Air Quality Assessment
Mt. Ashland LSR Habitat Restoration Project
April 4, 2007

The Mount Ashland LSR Restoration Project Area is located in northern Siskiyou County, California, and southern Jackson County, Oregon. In California, the project area is within the Northeast Plateau Air Basin whose boundary ends at the state and county border. The Northeast Plateau Air Basin includes all of Lassen, Modoc, and Siskiyou Counties and is the fourth largest air basin in the state. The Medford-Ashland area (Rogue Valley) is part of the Medford Air Quality Management area (AQMA). The Mount Ashland LSR Restoration Project Area is located about 10 miles south of the Medford AQMA.

The project area is located in the Beaver Creek Watershed which includes tributary streams of Long John, Grouse, and Deer Creeks. Land uses in the project vicinity include forested private and federally managed lands, and rural and agricultural lands with no substantial emission sources other than fugitive dust from logging, recreational, and agricultural activities. Other contributions too reduced air quality include smoke and haze from seasonal wildland and prescribed fires from both within and outside the basin.

General topography and climate is described in the Beaver Creek Ecosystem Analysis, Characterization, July, 1996.

Sensitive Sites

Class I airsheds are federally designated wilderness areas, national monuments and other areas of special natural, recreational, scenic or historical value. Class I designation applies to select pristine airsheds including national parks greater than 6,000 acres and wilderness areas greater than 5,000 acres. Wildernesses that were federally designated prior to the 1977 amendments to the Clean Air Act were designated as Class I airsheds. In California, the nearest Class I airshed is the Marble Mountains Wilderness, which is within 25 miles (40 km) to the closest activity fuels treatment and 27 miles (43 km) to closest planned underburn area. Class I airsheds in Southern Oregon include: Crater Lake National Park, (60 miles, 100 km northeast); Kalmiopsis (50 miles, 80 km northwest) and Mountain Lakes (32 miles, 50 km northeast).

On June 9, 2000, President Clinton proclaimed the Cascade-Siskiyou Ecological Emphasis Area as a National Monument. This area is located 4 miles from the eastern boundary of the Mount Ashland LSR Project Area. As a newly designated National Monument, air quality is an important value. Though it meets the acreage criteria for a Class I airshed, it has not been designated as one and it is unlikely that it will be. For project planning purposes, it should be considered a Class II area and a sensitive site.

Class II is the designation for clean air areas where a moderate amount of development can be permitted. These include wilderness areas designated after 1977. Class II areas in Oregon and California near the project include the Red Buttes Wilderness (20 miles, 30 km west) and Sky Lakes Wilderness (30 miles, 50 km northeast), Siskiyou Wilderness (36 miles, 60 km west) and Russian Peak Wilderness (40 miles, 60 km south).

The Pacific Crest National Scenic Trail follows the Siskiyou Crest mountain divide on the north border of the project area and provides scenic vistas to the mountains and valleys. The Marble Caves Proposed Research Natural Area is within the Marble Mountain Wilderness.

Local communities and sensitive sites such as campground areas that could be affected by smoke and haze in Oregon and California include: the general areas of the Interstate 5 corridor, Mt. Ashland, and the Klamath River; the cities of Colestine, Ashland, Phoenix, Talent, Yreka, Hornbrook, Medford, and Hilt; the California Agricultural Station; the Tree of Heaven and Beaver Creek Campgrounds, and residential communities along the Klamath River such as Beaver Creek.

Air Quality Standards

Within the Federal Clean Air Act, the Northeast Plateau Air Basin is classified as "attainment" for National Ambient Air Quality Standards (NAAQS). Within the State of California Clean Air Act, the basin is classified by the California Air Resources Board as "non-attainment" for particulate matter less than 10 microns or PM_{10}. Areas where particulate matter has exceeded standards have been in the communities of Alturas and Yreka where monitoring stations are located and where there are air polluting industries and problems with wood smoke.

The Medford AQMA was established because of failure to attain federal or state standards. That is, the area is in non-attainment because the ambient level of one or more criteria pollutants exceed Federal or State standards. The Medford AQMA is clasified as non-attainment for partuclate matter less than 10 microns in size (PM_{10}). PM_{10} sources include wood smoke, wind-blown dust, and industrial emissions. The Meford AQMA is also classified as non-attainment for carbon monoxide (CO). Cars and trucks produce 90% of the CO emissions.

The following pollutants will be emitted during fuels and vegetation burning through the use of prescribed fire: PM_{10}, CO, CO_2, volatile organic carbon (VOC), and toxic compounds. PM_{10} will be emitted in the form of dust from timber hauling and logging operations, including road reconstruction and decommissioning activities.

National and State Ambient Air Quality Standards for PM_{10}, $PM_{2.5}$ and CO and are listed in Table AQ-1

Table AQ-1 State and Federal Ambient Air Quality Standards (units are ug/m^3; numbers in brackets are ppm)

Pollutant	Averaging Time	Federal Standard	State Standards	
			California	Oregon
PM_{10}	Annual	50 (arithmetic mean)	30 (geometric mean)	50 (arithmetic mean)
	24-hour	150	50	150
$PM_{2.5}$	Annual	15	---	---
	24-hour	65	---	---
CO	8-hour	10,000 (9)	10,000	10,000 (9)
	1-hour	40,000 (35)	20,000	40,000 (35)

Annual standards are never to be exceeded. Other standards are not to be exceeded more than once a year.

The conformity rules apply to Federal standards only.

$PM_{2.5}$

$PM_{2.5}$ is airborne particles with a diameter of less than 2.5 microns. This is often referred to as "fine" particulates. In July of 1997, the EPA promulgated new ambient air quality standards for $PM_{2.5}$ of 65 ug/m^3 and 15 ug/m^3 for the 24-hour and annual concentration averages, respectively. The EPA stated that the 65 ug/m^3 standard will provide an adequate margin of safety in communities that meet the annual standard but have infrequent or isolated 24-hour peaks such as in the Northeast Plateau Air Basin. Approximately 80% of the smoke particles are fine particles. Only PM_{10} standards are applicable at the present time.

Conformity

The conformity provisions of the Federal Clean Air Act, Section 176 [c] prohibit federal agencies from taking any action that causes or contributes to any new violation of the National AAQS, increases the frequency or severity of an existing violation or delays the timely attainment of a standard. The federal agency responsible for the action is required to determine if its actions conform to the applicable State Implementation Plan. Because the Northeast Plateau Basin is in an attainment area (federal) no conformity determination is needed for this project. The Project Area in Oregon is outside of the Medford Air Quality Management District and no conformity determination is needed.

Air Quality Related Values, Prevention of Significant Deterioration, and Regional Haze

The 1977 Federal Clean Air Act amendments charged Federal land mangers to protect Air Quality Related Values (AQRVs) of Class I areas (such as the Marble Mountains Wilderness) from adverse air pollution impacts. Visibility is an AQRV that needs to be specially protected for all Class I areas, but is also important to all designated wilderness areas, national parks, and monuments.

Prevention of Significant Deterioration (PSD) is mandated by the 1977 amendments to the Clean Air Act. These provisions prevent the growth of stationary industrial sources from causing significant deterioration of air quality in areas that meet the NAAQs (in attainment areas). The PSD requirements include actual monitoring of air quality conditions and placement of limits on the "increment" of clean air that can be used by industrial projects. PSD analysis is done usually for proposed industrial developments such as power plants, or geothermal plants.

Regional Haze Regulations were adopted EPA in 1999 for the protection of visbility in National Parks and wilderness areas. Regional haze obscures the clarity, color, texture and form of what we see. Haze-causing pollutants are mostly fine particles which are emitted into the atmosphere by various sources including: electric power plants, manuafacturing plants, trucks and automobiles, construction, and forest management and agriculture burning including seasonal wildfire. Pursuant to federal Regional Haze rules promulgated in 1999, the California Air Resources Board will address the impacts of prescribed fire and other contributing sources in regional haze plans that will be developed over the next several years. As part of this program, an air quality monitoring station (IMPROVE station) will be set up in the Trinity Conservation Camp northwest of Shasta Lake to monitor air quality related to the Yolla Bolly and Marble Mountain Wildernesses. The goal of the national Regional Haze program is for States to develop haze control strategies and programs to improve visbility.

Background/Existing Air Quality in Northeast Plateau Air Basin and Project Vicinity

The project area is located away from the more populated areas of Siskiyou County where emissions are higher. Air quality within Siskiyou County is very good and has improved since 1988 (Appendix A). The nearest air quality monitoring stations are in Yreka-Foothill Drive and Mt. Shasta-N. Old Stage Road. Air quality data compiled by the California Air Resources Board indicates that air quality with respect to PM_{10} has improved from 1988 to 1998, with respect to the more stringent state 24-hour standards. Annual standards have not been exceeded over this time period. Review of the highest four daily PM_{10} measurements for the three stations in Siskiyou County indicate Yreka and Mt. Shasta have exceeded the daily PM_{10} standard two times over the years 1997–1999. TheLava Beds National Monument exceeded the 24-hour standard one day in 1996 because of a prescribed underburn in the monument within 100 yards of the monitoring station. $PM_{2.5}$ is not currently being monitored in the basin. $PM_{2.5}$ data will be obtained by the two IMPROVE monitoring sites in the basin at Lava Beds National Monument and at the Trinity River Conservation Camp.

In south-central Oregon, there are two PM_{10} and $PM_{2.5}$ monitoring stations located at Ruch and Provolt in the Applegate River Valley which operated jointly by the USDA Forest Service and the Bureau of Land Mangement. The stations are north of the Project Area.

Air quality was noticebly poor at various times in Northern California from August through October of 1999 due to large wildfires on the Shasta Trinity and Six Rivers National Forests. The fires included the Big Bar Complex located in the Big Bar area of the Trinity River (Megram, Fawn, and Onion fires) and the High Complex located in the Lakehead area of Shasta Lake. Monitoring at the community of Hoopa indicated that, as a result of the Big Bar Complex fires, California 24-hour PM_{10} standards were exceeded on 19 days and the federal standard was exceeded on 12 days. During several days, average PM_{10} standards were greater than 420 ug/m^3 which is considered hazardous. The smoke from the fires precipitated the first declared state of emergency in a California county due to air pollution (Herr, 1999). Medford, Oregon was also affected by smoke from the fires and experienced days of poor visbility. No air quality standards were exceeded in Medford or Klamath Falls during these months.

Direct and Indirect Effects and Significance

Forest air pollutant sources with the greatest impact are wildfire and prescribed burns. Other lesser pollutant sources are dust emissions from logging operations, log truck haul on unpaved roads, and other activities such as road maintenance, road reconstruction and decommissioning.

The proposed project will generate short term smoke emissions suspended in the atmosphere generated from prescribed burning and fugitive dust generated primarily from timber hauling activities.

Prescribed burning is used on natural and activity generated fuels and is applied under controlled conditions to accomplish established resource objectives. The major air pollutant concern from prescribed fires is the smoke produced by the fire. These include fine particulates generally less than 2.5 microns. Particles over about 10 microns, consist of ash and partially burned plant matter, and are mostly associated with high-intensity fires. Particulate emissions depend on the mix of combustion phases (preheating, flaming, glowing and smoldering), rate of energy release, and type of fuel consumed. Smoke from prescribed fires can be transported over large distances and can contribute to regional haze and visibility impairment.

These prescribed fire fuel treatments will result in emissions of particulates over a short time duration of one to several days. The emissions and impacts of prescribed burning on air quality are difficult to precisely quantify because of the many site specific factors involved: fuel type, fuel loading, moisture conditions, combustion rate, and meteorological conditions. Emissions of PM_{10}, $PM_{2.5}$, and CO can be estimated through use of fire modeling programs which take into account the aforementioned specific factors.

Indirect effects of prescribed fire include an expected decrease in wildfire emissions due to reduction of overall fuel loadings. This is accompanied by an increase in short-term emissions, smoke and haze brought on by increased prescribed fire management program.

Timber hauling, logging, road reconstruction, maintenance and decommissioning activities will generate particulate emissions into the atmosphere for short periods of time during the day, while these activities are taking place. The dust generated by these

activities, though certain to occur, is difficult to model and estimate emissions. Tractor yarding operations disturb the most soil and likely generate the most dust. Cable yarding and helicopter yarding disturb less ground and so generate fewer fugitive dust emissions. The road-related activities generally take place when there is some moisture content in the soil of the road, in order to achieve some level of compaction. The dust generated is generally less than for tractor logging activities where logs are being dragged along the ground.

Emissions Estimates and Effects of the Proposed Action

Prescribed Fire

Prescribed fire in natural areas and activity fuels treatments proposed for this project include underburning, hand pile and tractor pile burning. Broadcast burns are also proposed.

Fuel Treatment (Acres)	No Action	Proposed Action Alt. 2	Alt. 4	Alt. 5
Handpile/Underburn	0	976	963	959
Underburn	0	1502	1438	1536
Handpile and Burn	0	980	862	997
Natural Underburn	0	120	120	120

Emission estimates for underburning and broadcast burning for the project were quantified through FOFEM (First Order Fire Effects Model, version 4.0). FOFEM is recognized by the Forest Service Pacific Southwest Region (R5) as being the most current and accurate analysis tool available for emissions prediction. It is based on extensive research in western forest ecosystems. Emissions from both activity and natural fuels within harvest units and natural fuels in the large underburn units are considered; emissions calculations for wildfire do not include activity fuels.

Tons Emissions

Emissions	No Action (w/wildfire)	Proposed Action Alt. 2	Alt 4.	Alt. 5
PM_{10}	1370	386	365	390
PM_{25}	1167	329	309	332
CO	12486	3520	3329	3554

The table above reflects emissions from both activity and natural fuels in the harvest and underburn units under the two action alternatives. Emissions are averaged over the five-year life of the project. These emissions should be considered a worst-case scenario in the event that the harvesting does not include biomass extraction, which could conceivably reduce emissions in half or more.

Emissions for wildfire are not averaged over a five-year period and reflect a one-time event wildfire.

The following statements are effects determined for the project.

Piles will be burned in late fall when weather would not allow underburn or broadcast burning. Underburning will occur over a 5-year period. Broadcast burns will occur over a one year period. Hand pile burning will occur during the fall when weather will not allow underburns or broadcast burning. Handpiles will be covered to keep dry.

Estimated 24 hour emissions are very unlikely to exceed the 24 hour standard (California) for PM_{10} and $PM_{2.5}$ in at the Project site (burn location) and are definitely not expected to exceed annual State or Federal standards, and would not degrade air quality or attainment status.

Emissions of smoke during prescribed burning may reduce the visibility in some locations but implementation of smoke management practices and plans, burning during favorable weather conditions when smoke is carried away from Class I and II airsheds and other sensitive areas, and using the best available fire and emission control measures will minimize visibility impairments.

Unpleasant odors and visibility impairment may be detected by Wilderness visitors and residents of local communities.

PM_{10} and $PM_{2.5}$ emissions from prescribed burning would contribute to local, air basin and broader regional pollutant loading. Local and air basin effects would include cumulative prescribed burn emissions from Federal, State and private lands in the area.

Fugitive Dust

The project proposes the following logging and road-related activities by alternative.

Yarding System	No Action	Proposed Action Alt. 2	Alt. 4	Alt 5.
Cable	0	1602	1528	1471
Helicopter	0	1071	861	1245
Ground Based	0	1202	965	1065

The single greatest source of dust emissions for the project is from timber hauling by log trucks on unpaved roads. This activity occurs over a long period of time, over multiple years and seasons, and over many miles. This emissions source can be estimated and modeled (EPA, 1998). When a vehicle travels on an unpaved road, the force of the wheels on the road surface pulverizes the surfacing material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the road surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Factors used in the emission equation include estimated surface material silt content, the mean vehicle weight (tons) and the surface material moisture content. Emissions are expressed in pounds of dust (PM_{10}) per vehicle mile traveled.

Total dust emissions were estimated for the Mt. Ashland LSR Project using data from the volume of harvest per acre, and haul distance to the nearest paved roads. Since all action alternatives have the same haul pattern, with minor variations in haul miles, they are shown as one figure, below.

	No Action	**Proposed Action Alternatives**
Haul Miles	0	32,400
Tons of Dust	0	35.3_a

[a] Assumes 2.18 lbs. of dust/haul mile.

The following statements are effects determined for the project.

Hauling is expected to occur over a 4 year period. Thus, annual emissions for each of the action alternatives are 8.8 tons and 7.7 tons. The estimate is for a worst case scenario because no moisture due to rainfall was assumed.

Dust emissions from hauling will add to the PM 10 locally and regionally.

Fugitive dust emissions, dispersion and trasnport will be mitigated by treating selected main unpaved haul routes with water and or chemical dust suppressants thereby reducing overall dust emissions and cumulative effects from the project activities. Dust abatement methods are estimated to reduce total emissions between 50 to 80% (EPA 1998).

Surface improvements such as adding aggregate will also reduce overall emissions.

Mitigation Measures to Reduce Smoke and Dust Emissions

Compliance with Burn Day, Marginal Burn Day and No Burn day designation, and coordination with and permitting from the local air pollution control district, will minimize cumulative effects. Overall emissions are expected to be similar to those of the past three years when prescribed burns were carried out by state and federal land management agencies, as well as private landholders.

Various smoke reduction techniques can be employed to reduce emissions of smoke from

a prescribed burn. The techniques used for prescribed fire and underburning include:

Reducing the pre-burn fuels loading through increased utilization such as establishing YUM specs and considering biomass possibilities.

Burning under conditions that reduce the biomass that is consumed while achieving burn objectives. This can be accomplished by burning at high fuel and duff moisture levels, limiting burning of large stumps and coarse wood, and burning concentrations of fuel.

Construct and prepare tractor piles and hand piles so that they will burn with a minimum of smoke. Techniques include covering piles to keep them dry and construction methods to limit soil incorporation into the piles.

Burning during favorable weather conditions when smoke is transported away from sensitive locations. Spring burning has advantages of higher fuel and ground moisture, atmospheric instability, and good transport winds. Fall and winter burning can restrict emissions and smoke to the ground level if burning takes place under the inversion layer.

Handpile and tractor pile burning above fall or winter inversion layers can direct smoke away from sensitive locations.

Avoidance of impacts. Ignitions will be slowed or stopped when meteorological conditions change to cause intrusions of smoke into sensitive areas. This may also include burning on low visitor use days in the spring and avoiding burning on high use weekends. Spot forcasts of weather in the project area will be used to ensure favorable "within prescription" weather conditions for the burn and for smoke transport.

Planning and providing for implementation of contingency actions to be taken if smoke impacts occur or meteroogical conditions change or go out of prescription.

A Dust Abatement Plan is required under the Timber Sale Contract, Specification CT5.4, under road maintanence. Roads to be dust abated with water and/or chemical additives will be specified in the contract by project engineer.

The California Air Resources Board has promulgated changes to Title 17 Smoke Management Guidelines forAgricultural Burning and Prescribed Fires. The new regulations are to be adopted soon by the Board. There are many new changes in the regulations. The new regulations require submission of Smoke Management Plans to the local air district for each Burn Plan and require permitting and increased coordination between burners and the local air district. Oregon also requires similar burn permits and smoke management plans for prescribed fires. These existing and new regulations are important to allow continued use of prescribed fire to manage fuels and at the same time, reduce and limit smoke impacts to communities and sensitive areas.

The U.S. Forest Service, Region 5 has also signed a Memorandum of Understanding on Prescribed Burning on July 13, 1999 with the California Air Resources Board. In this

MOU, the Forest Service agrees to limit public exposure to smoke by considering all practical alternatives to burning, applying all appropriate emission reduction techniques, and limiting the amount of material to be burned on any one day based on meterological and air quality conditions, consultation with the lcoal district, and the Interagency Fire Forecast Warning Units.

s// William P. Snavely 4 April 2007
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