smoke stored in hazardous vegetation.

Emissions produced historically are estimated to be less than the amount stored in hazardous vegetative conditions in forested communities (Figure AQ-21). Currently, vegetative conditions are such that uncharacteristic wildfires could produce more than twice to almost three times the PM 2.5 emissions produced historically. The uncharacteristic conditions on the Boise have the potential to produce smoke emissions that are about 2 times greater than historical levels (Figure AQ-21). Potential emissions on the Payette and Sawtooth are about 2.3 and 2.7 times greater than historical, respectively.

Potential smoke emissions were altered for alternatives based on changes in vegetation, which in turn affects the uncharacteristic wildfire hazard (see the *Vegetation Hazard* section). Over the first five decades, all alternatives except 1B on all three Forests reduced the potential wildfire emissions from current levels (Figure AQ-21). Reducing hazardous vegetative conditions was a modeling goal of all alternatives except 1B to represent National Fire Plan objectives. On the Boise, Alternative 3 followed by 4 and 6 reduced potential emissions the most compared to the current condition. These three alternatives had the lowest 5^{th} decade uncharacteristic wildfire hazard indexes (see the *Vegetation Hazard* section). For the Payette, Alternatives 4, 6, and 3 were the lowest compared to the current condition. Again these three alternatives had the lowest 5^{th} decade hazard indexes. On the Sawtooth, Alternative 7 produced the lowest potential wildfire emissions followed by 4. Alternatives 3 and 6, which were next lowest, were the same.

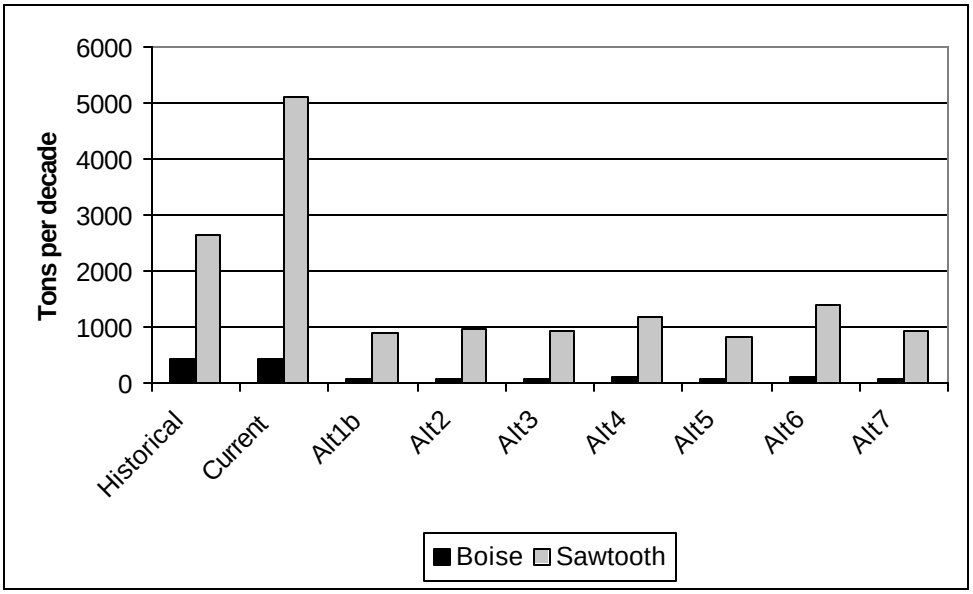
Figure AQ-21. Potential PM 2.5 Emissions Stored in Hazardous Vegetative Conditions in Forested Vegetation for Alternatives by Forest



Non-forested Vegetation – Background and uncharacteristic wildfire were both represented in the VDDT modeling for the non-forested vegetation. There were not enough acres on the Payette to model so only the Boise and Sawtooth were included. Like the modeling done for the forested communities, the VDDT model was used to show how different combinations of vegetative treatments influence vegetative conditions, including hazard, and the potential affects these changes have on wildfire events. Based on recent historic (since 1950) wildfire data, probabilities were developed and interjected to represent background and large-scale wildfires (failed fire suppression). These events were used for alternative comparison only; they do not represent a "best guess" of when future wildfires will occur. Rather they were used to display how changes in vegetative conditions produced by the different alternatives may influence wildfires.

Current potential emissions for the Boise are about the same as the estimated historical level; they are about two times the estimated level on the Sawtooth (Figure AQ-22). Alternative 5 followed by 7 had the lowest modeled wildfire emissions over the 5-decade time period. Alternatives 4 and 6 were the highest. Alternatives 5 followed by 7 reduced the number of acres in the most hazardous vegetative conditions while Alternatives 4 and 6 retained the most. Acres in hazardous vegetative conditions were closely linked to acres burned by both kinds of wildfire in the modeled scenarios.

Figure AQ-22. Potential PM 2.5 Non-forested Wildfire Emissions from Background and Failed Fire Suppression for Alternatives by Forest

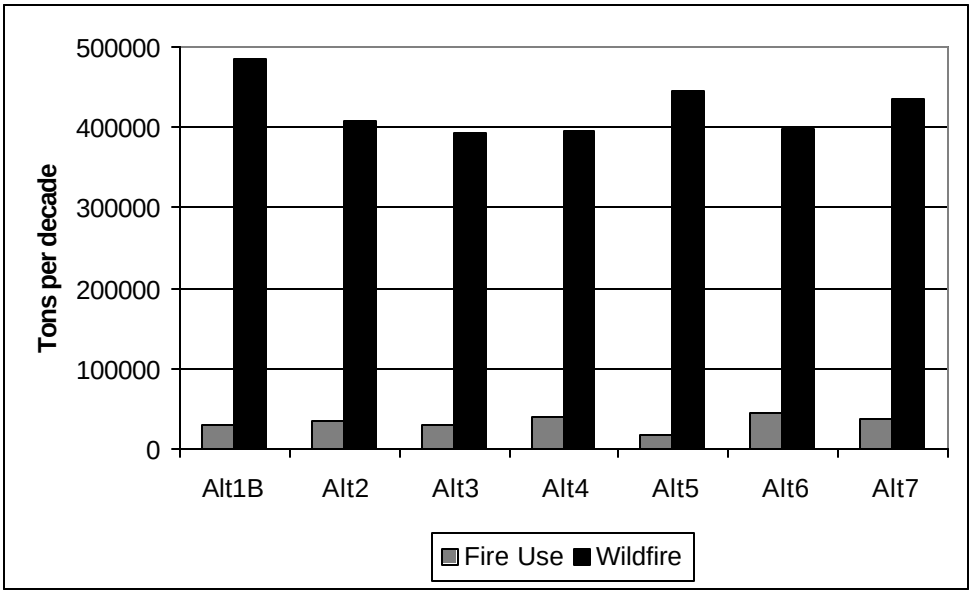


Comparison of Fire Use Versus Wildfire Emissions

Forested Vegetation - Fire is used as a vegetative management tool to restore or maintain desired conditions. It may be used alone or in combination with mechanical treatments depending on the Management Prescription Categories applied for the various alternatives. The conditions created on the landscape determine the vegetative hazard and the potential risk of wildfire. However, fire use to achieve desired conditions creates a tradeoff in emissions relative to potential wildfire.

In the forested communities the estimated emissions from fire use were much lower than the potential wildfire emissions over five decades for all alternatives (Figure AQ-23). This was in part due to differences in acres affected. That is, fewer acres were burned with fire use than are at risk to uncharacteristic wildfire over the first five decades. In addition, fuel consumption levels were assumed to be lower for fire use than wildfire since fire use is conducted within prescriptions designed to reduce impacts on resources. Lethal fire, regardless of whether it is within the historical fire regime or not, generally produces the greatest impacts to ecosystems. In vegetative types that contribute the most to uncharacteristic wildfire hazard, that is, the nonlethal and mixed1 fire regimes, fire use would be to emulate the lower intensity and severity burning consistent with the historical regime. Therefore fire use would not generally be lethal. Lethal wildfires consume much more fuel and therefore produce much higher emission levels.

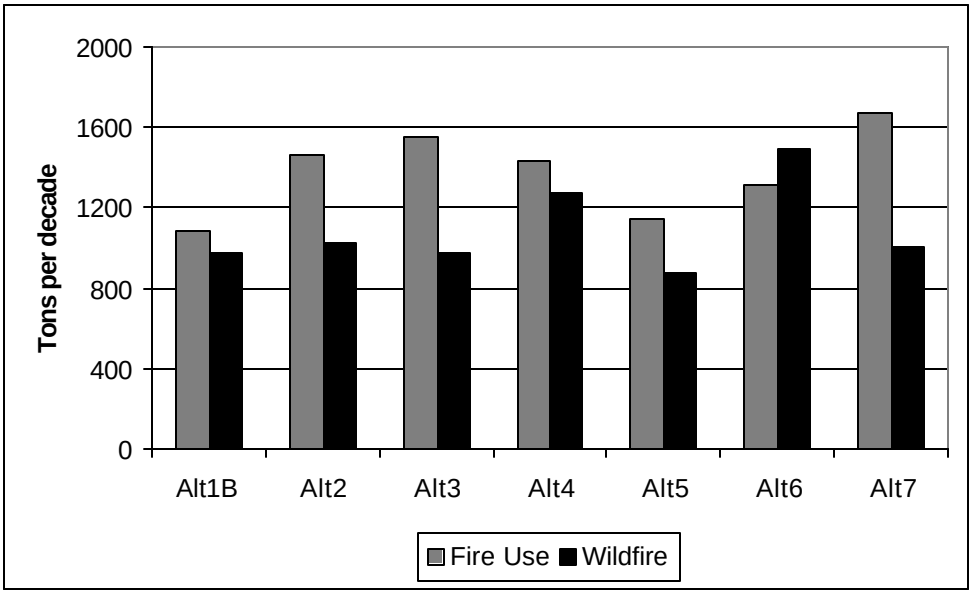
Figure AQ-23. Emissions from Fire Use in Forested Vegetation versus Potential Uncharacteristic Wildfire for Alternatives



Alternative 3 reduced the uncharacteristic wildfire hazard indexes to about the same levels as Alternatives 4 and 6 (see the *Vegetation Hazard* section, Table VH-14). However, the estimated emissions generated by this alternative are lower than Alternatives 4 and 6. This is due to the mix of tools defined by the Management Prescription Categories applied to Alternative 3 compared to 4 and 6. The MPCs in Alternatives 4 and 6 emphasize fire use whereas in Alternative 3, MPCs are a greater mix of mechanical and fire use treatments. For Alternative 5, which has the lowest fire use due to the greater emphasis on mechanical treatments, potential wildfire hazard is second highest of all the alternatives. In the case of this alternative, the desired conditions, which emphasize younger, denser vegetative, tend to be more hazardous because they represent denser, more continuous fuel conditions than historical (see the *Vegetation Hazard* section). Alternative 1B produces the greatest uncharacteristic wildfire hazard over the five decades. The desired conditions for this alternative are more hazardous than most other alternatives (see the *Vegetation Hazard* section, Table VH-11), and unlike the other alternatives, do not emphasize vegetative treatments to reduce hazard.

Non-forested Vegetation - The difference between estimated fire use and wildfire emissions was much closer in the non-forested communities compared to the forested vegetation (Figure AQ-24). Like with the forested, Management Prescription Categories for the alternatives determine the various mixes of treatments that will occur. These include fire use, chemicals, and grazing in all vegetative types plus mechanical treatments in aspen and juniper woodlands. The vegetative conditions that result determine the level of hazard and the amount of potential wildfire.

Figure AQ-24. Emissions from Fire Use in Non-forested Vegetation Versus Potential Wildfire for Alternatives



Alternative 5 produced the lowest estimated levels of wildfire emissions over the five decades. Compared to other alternatives, fire use emissions were second lowest. Overall, this alternative has the highest level of fire use for non-forested vegetation (see the *Fire Management* section for further discussions on fire use treatments). However, the primary kind of fire use is from prescribed fire rather than wildland fire. Prescribed fire is assumed to produce lower levels of emissions than wildland fire use. This is based on the assumption that fuel consumption using prescribed fire is less than wildland fire use because prescribed fire is more likely to be implemented when fuel moistures are higher. Therefore emissions from prescribed fire would be lower.

Alternative 7 produced the greatest level of fire use emissions; wildfire emissions were at similar levels to Alternatives 1B, 2, and 3. While acres treated with fire use in this alternative are toward the lower end, the high emissions are due to a combination of prescribed fire and wildland fire use. Alternatives 1B, 2, and 3 all have higher levels of fire use than Alternative 7 but all have a greater emphasis on prescribed fire. Alternative 6 produced the highest wildfire emissions. Fire use in Alternative 6 is the lowest of all alternatives on the Sawtooth and second lowest on the Boise next to Alternative 4. However, even though treatment levels were lower in these two alternatives, both emphasize wildland fire use over prescribed fire.

Risks to Designated Sensitive Areas

Non-attainment and Maintenance Areas – The Northern Ada County PM 10 Non-attainment/Carbon Monoxide Maintenance Area is in Airshed 22. The Boise Forest is the only Ecogroup unit within this airshed. The Boise administers less than 1 percent of the area (3,400 acres) in Ada County. The dominant historical fire regimes in this portion of the county are Fire Regimes I (forested, nonlethal) and II (non-forested, mixed). In addition to other mitigations

associated with this area, Forest Plan Management Area direction was developed to ensure that State Air Quality managers were involved early in the planning processes that may impact air quality, in particular the PM 10 and carbon monoxide levels. Due to the relatively minor amount of administered lands within the county, impacts from fire use would be low. Fire use also does not normally occur during the winter, which is the season of poorest dispersion.

Portneuf Valley PM10 Non-attainment Area is in Airshed 19, which does not contain any Ecogroup administered lands. Due to the distance between the Ecogroup and the Non-attainment Area, in combination with the coordination that occurs through the Montana/Idaho Airshed Group, there is little likelihood that smoke generated by the Ecogroup would contribute to existing problems in this area. In addition, fire use activities generally do not occur in the winter, which is the main season in which past exceedances have occurred.

Visibility Impairment (Mandatory Class I Areas) – Wind patterns for representative months (April, July, and October) were used to evaluate the potential risk of smoke impacts to Class I areas from fire use activities in spring, summer, and fall at two different scales (see the Dispersion Meteorology discussion in this section). The 30-year average upper level winds (850 millibar at approximately 1,500 meters above sea level) winds were used as an indicator of the potential for smoke impacts between airsheds based on the general wind direction. Table AQ-19 summarizes the upper level and surface winds for each Class I area and indicates whether the predominate wind pattern might carry smoke towards or away from it.

Table AQ-19. Summary of Prevailing Representative Seasonal Surface and Upper Level Winds for Class I Areas within the Area of Consideration

Class I Area (name)	State(s)	Within Direction of Prevailing Upper Level Winds[1]	Airshed	Adjacent Ecogroup unit	Within Direction of Surface Winds[2]		
					April	July	Oct
Eagle Cap Wilderness	OR	No	N/A	N/A	N/A	N/A	N/A
Hells Canyon Wilderness	OR, ID	No	ID-13	N/A	N/A	N/A	N/A
			ID-14	Payette	No	No	Yes
			ID-15	Payette	No	No	No
Selway-Bitterroot Wilderness	ID, MT	No[3]	ID-13 MT-4	N/A	N/A	N/A	N/A
Anaconda-Pintlar Wilderness	MT	No[3]	MT-4 MT-5 MT-7	N/A	N/A	N/A	N/A
Sawtooth Wilderness	ID	Yes	ID-15	Boise	Yes	Yes	Yes
				Sawtooth	No	Variable	No
			ID-17	Sawtooth	No	Yes	No
			ID-21	Boise	No	Yes	Yes
				Sawtooth	No	Variable	No

Class I Area (name)	State(s)	Within Direction of Prevailing Upper Level Winds[1]	Airshed	Adjacent Ecogroup unit	Within Direction of Surface Winds[2]		
					April	July	Oct
Craters of the Moon National Monument	ID	Yes	ID-19	N/A	N/A	N/A	N/A
Jarbidge Wilderness	NV	No	N/A	N/A	N/A	N/A	N/A

[1]Upper level winds used are the 850 mb winds and vary little in direction during representative seasons (April, July and October). Wind direction would generally transport smoke in an easterly direction across the Ecogroup.
[2]Surface winds were evaluated only for areas adjacent to the Ecogroup
[2]During wildfire events plume trajectories have been observed to predominately flow in a northeast direction and could carry smoke into these wilderness areas.

If the dominant direction or pattern could not be generalized, this was listed as variable. If that direction is predominately toward a Class I area from Ecogroup activities, then the risk of smoke impacts increases, increasing the concern about implementation of fire use. If the predominate flow is away from the area, then the risk of impacts and concerns regarding implementation decreases. The 30-year average surface winds (10 meters above ground level) were used as an indicator of the potential risk of smoke impacts within an airshed.

Information from these wind fields indicates only a generalized evaluation of the potential for smoke to travel toward or away from a Class I area. Other factors also determine which winds (upper or surface) may transport or influence the plume trajectory including how strong the winds are, and the mixing heights or depth of the mixing layer. We assumed that the upper level winds would be more likely to carry smoke from wildland fire use activities since emissions from these types of fire can be of greater magnitude than prescribed fires. Prescribed fires, especially where lower intensity and severity fires are needed to achieve certain resources objectives, would be carried primarily by surface winds**.**

Upper level winds vary little over the Ecogroup in the spring and summer (Figures AQ-10, AQ-11, AQ-12). During this time period, winds generally blow east to southeast. This changes in the fall when winds generally travel east to northeast over some of the area. The prevailing flow in Airsheds 14, 15, and 16 is northeasterly. Surface winds a more difficult to generalize. Surface flows vary between and within airsheds and can change with seasons. Surface winds follow the terrain and therefore in complex, mountainous areas, wind direction varies. The potential risk of smoke impacts would therefore vary depending on the location of the burning relative to the sensitive area within the airshed.

The general wind patterns from the Ecogroup are away from the Eagle Cap Wilderness. This area is not downwind of the prevailing upper level winds. In addition, although the Wilderness is within the area of consideration, it is not adjacent to the Ecogroup. Therefore this area is unlikely to be impacted by Ecogroup activities.

The Hells Canyon Wilderness is adjacent to the Payette Forest boundary. However, prevailing upper level winds would transport smoke from fire use on the Payette away from this area. Surface winds in the spring and summer would also transport smoke away. In Airshed 14,

surface winds in the fall could carry smoke toward this area. In this case, smoke produced by prescribed burning in the fall may be carried into the Wilderness.

The Selway-Bitterroot and Anaconda-Pintlar Wildernesses are within the area of consideration but are not adjacent to Ecogroup administered lands. The upper level winds would generally transport smoke plumes away from the Wilderness. However, smoke from upper level winds blowing from the southwest was observed to transport smoke into this area during the 2000 fire season (IDEQ undated).

The Sawtooth Wilderness lies downwind of the Payette and Boise Forests. However, fire use activities on the Payette pose a relatively low risk of smoke impacts since the Payette is not immediately adjacent. Activities occurring in northwestern portion of Airshed 21 and the southern end of Airshed 15 have the potential to impact the Wilderness based on surface winds, particularly in the summer. Therefore prescribed fire and wildland fire use, depending on where they occur, could impact the Wilderness.

Though Craters of the Moon is not adjacent to the Ecogroup, there is some risk of smoke since this area is downwind from portions of the Ecogroup. Upper level winds could transport smoke from fire use into the area. The potential risk is greatest from activities occurring in Airshed 24 and southern portions of Airshed 21.

The Jarbidge Wilderness does not occur adjacent to the Ecogroup. In addition, smoke generated by the Ecogroup would flow away from this area during all seasons based on upper level winds.

Emissions from fire use and wildfire along with other sources, contribute to levels of organic and elemental carbon. Emissions from wildfire and wildland fire use would most likely occur during the same seasons. However, the contribution to impairment would be episodic and unlikely to occur annually. Prescribed fire is most often implemented in the spring and fall seasons. Therefore it is likely that the best visibility days will not be affected by prescribed burning within the Ecogroup since the best days occur in the winter when prescribed burning is typically not conducted. The poorest visibility days and years typically coincide with extreme wildfire seasons when we have little control over the number of acres burned and fuel consumed, and subsequently smoke impacts to visibility.

Summary of Risks to Other Sensitive Areas

Airshed 14 – The Ecogroup administers 28 percent of the lands in the airshed. Of this, most (23 percent) is the Payette Forest; the Boise makes up the remainder (5 percent). From 1981 through 2000, wildfire smoke has not had as much influence on this airshed as others (for example Airsheds 15 and 21). The number of acres burned by wildfire and prescribed fire during this time was relatively close. Wildfire burned about 1.5 percent of the area and about 1.0 percent was burned using prescribed fire.

Burning conducted by Airshed Group members does not appear to be of concern in this airshed. In the past, the Boise and Payette Forests rarely burned at the same time in the airshed. The amount of past burning has been relatively small; during the peak burning years (1995-1999), an average of 3,800 acres were burned annually. This is in comparison to 2001-2002 when as much

as 8,900 acres was planned. However, only around 2,300 to 3,400 acres were accomplished, which is below the 1995-1999 average.

Under most alternatives, prescribed fire is the most likely source of smoke contributing to particulate matter as prescribed fire treatments are available under all alternatives throughout the airshed. Although portions of the Ecogroup within the airshed have been identified as part of the Wildland Fire Use Planning Area (see the *Fire Management* section) implementation may be limited by the size and shape of administered lands. This Ecogroup area contains a relative large number of vegetative acres that are in Fire Regime I (forested, nonlethal) (and II [non-forested, mixed] though this was not modeled for the Payette or the northern portion of the Boise [see the *Vegetation Diversity* section]). On the Payette, all alternatives burn more acres in this fire regime over the next five decades than Alternative 1B. This is primarily due to the goal to reduce the number acres with vegetative conditions that contribute to uncharacteristic wildfire. Fire Regime I currently contains the most number of acres with hazardous conditions. Alternative 4 followed by 6, 3 and 2 on the Payette and Boise burn the most acres in this fire regime over the first five decades (Figures AQ-18 and AQ-19).

Airshed 15 – The Ecogroup administers about 74 percent of the lands in this airshed. Of this, the Boise Forest accounts for 37 percent, the Payette 35 percent, and the Sawtooth 2 percent. From 1991 through 2000, more acres were treated with prescribed fire in this airshed than any other. However, the amount of prescribed fire has been relatively minor (2 percent) compared to the number of acres burned by wildfire (13 percent).

Prescribed fire is allowed throughout the airshed under all alternatives. Valley and Boise Counties contain the most amount of Ecogroup area in Fire Regime I (forested, nonlethal). As noted for Airshed 14, all alternatives burn more acres in this fire regime than Alternative 1B. Alternative 4 followed by 6, 3 and 2 on the Payette and Boise burn the most acres in this fire regime over the first five decades (Figures AQ-18 and AQ-19). Portions of the Ecogroup in this airshed have been identified as part of the Wildland Fire Use Planning Area. Most of the identified area is in the northern and eastern areas of the airshed adjacent to the Frank Church – River of No Return and Sawtooth Wildernesses. In areas where wildland fire use may occur, vegetative types in Fire Regimes III and V (forested mixed and lethal) are the most likely targets. On the Payette, alternatives 6 and 4 burn slightly more acres than 1B in this type. On the Boise, Alternative 4 followed by 7 and 6, treat more acres than Alternative 1B.

Airshed 16 – The Forest Service, including the Ecogroup, administers most of the land in this Airshed (98 percent). Of this, the Payette Forest manages 25 percent, the Boise 4 percent, and the Sawtooth less than 1 percent. The Frank Church – River of No Return Wilderness makes up the majority of the area. This area is administered under an existing Wilderness Management Plan that allows primarily for wildland fire use with small amounts of prescribed fire adjacent to in-holdings and boundaries. Forest Plan revision proposes no changes to the existing Wilderness Management Plan and therefore alternatives do not differ for this area.

Airshed 17 - The Sawtooth administers about 16 percent of the lands in this airshed. In total the Forest Service administers about 58 percent of the airshed. From 1981 through 2000, wildfire and fire use have been relatively minor. During this time period, there were no fires greater than

300 acres and prescribed fire has been used on less than 100 acres annually. This may be due to the vegetation types that occur across this area; the majority of the Ecogroup area is forested and falls into Fire Regimes III and V (forested, mixed and lethal).

Wildland fire use is currently allowed in the Sawtooth Wilderness under an existing Wilderness Management Plan. Additional Wildland Fire Use Planning Areas were identified for eastern portions of the Ecogroup in this airshed. Wildland fire use treatments in the Sawtooth Wilderness generally burn few acres due to the elevations, vegetation types, and the extensive natural fuel breaks in the form of rock and water. Because of the climatic regime over the Sawtooth, the Forest in general receives less dry lightning and therefore fewer ignitions. Ignitions that may result in wildland fire use treatments are expected to occur less often in the forested communities of the Sawtooth compared to the Boise and Payette.

Prescribed fire is allowed throughout the airshed under all alternatives. However, because of the vegetative types, emissions produced by fire use overall, particularly in the forested communities, is anticipated to the lower than the Boise and Payette (Figures AQ-18 and AQ-19). On the Sawtooth, all alternatives except Alternative 5 increase the amount of fire use over Alternative 1B in Fire Regimes III and V (forested mixed and lethal) (see Figure AQ-20). Alternative 2 followed by 4 and 7 treat the most acres.

Airshed 21 – The Ecogroup administers about 80 percent of the lands within the airshed. Of this, the Boise manages 52 percent of the area and the Sawtooth 28 percent. Prescribed fire use has been relatively minor compared to the amount of wildfire that has occurred in this area. From 1991 through 2000, prescribed fire has been used on less than 1 percent of the airshed while 23 percent has been burned by wildfire.

Prescribed fire is allowed throughout the airshed under all alternatives. A little over half the Ecogroup area in the airshed is in Fire Regimes I (forested, nonlethal), and II (non-forested, mixed). All Alternatives on the Boise burn more acres in Fire Regime I than Alternative 1B, in order to reduce uncharacteristic wildfire hazard. This is also the case on the Sawtooth though fewer acres are treated. The Sawtooth supports much less area in the vegetative types that make up this fire regime. On the Boise, Alternative 4 followed by 6, 3, and 2 burn the most acres in Fire Regime I. For the Sawtooth, Alternative 4 followed by 6, 7, and 3 burn the most.

Portions of the Ecogroup have been identified as part of the Wildland Fire Use Planning Area. Most of the identified area is adjacent to the Sawtooth Wilderness. Vegetative communities targeted for wildland fire use are primarily those in Fire Regime III and V (forested, mixed and lethal). On the Boise, Alternative 4 followed by 7 burns then 6 burn more acres over the next 5 decades than Alternative 1B. The other alternatives burn fewer acres than 1B. On the Sawtooth, all alternatives except 5 burn more acres in this type than Alternative 1B. Alternative 7 burns the most followed by 4, 2, and 6.

Airshed 24 – The Ecogroup, primarily the Sawtooth Forest, administers 14 percent of the airshed. The Sawtooth has implemented very few acres of prescribed fire in this airshed. From 1981 through 2000, wildfires burned less than 300 acres although Camas County experienced a spike in emissions in 1996 from wildfire.

Prescribed fire is allowed throughout the airshed under all alternatives. In addition, portions of the Ecogroup have been identified as part of the Wildland Fire Use Planning Area. About half the Ecogroup administered area is made up of non-forested vegetation types in Fire Regimes II (non-forested, mixed). The other half is made up of forested communities in Fire Regimes III and IV (forested, mixed and lethal). In the Forested areas on the Sawtooth, all alternatives except 5 burn more acres in this type than Alternative 1B (Figure AQ-20). Alternative 7 burns the most followed by 4, 2, and 6.

In the non-forested communities, Alternative 1B on the Sawtooth displays the acres that could be treated with fire use based on the Management Prescription Categories assigned to that alternative. However, fewer acres are currently being implemented so all alternatives may burn more acres over the next 5 decades than the current amount. Of these, Alternative 5 burns the most acres in the non-forested followed by Alternatives 3, 2, and 7. Alternatives with Management Prescription Categories that focus on prescribed burning treat more acres than those that emphasize wildland fire use (see the *Fire Management* section).

Airsheds 20, 25, and 1 – The number of acres administered by the Ecogroup Forests is small compared to the overall size of this area. The Sawtooth Forest manages about 10 percent of the area over all three airsheds. Past prescribed burning and wildfire have been minor in this airshed.

Prescribed fire is allowed throughout the airshed under all alternatives. Portions of the Ecogroup Forests within the airshed have been identified as part of the Wildland Fire Use Planning Area. The majority of the vegetation on Ecogroup administered lands is made up of Fire Regimes II and IV (non-forested, mixed and lethal) though there is a small amount of Fire Regime III and V (forested, mixed and lethal) (Figure AQ-20). Fire use in the various alternatives for the fire regimes in this airshed is similar to that described for Airshed 24.

Direct and Indirect Effects to Individual Airsheds

Airshed 14 - Most of the population centers within this airshed are not immediately adjacent to the Forest boundaries. However, there are a few communities, like Cuprum, that are close to the Forest boundary and contain vegetative communities assigned to Fire Regime I (forested, nonlethal) (Figure AQ-14). All alternatives burn more acres in this Fire Regime than Alternative 1B in order to reduce hazard where it is currently high. These activities are focused around communities in the short-term in order to meet National Fire Plan objectives.

Surface winds within the airshed generally carry smoke away from population centers during the spring and fall, which is when prescribed fire is usually conducted. Potential smoke impacts to population centers would primarily be from wildland fire use, if it occurs, and wildfires.

Airshed 15 - The McCall Impact Zone occurs adjacent to the Payette Forest boundary. The dominant fire regimes around the Impact Zone are Fire Regimes III and V (forested, mixed and lethal) (Figure AQ-14). Therefore smoke impacts to this area would be less than may occur for areas adjacent to Fire Regime I (forested, nonlethal). Surface and upper level winds within the airshed generally transport smoke away from the Impact Zone but this area may be impacted by smoke carried in from Airshed 14. Although this airshed has many other population centers,

most are located along the western boundary. As with the Impact Zone, surface and upper level winds would generally carry smoke away from the population centers. However, there are a few communities, such as Lowman and Yellow Pine that are in close proximity to the boundary adjacent to vegetative communities in Fire Regime I (forested, nonlethal). As described for Airshed 14, all alternatives burn more acres in this fire regime than Alternative 1B in order to reduce hazardous vegetative conditions.

Impacts from past burning have been minor in this airshed due in part to favorable transport winds during spring and fall. However, limited ambient air quality data from the McCall and Garden Valley monitoring sites suggests that coordination during the burning period is necessary to reduce potential effects to the McCall Impact Zone and some population centers in the airshed. Air quality monitoring during the burning season conducted in previous years shows that air quality was generally "good" in the spring and fall though some days reached "moderate". In addition, in the past this airshed has had the highest average number of days when ignitions were restricted because of risks to air quality. Most of these occurred in the fall. It may be difficult to implement large areas of burning at one time based on data from past seasons. This may be of particular concern in the fall where there is potential to affect the McCall Impact Zone.

Airshed 16 – The risk of smoke-related impacts to population centers within this airshed is very low since the majority of the area is the Frank Church – River of No Return Wilderness and there is only one small population center in the airshed (Big Creek). Based on the existing Wilderness Management Plan, wildland fire use is the primary type of fire application. This type of burning occurs primarily the summer and is unpredictable as the timing, amount, and duration of smoke events vary from year to year. Large wildland fire use and wildfire events that occur near the northeastern boundary of the airshed have the potential to affect the Salmon Impact Zone in adjacent Airshed 17.

Airshed 17 – Most of the population centers immediately adjacent to the Ecogroup boundary are surrounded by vegetative types that burn less frequently than Fire Regime I (forested, nonlethal) (Figure AQ-14). Prescribed fire activities to reduce hazardous fuels may occur occasionally, but would not be as frequent as what might occur for areas surrounded by vegetative types in fire regimes that burned more frequently. In the spring, surface winds generally blow to the east, moving smoke across the airshed. In the fall, winds generally move from the south to the north, northeast. In the summer, winds generally blow from the south to north. Wildland fire use treatments in the Sawtooth Wilderness could impact adjacent communities. However, wildland fire use treatments in this Wilderness are generally small and of short duration. Although The Salmon Impact Zone is in this airshed, smoke from wildland fire use in eastern portions of the Sawtooth Forest would generally be transported away from population centers due to the speed and direction of upper level winds. However, surface and upper level winds could transport smoke from treatments at the southern end of the airshed toward the Sun Valley/Ketchum Impact Zone in Airshed 24.

Airshed 21 – Though much of this airshed is unpopulated, many of the communities that occur here, including Idaho City, Atlanta, Featherville, and subdivisions along the Highway 21 corridor, are adjacent to Fire Regimes I (forested, nonlethal), and II (non-forested, mixed) (Figure AQ-14). Smoke impacts to these communities are likely to occur under all alternatives

due to the emphasis on reducing uncharacteristic wildfire hazard. The potential impacts to communities would be evaluated during project level planning for prescribed fire to determine compliance with the NAAQS. Appropriate mitigations would be instituted to reduce the potential for exceedances of the PM 2.5 NAAQS. In the past, prescribed fire activities have been implemented adjacent to these communities under the coordination of the Montana/Idaho Airshed Group. Although the magnitude and duration of smoke impacts can be minimized by this coordination in combination with other smoke management techniques, air quality levels for short time periods (one to two days) may reach "moderate" levels.

Based on the location of the Wildland Fire Use Planning Area and the prevailing surface and upper level winds, impacts from wildland fire use would be minimal to population centers located in the airshed since most are upwind of where the use is most likely to occur. However, wildland fire use on the Sawtooth Forest may affect the Sun Valley/Ketchum Impact Zone. Upper level winds in this area in the late summer and fall tend to flow across that portion of the Sawtooth toward this area.

Airshed 24 – The Sun Valley/Ketchum Impact Zone is an area of concern in this airshed due to its proximity to Ecogroup administered lands. About half the lands administered by the Sawtooth in this airshed fall within the boundary of the Impact Zone. Increases in burning on Ecogroup administered lands have the potential to affect this area. The season of poorest dispersion is winter, when fire use does not normally occur. However, average morning mixing heights in any season, particularly summer and fall, are generally poor indicating potential for accumulation during the night from residual smoke. Spring and fall surface winds may reduce the amount of smoke that accumulates as winds tend to blow toward the east, away from the communities. In the summer the winds shift, blowing from north to south over Ecogroup administered lands is toward the Sun Valley and Ketchum areas. However, upper level winds potentially carry smoke away from the Impact Zone in all seasons.

Airsheds 20, 25, and 1 – This large area contains several small communities and the Twin Falls Impact Zone. The Impact Zone is located to the north of the western-most Division of the Sawtooth. Based on the prevailing west to east-southeast wind direction that occurs in all seasons, smoke from fire use activities on Ecogroup administered lands would generally be carried away from the Impact Zone. This would also be the case for population centers like Burley and Heyburn that lie to the north of the Sawtooth Divisions. Communities located between the Divisions, such as Malta, Oakley, Elba, Almo, Yost, Clear Creek, may experience smoke impacts depending on the season. Wind direction varies throughout this area from spring, summer, and into fall which may carry smoke from Ecogroup administered lands into population centers. In addition, average morning mixing heights in some areas are poor, indicating the potential for residual smoke to accumulate during the night.

Cumulative Effects

Airshed 14 – Based on data from 1995 through 1999 smoke produced by Airshed Group members is the primary source. Even though the Montana/Idaho Airshed Group does not coordinate prescribed burning on almost half of the lands within this airshed, there does not appear to be a potential risk of impacts from other sources. The total average tons per year of

PM 10 emissions within counties containing Ecogroup administered lands is relatively low. Payette County is above the PM 10 threshold of concern (10,000 tons per year), but the Ecogroup does not administer lands in this county. The annual averages for PM 2.5 are similarly low for all counties though Payette County is again the highest.

From 1995 through 1999, PM 10 levels declined primarily due to reductions in Fugitive Dust. Fugitive Dust is the largest contributor of PM 10 and 2.5 in all counties followed by either Other Combustion or Agriculture and Forestry. There are also no point sources within the airshed. This further reduces the potential for fire use activities to conflict with other sources of emissions.

The potential to conflict with agricultural burners is also low based on estimated amounts of crop residue burning. Counties within this airshed have some of the lowest levels of burning for agricultural-related uses in the state. However, there may be some concern about smoke that could be transported into the airshed from upwind counties in Oregon though this has been minor in the past.

Airshed 15 – The risk of conflict with agriculture burning in this airshed is low based on past data as Valley and Boise Counties have had very low amounts of crop residue burning. Though the level in Idaho County was "moderate" in the past, areas that contribute to this county rating are located outside of the airshed. PM 10 emission trends for all counties have been improving while PM 2.5 trends show no change. Sources of emissions within the airshed are primarily from Fugitive Dust, Other Combustion, and Agriculture and Forestry. Improving PM 10 trends are primarily due to reductions in Fugitive Dust. There are no point sources within the airshed.

The overall risk of cumulative impacts to population centers is low based on the available emissions data. In addition, there are relatively low levels of burning conducted by burners other than those that make up the Montana/Idaho Airshed Group.

Airshed 16 – The risk of cumulative effects in this airshed is very low. Agricultural burning is low for all counties except Idaho, but the sources that contribute to the county level occur outside of the airshed. Annual average amounts of emissions are ranked among the lowest for counties within the area of consideration. PM 10 trends in all counties within the airshed have been improving due to reductions in Fugitive Dust. PM 2.5 trends generally show no change, though Lemhi County has shown slight improvement. Valley County average annual emissions are near the threshold of concern (10,000 tons per year), but emissions spiked in 1996 due to wildfires that temporarily increased emissions. This spike similarly influenced the average annual emissions for PM 2.5 and contributed to the relative high ranking. In addition, there are no major point sources within the airshed.

Airshed 17 – This airshed is managed primarily by burners who are members of the Montana/Idaho Airshed Group. This, in combination with the vegetative types being managed, reduces the potential for cumulative effects. In addition, crop residue burning is low to very low in the counties in this airshed. Counties in this airshed are ranked among the lowest in total annual average emissions and PM 10 trends for all counties have been improving. There are no

major point sources located in this airshed. Overall, the risk of emissions impacts from cumulative effects is very low.

Airshed 21 – The potential for cumulative effects in this airshed is relatively low. The Ecogroup manages a large portion of the area, which decreases the chances of conflicting with other burners. Agricultural burning in the counties that make up this airshed is minor. PM 10 trends for Boise and Elmore County show improvement, primarily due to reductions in Fugitive Dust. Trends are also improving in Camas County though the data is skewed by a large increase in emissions in 1996 due to wildfires. However, average annual levels do not indicate a potential risk for cumulative effects. In addition, there are no point sources in the airshed.

Airshed 24 – The risk of impacts from cumulative effects in this airshed is low even though the Ecogroup manages only a small portion of the area. Agricultural burning in the counties in this airshed is low. PM 10 levels have been improving primarily due to reductions in Fugitive Dust; PM 2.5 levels have remained constant. There are no major point sources in the airshed.

Airsheds 20, 25, and 1 – In Airshed 25, although the Ecogroup administers a relatively small portion of the airshed, about 60 percent of the area in Idaho is managed by members of the Montana/Idaho Airshed Group. In 2002, Airshed members increased the amount of burning conducted in this airshed. In the future, coordination through smoke management programs will be key to reducing the potential smoke impacts, particularly at population centers.

Counties within and adjacent to these airsheds produce varying amounts of smoke from agricultural-related burning. Within the area of consideration, counties in these airsheds have the highest levels of crop residue burning. This suggests that there may be conflicts between burners for available burning windows. In addition, a number of the counties in the airshed contain point sources, which are another potential contributor of pollutants. The potential ramifications of the cumulative contribution of the Ecogroup to other sources are considered during project-level planning for prescribed fire, or as part of the implementation decisions for wildland fire use.

Other burners in Idaho are involved in a smoke management program. Practices developed through the Idaho Department of Agriculture and Department of Environmental Quality may further reduce the risk of potential cumulative impacts from emissions produced by multiple sources. PM 10 trends in counties adjacent to or containing Ecogroup administered lands have been improving primarily from reductions in Fugitive Dust. Dust currently accounts for the largest proportion (61 to 80 percent) of the annual emissions in these counties. This is also the case for PM 2.5.

Alternatives to Burning and Emissions Reduction

Alternatives provide various opportunities to reduce emissions through the use of mechanical rather than burning treatments. The differences between alternatives are based on the varying amount of area assigned to Management Prescription Categories, which provide the basis for determining opportunities. MPCs were assigned to Very Limited, Limited, and Not Limited Opportunity Groups based on potential limitations of the use of mechanical treatments defined by MPC theme, and standards and guides. Table AQ-20 displays the total acres in each alternative assigned to the various opportunity classes. On all three forests, Alternative 5

provides the most area in the Not Limited Opportunity Group and Alternative 6 followed by 4 provides the least amount of area in this group.

Table AQ-21 displays the percentage of acres treated with fire use in each opportunity group based on the vegetation modeling. For Alternatives 1B, 4, 6, and 7 the majority of the fire use is occurring in areas with Very Limited opportunities (Table AQ-21). Of these alternatives, Alternative 4 as opposed to 6 provides more opportunities as it has more area in Limited than the Very Limited Opportunity Group. The majority of the fire use in Alternative 3 on all three forests and Alternative 2 on the Boise is also occurring in areas with Limited as opposed to Very Limited opportunities.

Table AQ-20. Percentage of the Total Acres Assigned to Very Limited, Limited, and Not Limited Opportunity to Reduce Emissions Groups

Opportunity Group	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise NF							
Very Limited	23	29	19	53	10	71	42
Limited	37	61	77	47	37	23	40
Not Limited	40	14	4	0	53	6	18
Payette NF							
Very Limited	56	56	30	70	20	73	54
Limited	15	32	70	30	29	18	30
Not Limited	30	12	0	0	51	9	16
Sawtooth NF							
Very Limited	33	40	32	76	17	83	46
Limited	31	53	66	24	40	14	54
Not Limited	36	7	2	0	43	2	0

Table AQ-21. Percentage of the Total Forested Vegetation Fire Use Acres Occurring in the Very Limited, Limited, and Not Limited Opportunity to Reduce Emissions Groups

Opportunity Group	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise NF							
Very Limited	82	33	22	63	29	88	54
Limited	18	64	78	37	60	11	43
Not Limited	0	3	0	0	11	1	3
Payette NF							
Very Limited	92	74	42	70	61	91	76
Limited	7	25	58	30	33	8	22
Not Limited	2	2	0	0	5	1	2
Sawtooth NF							
Very Limited	96	57	44	92	45	92	76
Limited	3	43	56	8	32	8	24
Not Limited	1	0	0	0	22	0	0

Alternatives 5 and 1B provide the most amount of area in MPCs that facilitate mechanical removal of biomass (Table AQ-20). However, only a small amount of the total fire use acres over the first five decades are occurring in this Opportunity Group (Table AQ-21). For Alternative 5, which has the most area in the group with the Not Limited opportunities, only 11 percent of the total fire use on the Boise and 5 percent on the Payette occurs in this group. Mechanical treatments for meeting desired vegetative conditions and other forest-wide goals are the focus of this group and the primary use of fire here is to treat fuels produced by the mechanical activities.

Even though MPCs in the Not Limited and Limited Opportunity Groups facilitate treating mechanically rather than through burning, recent studies on the viability of small diameter utilization within Valley, Gem and Boise Counties show that haul costs and current transportation systems would be prohibitive. In addition, there is currently a lack of locally available business operations that utilize this sized material. Groups are working to overcome and develop local operations for small diameter material, but it is uncertain when and if they will become a large scale viable method for emissions reductions. While technologies are improving to remove and utilize biomass within the Ecogroup area, additional barriers exist before alternatives to burning using biomass removal are a feasible option.