GRASS VALLEY FIRE RESTORATION PROJECT

AIR QUALITY REPORT

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for:

San Bernardino National Forest

March 20, 2018

REGULATORY FRAMEWORK

Federal Laws and Regulations

The Clean Air Act (CAA) was first passed in 1970 to protect national public and environmental health from air pollution. Under this law, the EPA sets limits on certain air pollutants and establishes a regulatory framework for states to follow to protect air quality. For the federal land management agencies there are two major categories of rules that affect management units. Compliance with the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD), and Air Quality Related Values (AQRV's) are sensitive to air quality effects such as visibility and acid deposition. The Forest Service and other federal agencies have established air quality monitoring programs to study the condition of AQRVs in Class I and Class II air quality areas.

National Ambient Air Quality Standards

The CAA, which was last amended in 1990, requires EPA to set NAAQS (40 CFR part 50) for pollutants considered harmful to public health and the environment. The CAA identifies two types of national ambient air quality standards. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (EPA 2011). The CAA requires areas that are determined to not be in compliance with NAAQS, and therefore are considered in non-attainment, must develop and submit attainment plans for EPA approval and are called State Implementation Plans (SIPs)

EPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants. They are listed below in Table 1. Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$).

Table 1 shows the current NAAQS and California State Air Quality Standard values for relevant criteria pollutants.

Regional Haze Rule

The CAA Regional Haze Rule calls for state and federal agencies to work together to improve visibility in impaired mandatory Class I areas. Mandatory Class I areas include National Parks and Wilderness areas that were congressionally designated under the CAA for stringent protection of their pristine air quality (40 CFR PART 81). In general, Class I Wilderness areas are greater than 5,000 acres in size and were established prior to 1977. Areas not designated as Class I are Class II.

In addition to setting the NAAQS, the CAA specifically addresses visibility under Section 169A:

"Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution."

Section 169B was added to an amendment to the CAA in 1990 to address regional haze. Regional haze is a term used to describe the white or brown haze that obstructs vistas. It is caused by fine particles in the air including sulfates, carbon, soils and nitrates. Sources of these particles include emissions from power plants, industrial activities, motor vehicles, fires, and windblown dust and dirt. Air pollutants contributing to regional haze can be both locally derived and carried into an area by the wind hundreds and even thousands of miles from a pollutant source.

While federal land managers are tasked under the CAA with the affirmative responsibility to protect the AQRVs, including visibility of these Class I areas, the permitting authority lies with the State of California, the South Coast Air Quality Management District and EPA.

General Conformity Rule

The CAA requires that all projects receiving federal funds must conform to relevant State Implementation Plans (SIPs) in areas that are classified as non-attainment concerning exceedances of NAAQS. Federal actions are subject to either the Transportation Conformity Rule (40 CFR 51[T]), which applies to federal highway or transit projects, or the General Conformity Rule (40 CFR 51[W]), which applies to all other federal actions. The Grass Valley project is not a federal highway or transit project, and it is subject to the General Conformity Rule. Per 40 CFR Section 95.153(4)(i)(2) (April 5, 2010) the Grass Valley project is presumed to conform: "Prescribed fires conducted in accordance with a smoke management program (SMP) which meets the requirements of EPA's Interim Air Quality Policy on Wildland and Prescribed Fires or an equivalent replacement EPA policy." Grass Valley is presumed to conform to the CAA because the State has a smoke management program (Title 17) in place that regulates prescribed burning and during project implementation fire managers are required by law to not violate state and local air quality regulations.

Climate Change – Green House Gasses and Carbon Sequestration

Currently there are no national or state level legal requirements concerning the regulation of GHG emissions or sequestration regulations for projects such as Grass Valley. On January 16, 2009, the Washington Office of the USDA Forest Service released guidance to Forest Service units regarding the incorporation of climate change science into project level EPA documents (USDA 2009).

1. Climate change effects include the effects of agency action on global climate change and the effects of climate change on a proposed project.

2. The Agency may propose projects to increase the adaptive capacity of ecosystems it manages, mitigate climate change effects on those ecosystems, or to sequester carbon.
3. It is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change and therefore determining significant effects of those projects or project alternatives on global climate change cannot be made at any scale.
4. Some project proposals may present choices based on quantifiable differences in carbon storage and GHG emissions between alternatives.

This guidance document provides that units should consider two kinds of climate change effects at the project level. First, units may, where appropriate, consider the effect of a project on climate change. Second, units may, where appropriate, consider the effect of climate change on a proposal. (Hapner v. Tidwell, 2008.)

Currently, the federal government is not proposing new laws or rules that would regulate GHG emissions and sequestration that covers federal land and resources management actions.

On August 1, 2016, the Council on Environmental Quality (CEQ) issued guidance to assist Federal agencies in their consideration of the effects of greenhouse gas emissions and climate change when evaluating proposed Federal actions in accordance with the National Environmental Policy Act (NEPA) and the CEQ Regulations Implementing the Procedural Provisions of NEPA. This guidance will facilitate compliance with existing NEPA requirements, thereby improving the efficiency and consistency of reviews of proposed Federal actions for agencies, decision makers, project proponents, and the public. The guidance provides Federal agencies a common approach for assessing their proposed actions, while recognizing each agency's unique circumstances and authorities.

Locally, the South Coast Air Quality Management District (SCAQMD) requires burners to provide the District with an evaluation of and consideration of emission reduction techniques including environmentally, economically, and logistically viable alternatives to burning (Rule 444 (d) (9) (c) (v)).

State Laws and Regulations

California Clean Air Act

The California Air Resources Board (CARB) establishes state air quality standards, maintains oversight authority in air quality planning, develops programs for reducing emissions from motor vehicles, develops air emission inventories, collects air quality and meteorological data, and approves and then submits SIPs for EPA approval. The California Clean Air Act (CCAA) of 1988 substantially added to the authority and responsibilities of air districts. The CCAA designates air districts as lead air quality planning agencies, requires air districts to prepare air quality plans, and grants air districts authority to implement control measures. The CCAA focuses on attainment of the state ambient air quality standards, which, for certain pollutants and

averaging periods are more stringent than the comparable federal standards. Responsibilities of air districts include overseeing stationary source emissions, approving permits, maintaining emissions inventories, maintaining air quality stations, overseeing agricultural burning permits, and reviewing air quality–related sections of environmental documents required by California Environmental Quality Act (CEQA).

Responsibility for achieving California's air quality standards, which are more stringent than federal standards, is placed on the CARB and local air districts, and is to be achieved through district-level air quality management plans, Table 1. The CAA remains the overarching law that the state must comply with and implement so emphasis on attaining compliance with NAAQS in federal nonattainment is a higher priority over the state's air quality standards. In California, the EPA has delegated authority to prepare SIPs to the CARB, which in turn has delegated that authority to individual air districts.

The Smoke Management Guidelines for Agricultural and Prescribed Burning (Title 17 of the California Code of Regulations, Subchapter 2, Smoke Management Guidelines for Agricultural and Prescribed Burning (Title 17 2001)) are to provide direction to air pollution control and air quality management districts in the regulation and control of agricultural burning, including prescribed burning, in California. The Guidelines are intended to provide for the continuation of agricultural burning, including prescribed burning, as a resource management tool, and provide increased opportunities for prescribed burning and agricultural burning, while minimizing smoke impacts on the public. The regulatory actions called for are intended to assure that each air district has a program that meets air district and regional needs.

Table 1. State of California and National Ambient Air Quality Standards.

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 µg/m³)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m³)		0.070 ppm (137 µg/m³)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 µg/m³	Gravimetric or Beta Attenuation	150 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m³		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m³	Gravimetric or Beta Attenuation	12.0 µg/m³	15 µg/m³	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m³)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m³)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m³)		9 ppm (10 mg/m³)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m³)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 µg/m³)	Gas Phase Chemiluminescence	100 ppb (188 µg/m³)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m³)		0.053 ppm (100 µg/m³)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 µg/m³)	Ultraviolet Fluorescence	75 ppb (196 µg/m³)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m³)	
	24 Hour	0.04 ppm (105 µg/m³)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	
Lead[12,13]	30 Day Average	1.5 µg/m³	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m³ (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m³		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m³	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m³)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 µg/m³)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990 California Air Resources Board (5/4/16)

South Coast Air Quality Management District

In California, local districts are given the responsibility to develop programs and plans for achieving both Federal and State air quality standards and are given the authority to implement control measures to reduce emissions of each nonattainment pollutants or its precursors. This is implemented through the use of Rules and Regulations (Title 17 2001). The project is located within San Bernardino County and the SCAQMD. Per SCAQMD rules the Grass Valley project is required to comply with Rule 444, Open Burning. A smoke management plan (SMP) is required for all prescribed burns, upon review and approval a burn permit will be issued with a fee for issuance. Participation on daily smoke management conference calls for burn project coordination is recommended on a daily basis prior to and during implementation. On the day of ignition, final approval must be received from the compliance officer at the district. Prescribed burning approval is received through the Prescribed Fire Information Reporting System (PFIRS) website on a daily basis. An Annual Post Burn Evaluation Report shall be submitted on or before January 31st of each calendar year for any open burn projects that require a Smoke Management Plan or a Burn Management Plan.

The SCAQMD requires controls for fugitive dust from vehicle use on unpaved roads and mud track-out on to paved roads (SCAQMD Rule 403).

Forest Service Direction

Forest Service Manual

FSM 2500 – Watershed and Air Management, Chapter 2580 – Air Resource Management
The Forest and Rangeland Renewable Resource Planning Act of 1974, as amended by the National Forest Management Act (16 U.S.C. 1602), directs the Secretary of Agriculture to protect and, where appropriate, improve the quality of soil, water, and air resources. The Clean Air Act, as amended (42 U.S.C. 7401 et seq.), significantly broadened the authority and responsibility of the Forest Service by:
1. Complying with all Federal, State, or local air control rules, regulations, and directives.
2. Requiring compliance with substantive and procedural requirements imposed by a Federal, State, interstate, or local administrative authority or court.
3. Requiring consultation with each State having delegated authority on all matters concerning the prevention of significant deterioration of air quality, visibility, air quality maintenance plan requirements, and nonattainment requirements.
4. Giving Federal land managers an affirmative responsibility to:
(a) Protect the air quality related values on any lands managed by them within a class I area.
(b) Consider, in consultation with the Administrator of the Environmental Protection Agency, whether a proposed major emitting facility will have an adverse impact on air quality related values.
The objectives of air resource management are:

1. Protect air quality related values within class I areas, as described in 42 U.S.C. 7475(d)(2)(B) and (C) and section 2580.5.
2. Control and minimize air pollutant impact from land management activities.
3. Cooperate with air regulatory authorities to prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangelands.

FSM 5100, CHAPTER 5140 – FIRE USE (Excerpts)
5140.3 – Policy

Plan and implement a hazardous fuels management and prescribed fire program applying:

3. Guidelines from The Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide (NWCG, PMS 484; see http://www.nwcg.gov/pms/RxFire/rx.htm).

4. Consideration of greenhouse gas emissions and effects on carbon sequestration.

5142 - PRESCRIBED FIRE
5142.8 - Smoke Management

1. Coordinate prescribed fire program activities with Regional air quality specialists and Federal, State, Tribal, air pollution control district or county regulatory authorities to ensure compliance with their regulations which are supported by the Clean Air Act.

2. When multiple wildland fire events are occurring within an airshed, or any airshed is impacted by ongoing wildland fire events, fire managers will consider the cumulative impact to air quality which their management actions might cause and implement prescribed fire only if compliance with air quality regulations can be maintained.

3. All prescribed fires should be conducted using Basic Smoke Management Practices. USDA Natural Resources Conservation Service and Forest Service Technical Note (2011). http://www.airquality.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046311.pdf

Forest Plan Direction

Land Management Plan (LMP) – Part 2 – San Bernardino National Forest Strategy
Appendix B – Program Strategies and Tactics

Air 1 - Minimize Smoke and Dust

Control and reduce smoke and fugitive dust to protect human health, improve safety and/or reduce or eliminate environmental impacts.

- Incorporate visibility requirements into project plans.

- Use emission reduction techniques (ERT).

Air 2 - Forest Air Emissions

Maintain and update the inventory for wildland fire emissions and other national forest resource management emissions within the current State Implementation Plan (SIP). The State Implementation Plan inventories establish levels of air pollution that meet the long-term federal air quality goals for bringing the nonattainment areas to attainment of the National ambient Air Quality Standards.

- Describe the magnitude and timing of prescribed and wildland fire emissions in each Air Pollution Control District.
- Provide input to AQMD on regional air quality issues for forest protection.

ANALYSIS METHODOLOGY

For this analysis, the air quality issues of concern entail compliance with the CAA and state of California air quality standards and regulations, and the Wilderness Act. Air quality standards primarily address human health. Under the CAA federal land managers have an affirmative responsibility to protect Class I air quality related values (AQRVs) from degradation. The Wilderness Act requires that congressionally designated wilderness areas be managed for their protection and preservation from human caused degradation.

Indicators used in this analysis include the following:

- Compliance with NAAQS
- Potential impacts to AQRVs which includes visibility impacts to Class I Wilderness areas, sensitive Class II wilderness areas, and important Scenic Vistas
- Potential impact of future fire management prescribed burning to criteria air pollutants
- Potential impact of future equipment use and fire management prescribed burning to Green House Gases (GHGs)
- Potential impact of future vegetation management activities to carbon sequestration

Modeling

In order to estimate emissions from prescribed burning the Forest Vegetation Simulator with the Fire and Fuels Extension (FVS-FFE) estimated NAAQS criteria pollutants, GHG emissions and carbon sequestration. We used the most comprehensive on site inventory data to run the model however we cannot capture exact inventory data for each proposed acre and therefore many of the model outputs will be shown as ranges of values.

Information Sources

A review of pertinent sections of the CAA and State of California air quality management regulations is presented in order to frame the extent of the analysis and point out essential compliance requirements.

AFFECTED ENVIRONMENT

Existing Condition

Affected environment and climate information is provided in Chapter 1 of the EA.

Air Quality Monitoring

Air quality monitoring is conducted throughout most of California as part of the state's program for tracking compliance with NAAQS and state standards. The data gathered is used for determining the status of areas concerning attainment or nonattainment of air quality standards. In California, the Air Quality and Meteorological Information System (AQMIS) is a web-based source for real-time and official air quality and meteorological data. It is used by various groups such as state and local officials and the public to track air quality. It is also used for smoke management and air pollution forecasting. Table 2 shows the air quality monitoring stations located in the Grass Valley project region.

Table 2. AQMIS operating air quality monitors in the Grass Valley region. Real time and archived monitoring data are available at a CARB interactive website – address below.

Location	CO	NO	NO2	NOX	Ozone	PM 2.5	PM 10
Lake Elsinore	x	x	x	x	x	x	x
Perris					x		
Winchester					x	x	
Mission Viejo	x				x		
Riverside-Magnoila	x	x	x	x		x	x
Riverside-Rubidoux	x	x	x	x	x	x	x
Mir-Loma Van Buren	x	x	x	x	x	x	x
Redlands-Dearborn					x		
San Bernardino-4th Street	x	x	x	x	x		x
Banning Airport		x	x	x	x	x	
Palm Springs-Fire Station	x	x	x	x	x		x
Indio-Jackson Street					x		x
Camp Pendleton		x	x	x	x	x	
Escondido-E Valley Parkway	x	x	x	x	x	x	

Source: http://www.arb.ca.gov/aqmis2/map_pages/gmap.php

NAAQS

Over the last 20 years, California's population increased by 22 percent and average daily miles driven increased by 45 percent. Over the same time, statewide emissions of smog-forming pollutants decreased by over 50 percent. Air quality in the South Coast region continues to improve over the long term, although the maximum concentration and number of days each year

in which the federal ozone standard is exceeded fluctuates from year to year due to weather and other conditions. In 2013, the number of days exceeding the federal ozone standard was the lowest ever recorded in the South Coast Air Basin.

In addition, air pollution controls have significantly reduced levels of PM2.5 across the region and preliminary 2013 data shows that the Southland is achieving the 2006 annual PM2.5 federal standard and is very close to achieving the 24-hour federal standard. The Air District continues to face major air quality challenges, particularly in reducing mobile source emissions. Nitrogen oxide emissions must be further reduced by 65 to 75 percent or more to meet federal health standards for ozone and PM2.5. (CARB 1).

Currently, San Bernardino County is in federal nonattainment for ozone and PM2.5, and state nonattainment for ozone, PM10, and PM2.5 (Coachella Valley in eastern Riverside county is in federal nonattainment for PM10), Table 3.

Table 3. Currently, the portion of San Bernardino County where the project is located is in federal and state nonattainment for ozone, and PM2.5, and state nonattainment for PM10.

Criteria Pollutant	(1) State Designation	(2) Federal Designation
Ozone 8 Hour	Nonattainment	Nonattainment
PM2.5	Nonattainment	Nonattainment
PM10	Nonattainment	Attainment
Carbon Monoxide	Attainment	Unclassified/Attainment
Nitrogen Dioxide	Attainment	Unclassified/Attainment
Sulfur Dioxide	Attainment	Attainment
Sulfates	Attainment	None
Lead	Attainment	Unclassified/Attainment
Hydrogen Sulfide	Unclassified	None
Visibility Reducing Particulates	Unclassified	None

(1) State Area Designations Definitions

For State Area Designations, there are three basic designation categories, and one sub-category. More detailed information regarding these categories can be found in the Regulatory Reference below.

- **Nonattainment** is the category for an area has one or more violations (see definition below) within the last three years.
    - **Nonattainment-Transitional** is a subcategory of nonattainment. For ozone, there must be three or fewer exceedances (see definition below) in the last year.
- **Attainment** is the category given to an area with no violations in the last three years.
- **Unclassified** is the category given to an area with insufficient data.

Exceedance versus Violation

- **Exceedance** is a concentration higher than the State standard. Some exceedances may be excluded if determined to be caused by an exceptional event, such as a wildfire or a dust storm. Not all exceedances are violations.

- **Violation** is a concentration higher than the State standard which is not determined to be caused by an exceptional event.

Geographic Extent of Designations

The size of the designated area may vary depending on the pollutant, the location of contributing emission sources, the meteorology, and the topographic features. The Board may designate areas smaller than an air basin or county, if the Board finds that a smaller area has distinctly different air quality.

- **Air Basin** is the area designated for ozone, nitrogen dioxide, PM10, sulfates, and visibility reducing particles. Further information, including maps, can be found on the California Air Basins webpage.
- **County** (or the portion of a county located within an air basin) is the area designated for carbon monoxide, sulfur dioxide, lead, and hydrogen sulfide.

Regulatory Reference

- See section 70300 through 70306 and Appendices 1 through 3 of the California Code of Regulations, Title 17

Source: http://www.arb.ca.gov/desig/adm/Define.htm

(2) Federal Area Designations Definitions

Nonattainment - any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

Attainment - any area (other than an area identified in clause (i)) that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable - any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Source: http://www.epa.gov/airprogm/oar/oaqps/greenbk/define.html

CARB maintains annual emissions inventories for air sheds, individual air district areas and at the county level in order to be able to inform emissions reductions programs for areas that are in nonattainment and maintaining areas that are in attainment.

For 2012 (the latest year data is available), CARB estimated in San Bernardino County that forest management prescribed burning produced 23.17 tons CO per day, 8,395 tons per year; 2.33 tons PM10 per day, 850 tons per year; 2.07 tons PM2.5 per day, 756 tons per year, Table 4.

Table 4. 2012 San Bernardino County Almanac Emission Projection Data published in 2013, Annual Average Emissions (Tons/Day and Tons/Year).

EMISSIONS INVENTORY CATEGORY	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
FOREST MANAGEMENT – San Bernardino County **Total Per Day (Tons)**	2.55	1.45	23.17	0.68	0.21	2.43	2.33	2.07

Total Annual (Tons)	931	529	8,395	248	77	887	850	756

TOG – Total Organic Gases
ROG – Reactive Organic Gases
CO – Carbon Monoxide
NOX – Nitrous Oxide
SOX – Sulfur Oxide
PM – Particulate Matter
PM10 – Particulate Matter <10 microns
PM2.5 – Particulate Matter <2.5 micron

Source: http://www.arb.ca.gov/ei/maps/statemap/cntymap.htm

Carbon Monoxide

CO is a colorless and odorless gas, formed when carbon compounds in fuel are not burned completely. It is a component of motor vehicle exhaust, which contributes about 50 percent of all CO emissions nationwide. Non-road vehicles account for the remaining CO emissions from transportation sources. High concentrations of CO generally occur in areas with heavy traffic congestion. In cities, as much as 85 percent of all CO emissions may come from automobile exhaust. Peak CO concentrations typically occur during the colder months of the year when CO automotive emissions are greater, and nighttime temperature inversions (conditions where air pollutants are trapped near the ground beneath a layer of warm air) are more frequent (EPA 2009, EPA 2010).

San Bernardino County is in state and federal attainment for CO.

Lead

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of ambient air lead emissions have historically been motor vehicles (such as cars and trucks) and industrial sources (such as lead smelters). Due to the phase out of leaded gasoline for automobiles, piston engine aircraft and metals processing are now the major source of lead emissions to the air today. The highest levels of lead in air are generally found near lead smelters and general aviation airports. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers. (EPA 2007).

San Bernardino County is in state and federal attainment for lead.

Nitrogen Dioxide

In its pure state, NO_2 is a reddish brown gas with a characteristic pungent odor. It is corrosive and a strong oxidizing agent. As a pollutant in ambient air, however, it is virtually colorless and odorless. NO_2 can be an irritant to the eyes and throat. Oxides of nitrogen (nitric oxide and NO_2) are formed when the nitrogen and oxygen in the air are combined in high temperature combustion (CAQDR 2012).

San Bernardino County is in state and federal attainment for NO_2.

Ozone

Ozone (O_3) is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but at ground-level is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Ozone has the same chemical structure whether it occurs miles above the earth or at ground-level and can be beneficial or detrimental, depending on its location in the atmosphere (CAQDR 2012).

In the earth's lower atmosphere, ground-level ozone is of concern to human health. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NOx and VOCs that help form ozone. Ground level ozone is the primary constituent of smog. Sunlight and hot weather cause ground-level ozone to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of ozone, but even rural areas are also subject to increased ozone levels because wind carries ozone and pollutants that form it hundreds of miles away from their original sources.

Ozone may be a wintertime pollutant in some areas. Emerging science is indicating that closed basins may be subject to higher ozone concentrations under the appropriate conditions. Low mixing boundaries (inversions) combined with high albedo snow cover can create and maintain high ozone concentrations within the basin. This is thought to occur because the stable atmospheric conditions allow for a build-up of precursor chemicals and the reflectivity of the snow cover increases the ultraviolet reactions during the day creating high ozone concentrations.

In the stratosphere the beneficial ozone layer extends upward from about 6 to 30 miles and protects life on Earth from the sun's harmful ultraviolet (UV) rays. This natural shield had been gradually depleted by man-made chemicals like chlorofluorocarbons (CFCs), though evidence suggests that the total ozone column has not decreased since 1998 (Weatherhead 2006). A depleted ozone shield allows more UV from the sun to reach the ground, leading to more cases of skin cancer, cataracts, and other health problems (EPA 2012).

Smoke can increase ozone production. Key ingredients for the chemical reaction by which ozone is most often formed are sunlight, volatile organic compounds (VOCs) and oxides of nitrogen (NOx). Smoke emission factors for VOC and NOx are both less extensively researched and lower than for more familiar smoke components like particulates or carbon monoxide. However, fires can be major sources and their overall role in the formation is not well understood. There are some indications that smoke enhances ozone formation and also some indications it inhibits ozone formation. In the instances where smoke is suspected of decreasing ozone formation, the smoke was very heavy and perhaps blocked the strong sunlight associated with ozone formation (CAQDR 2012).

For San Bernardino County, maximum ozone levels have been above the national 8 hour standard of 0.070 ppm from 1973-2015, and have generally been improving, Figure 1.

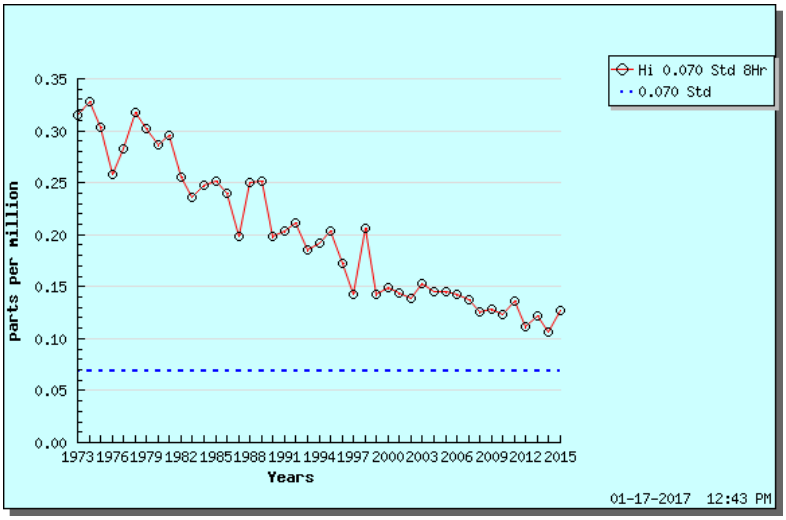

Figure 1. Shows the maximum ozone trends summary for San Bernardino County as being above the national 8 hour standard of 0.070 ppm from 1973-2015.

Source: http://www.arb.ca.gov/adam/trends/trends1.php

Particulate Matter

Ambient particulate matter (PM) concentrations increase substantially during a wildfire (Kochi et al. 2010b). A dose-response function is an equation that estimates the health consequences of exposure to pollution. Compared to conventional PM studies (based on urban air pollution), wildfire studies are "less likely to find a significant positive mortality effect in spite of the substantial increases in PM levels during the wildfire period" (Kochi et al. 2010a). There are several probable reasons for this finding, including: (1) urban air pollution and wildfire smoke are chemically different (wildfire smoke is generally less toxic), (2) wildfire events are more likely to promote averting behavior, such as evacuation (Kochi et al. 2010a). However, the wildfire studies did find increased hospital admissions linked to asthma and respiratory problems during wildfire events (Kochi et al. 2010a). PM studies find that the dose-response function is not linear. In other words, a doubling of PM concentration more than doubles the health consequences. Furthermore, at low-levels an increase in PM may result in no measureable health consequences (Kochi et al. 2010b). Five key health outcomes are considered in the literature: (1) mortality, (2) restricted activity days, (3) hospital admissions, (4) respiratory symptoms, and (5) self-treatment. Kochi et al. (2010b) estimate that the cost of health effects due to smoke from wildfire events range from $0.26 million to $1.2 billion depending on the scale of the fires occurring during fire seasons and the health outcomes considered.

As for the health risk to California residents from exposure to PM2.5, an extensive body of research provides compelling evidence that fine PM is the criteria air pollutant that poses the

greatest risk to public health. It has long been established that exposure to particulate matter has negative effects on the respiratory system, such as triggering asthma attacks, aggravating bronchitis, and diminishing lung function. In the past several decades, a multitude of studies have found that fine PM can also harm the cardiovascular system; these studies have shown a strong correlation between exposure to fine PM and severe health effects such as heart diseases and premature mortality. In recent studies, researchers have also found that exposure to fine PM may be correlated with a wide range of other health effects, such as diabetes, autism, and cognitive (brain function) impairment (CARB 1).

Smoke is inevitable in the airsheds of California, whether from wildfire or prescribed fire. Smoke can travel great distances and affect communities far away from the burn unit, sometimes persisting after the burn has been completed. Particulates become part of the air mass where they were released, gradually dispersing to a more uniform concentration within the air mass until gravity or precipitation brings them back to earth days or weeks later. Under the existing condition, dense shrubs, dead trees and forest litter accumulations are providing an increase to surface fuels over many years and could increase smoke emissions from wildland fires that are unpredictable when they occur, their size and intensity, and the amounts and duration of smoke production that can impact human health and visibility. The timing of prescribed fires is predictable, the volume of smoke produced is typically less than in a wildfire, and there is time to notify the public when burns will be implemented. As a result, adverse health consequences are less likely to result from prescribed fires.

PM10

The size of particles is directly linked to their potential for causing health problems. Small particles, less than 10 micrometers (microns) in diameter, pose the greatest problems. Since PM_{10} contains all particles smaller than 10 microns, $PM_{2.5}$ and ultrafine particles which are <0.1 microns are included in the PM_{10} measurement. The smallest particles, like $PM_{2.5}$, can get deep into the lungs, and some, like ultrafine particles, can penetrate all the way into the bloodstream. Exposure to such particles can affect the lungs, the heart, and the cardiovascular system. Larger particles are of less concern, although they can irritate the eyes, nose, and throat (AirNow 2003), and cause serious harm due to inflammation in the airways of people with respiratory diseases such as asthma, chronic obstructive pulmonary disease, and pneumonia (Weinmayr, et al. 2010).

San Bernardino County is in federal attainment and state non-attainment for PM10.

For the South Coast Air Basin (San Bernardino County data not available), PM10 levels have been above the national standard from 1988 through 2015 and have generally been improving, Figure 2.

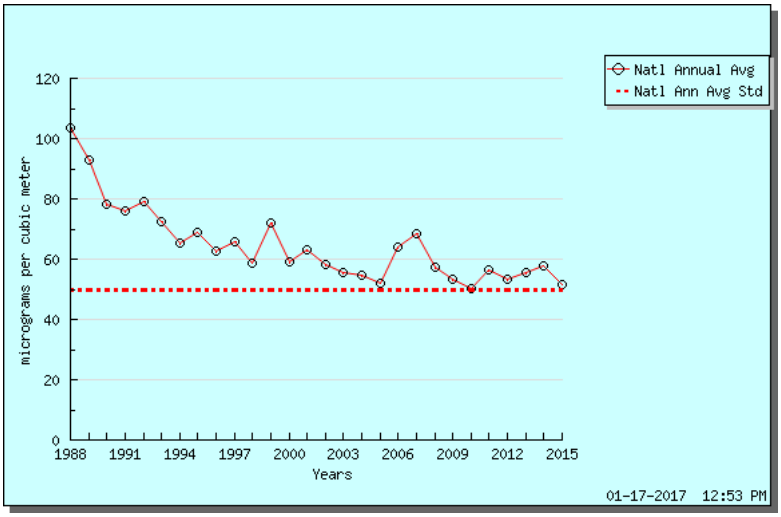

Figure 2. The three year average PM10 trends for the South Coast Air Basin Air Basin as above the national standard of 35µg/m^3 since 1988. Note the graph displays the old standard – 50µg/m^3.

PM2.5

EPA generally defines $PM_{2.5}$ as particulate matter with an aerodynamic diameter less than or equal to 2.5 microns in size. The health effects of $PM_{2.5}$ are not just a function of their size, with the largest fine particles measuring about 1/20th the width of an average human hair, which allows them to be breathed deeply into the alveoli of the lungs. It is also a function of their composition. These tiny particles can remain in the lungs for a long time and cause a great deal of damage to lung tissue. They can reduce lung function as well as cause or aggravate respiratory problems. They can increase the long-term risk of lung cancer or lung diseases such as emphysema or pulmonary fibrosis. The smallest range of $PM_{2.5}$ particles, also called ultrafine particles (those with a diameter <0.1 µm) can be transported from the lungs into the blood stream and affect the heart and cardiovascular system. Once in the blood stream, ultrafine particles can be transported anywhere in the body. Some of these ultrafine particles are carcinogenic (CAQDR 2012).

The "National Annual Average" for PM2.5 is the average of the year's quarterly averages, calculated according to the method specified in Title 40, Part 50, Appendix N of the Code of Federal Regulations as it appeared on October 17, 2006. The national annual standard is exceeded when the National Annual Average is greater than 12 micrograms per cubic meter and is violated when the National Annual Standard Design Value is greater than 12 micrograms per cubic meter.

San Bernardino County in in state and federal non-attainment for PM2.5.

For San Bernardino County, PM2.5 levels have been below the national standard from 2009 through 2014, Figure 3.

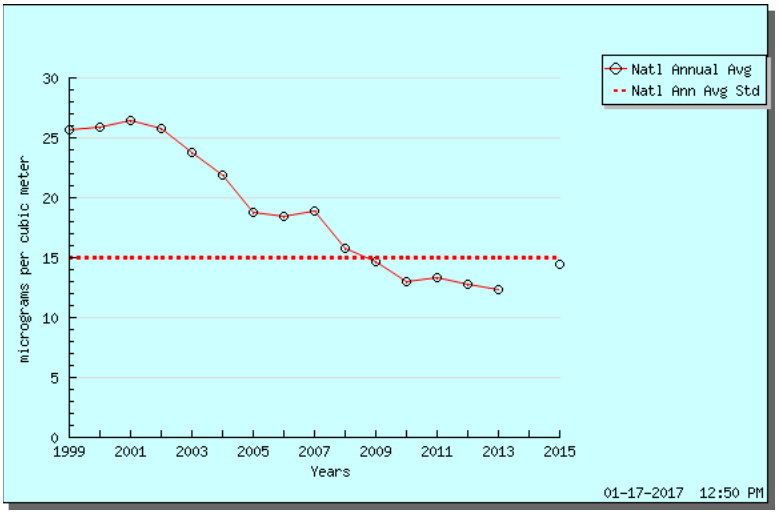

Figure 3. Annual average PM2.5 tends summary for San Bernardino County from 1999 through 2013. National standard is 12µg/m3. Note the graph displays the old standard – 15µg/m3.

Sulfur Dioxide

Sulfur dioxide (SO_2) belongs to the family of sulfur oxide gases (SO_x). Most SO_2 comes from electric utilities, particularly those that burn coal. Sulfur dioxide can react with other substances in the air to form small particles that can cause or worsen respiratory disease, aggravate existing heart disease, and form acid rain. Nationwide, SO_2 concentrations have decreased over time (EPA 2010).

San Bernardino County is in state and federal attainment for SO_2.

Smoke management plan

Visibility

Visibility is specifically identified in the CAA as an AQRV that Federal land managers must consider. The 1990 CAA amendments include a goal of improving visibility in Class I areas with visibility impairment. Regional haze is visibility impairment resulting from the transport of particles over long distances.

Visibility impairment is caused by pollutant plumes, layered haze, or uniform (regional) haze. Plumes are distinct in form and caused by a local source. Layered haze is usually a result of pollution trapped beneath a temperature inversion resulting in clearer views at higher elevation sites than at locations closer to the ground. Regional haze alters the entire view causing landscape features to evenly fade or disappear from sight. Regional haze often travels long distances, covering large geographic areas. It is caused by light scattering and light absorption by fine particles and gases. This type of haze is the cause of most visibility impairment in the country.

Visibility is easily understood in terms of visual range. Standard visual range (SVR) has been a popular measure of atmospheric visibility because of its familiar units of measure (distance). The fact that a sighted person can use it to characterize visual conditions without instrumentation is another reason for its popularity (ARS 1993). However, visual range is not linear to human perceived changes in visibility. For instance, a 5 mile change in visual range is most perceptible where the air is quite clear than under conditions where visibility is impeded by humidity or pollution sources.

To address different ambient conditions, a uniform standard of measure, called a “deciview”, has been developed to describe changes in visibility. Specifically, it is a measure of light extinction. A change of 1.0 deciview is equivalent to a ten percent change in extinction and represents a “just noticeable” change in visibility. The higher the deciview, the less a person can see into the distance.

Class I air sheds in the region surrounding the project area are the San Gabriel, Cucamonga, San Gorgonio, San Jacinto, Joshua Tree, and Agua Tibia Wilderness Areas. The nearest Class II airshed wilderness areas are the San Mateo Canyon, Beauty Mountain, Santa Rosa, Cahuilla, South Fork San Jacinto, Bighorn Mountain, Mecca Hills, Orocopia, Pleasant View, and Sheep Mountain Wilderness Areas.

The Regional Haze Regulations (under 40 CFR §51.308) establish that the Class I area progress goals must provide for an improvement in visibility for the most impaired (i.e., 20% worst) days over the period of the implementation plan, and ensure no degradation in visibility for the least impaired (i.e., 20% best) days over the same period.

California has 29 Class 1 Areas, more than any other state. Progress towards better visibility is calculated from data collected at the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. There are 17 IMPROVE monitors representing one or more of the Class 1 Areas in California. Class 1 areas in the projects vicinity have showed an improvement in visibility and have moved a range of 76-206% in progress towards their 2018 Reasonable Progress Goal, Table 5.

Table 5. Statewide 2018 Reasonable Progress Goal (RPG) Summary shows improvement at all the Class 1 areas in the project vicinity.

Southern California									
IMPROVE Monitor	**California Class I Area(s)**	**Best Days Baseline (dv)**	**Best Days (2007-2011) (dv)**	**Visibility Change (dv)**	**Worst Days Baseline (dv)**	**Worst Days (2007-2011) (dv)**	**Visibility Change (dv)**	**2018 RPG (dv)**	**Progress to 2018 RPG by 2011**
SAGA	San Gabriel W. Cucamonga W.	4.8	4.5	0.3	19.9	**18.0 (2005-2008)**	1.9	**17.4**	76% by 2008
SAGO	San Gorgonio W. San Jacinto W.	5.4	4.5	0.9	22.2	**18.7**	3.5	**19.9**	152%
AGTI	Agua Tibia W.	9.6	7.4	2.2	23.5	**19.8**	3.7	**21.6**	195%
JOSH	Joshua Tree N.P.	6.1	5.3	0.8	19.6	**16.1**	3.5	**17.9**	206%

Desired Condition

See Chapter 1 in the Environmental Assessment for a description of the desired condition for Arrowhead Place.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Direct and Indirect Effects

Under the No Action Alternative there would be no project related cutting or mastication of trees and shrubs, prescribed burning or equipment use. Current and future air quality conditions could remain the same or be similar to current conditions depending on wildfire occurrence, regional urban, and transportation emissions growth.

An increase in wildfire smoke emissions could increase air quality impacts in smoke sensitive areas and Class 1 areas. Concentrations of possibly unhealthy levels of particulate matter and carbon monoxide could occur in occupied smoke sensitive areas immediately adjacent to burning wildfires. Particulate matter can travel tens or even hundreds of miles depending on the amounts of smoke produced and meteorological conditions, and cause air quality impacts to smoke sensitive areas and Class 1 airs sheds down wind. Particulates become part of the air mass where they were released, gradually dispersing to a more uniform concentration within the air mass until gravity or precipitation brings them back to earth days or weeks later. As carbon monoxide moves further away from the burning source it degrades and reduces back into its original constituents, and generally would not pose a health problem several miles or further away from the source (Hardy 2001). Wildfire smoke NOx and VOC could increase or decrease ozone production depending on the amounts of smoke present during the day time and whether the

smoke plume is dense enough to limit the interaction of sunlight with ozone precursor constituents (CDPHE 2010). In other words, smoke plumes can reduce sunlight interacting with the chemicals that produce ozone and reduce the formation ground level ozone.

Cumulative Effects

Wildfires occurring in the Grass Valley project area would contribute to increase in the amounts of smoke produced in the region with corresponding impacts to NAAQS and visibility in Class 1 air sheds, and especially during periods of low smoke dispersal (low mixing heights and transport winds) or the capacity of the atmosphere to disperse smoke towards the east into the Mohave Desert.

Activities Common to Action Alternatives

Project unit treatment acres and activities are shown in chapter two of the Environmental Assessment.

Alternative 2 – Proposed Action _____

See Chapter 2 in the Environmental Assessment for a detailed description of the proposed action.

Direct Effects

Direct air quality effects would be the production of emissions from equipment used to implement project work, road dust and forest management prescribed burning.

Equipment use would include only tens of gasoline or diesel fuel powered vehicles and equipment on any given day, spread out over a large area. Therefore the amount of emissions the equipment would produce would be insignificantly small and dependent on where, when and how many acres would be treated, the number of and types of vehicles / equipment would be used, and their hours of operation. In most circumstances vehicle and equipment emissions disperse rapidly and in the potential concentrations caused by only tens of vehicles / equipment would not cause NAAQS exceedances. Therefore, potential vehicle and equipment emissions will receive no further analysis.

The SCAQMD requires controls for fugitive dust from unpaved road vehicle use and mud track-out on to paved roads (SCAQMD Rule 403). The rule requires that: “No person shall cause or allow the emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that: (A) the dust remains visible in the atmosphere beyond the property line of the emission source; or (B) the dust emission exceeds 20 percent opacity (as determined by the appropriate test method included in the Rule 403 Implementation Handbook), if the dust mission is the result of movement of a motorized vehicle. (2) No person shall conduct active operations without utilizing the applicable best available control measures included in Table 1 of this Rule

to minimize fugitive dust emissions from each fugitive dust source type within the active operation."

The rule also has specific requirements for the control of mud track-out on to paved roads that would cause fugitive dust. Project Design Feature 185 describes actions that will be taken to mitigate potential fugitive dust caused by project implementation. By following Rule 403 and Design Feature 185, the project will produce minor amounts of road dust that will remain within the project area and will not impact populated areas outside of the project area.

Prescribed Burning Emissions

Approximately 300 acres would be treated per year with prescribed fire and would produce the greatest amounts of smoke during the first treatment entry. For modeling purposes we show this first entry treatment occurring in 2018, Figure 4. Initial, first entry prescribed burning would produce a total of about 359 tons PM2.5, and 421 tons PM10. Each year over three years about 120 tons PM2.5, and 140 tons PM10 would be produced. This burning would be the equivalent of about 16% of the annual forest management prescribed burning emissions in San Bernardino County, Table 4 above. Figure 4 shows the tons per acre prescribed burning emissions estimates following mechanical treatment from 2018-2046.

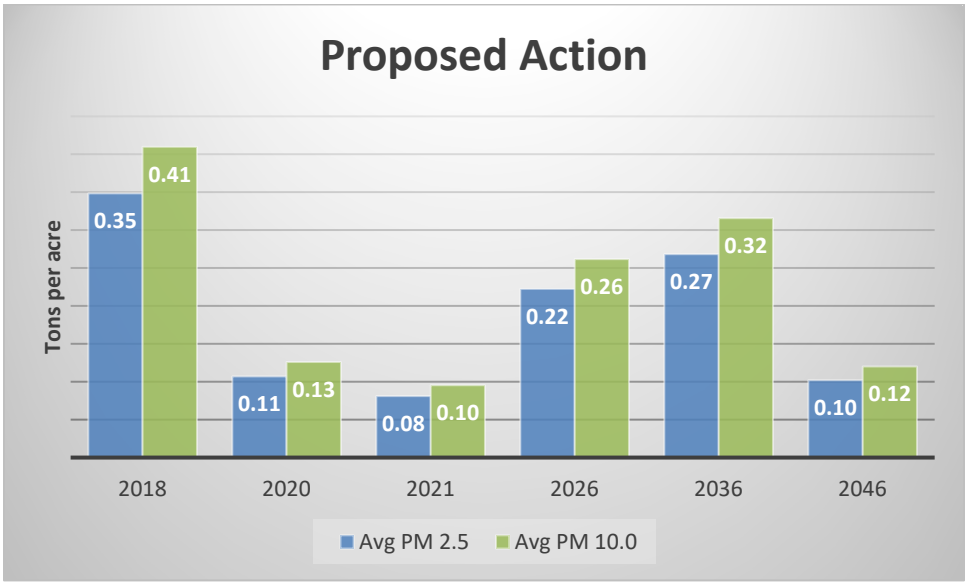

Figure 4. Tons per acre prescribed burning emissions estimates following mechanical treatment from 2018-2046.

Stand carbon would decrease from about 163 tons per acre, or 167,238 total project tons in 2017, to about 145 tons per acre, or 148,770 total project tons after first entry treatments are completed, Figure 5. Stand carbon would fluctuate from about 140-146 tons per acre from 2019-2025.

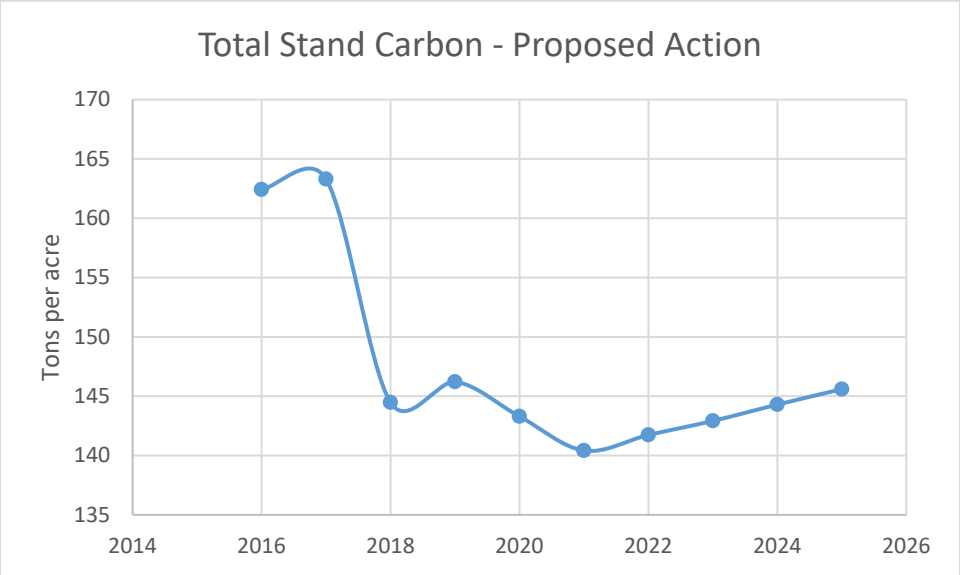

Figure 5. Stand carbon tons per acre from 2016-2025.

About 3 tons per acre of carbon, or 3,078 total project tons, would be removed to offsite from tree harvesting, Figure 6. About 20 tons per acre, or 21,516 total project tons of carbon would release from prescribed burning after first entry treatments are completed.

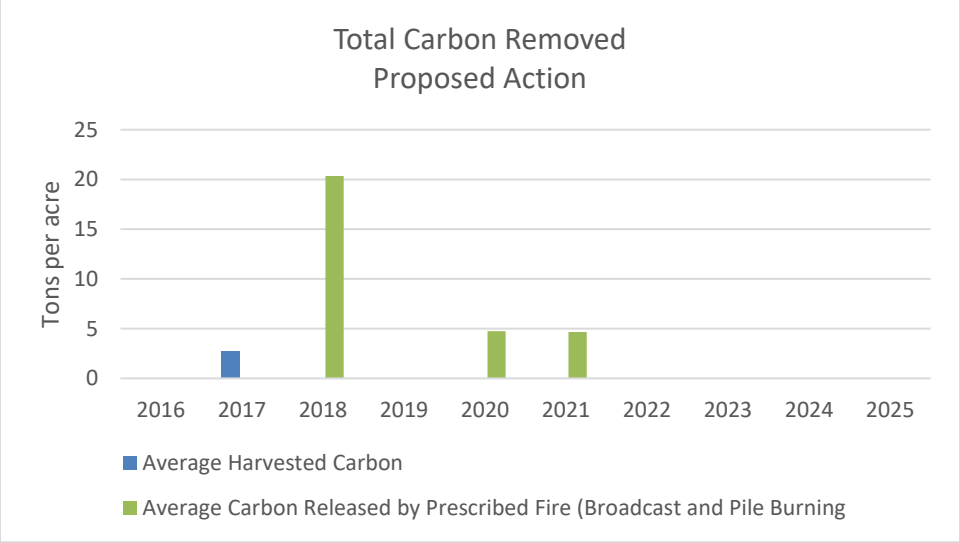

Figure 6. Total stand carbon removed from the project area by tree harvesting and prescribed burning, tons per acre.

Indirect Effects

Class 1 and Class 2 Areas

The nearest Class 1 areas closest to the project area are San Gorgonio, San Jacinto and Agua Tibia Wilderness Areas and Class 2 areas San Mateo Canyon, South Fork San Jacinto and Cahuilla Wilderness Areas. The project is not expected to cause significant visibility impacts to

the wilderness areas and any reduced visibility would be minor, temporary and transient compared to visibility that is reduced from stationary and mobile sources.

NAAQS

Prescribed burning would be controlled by the SCAQMD and it is unlikely smoke impacts to people in smoke sensitive areas would exceed NAAQS because fire managers are required by law to follow smoke permit stipulations. Most smoke impacts occur during night time and early morning hours when smoke pools in drainages and low lying areas such as valleys where most people occupy homes. People living in smoke sensitive areas will most likely smell smoke at night and during early morning hours.

Smoke Sensitive Areas

Smoke sensitive areas are defined as "populated areas and other areas where an Air District determines that smoke and air pollutants can adversely affect public health or welfare." Such areas can include, but are not limited to, towns and villages, campgrounds, trails, populated recreational areas, hospitals, nursing homes, schools, roads, airports, public events, shopping centers, and Class I Areas (areas that are mandatory visibility protection areas designated pursuant to section 169A of the federal Clean Air Act. (CARB Smoke Management Plan, Application for Burn Permit, http://www.arb.ca.gov/smp/techtool/techtool.htm)

Major smoke sensitive areas in close proximity to the Grass Valley project include the communities around Lake Arrowhead. Fire managers would be required to identify these areas in prescribed burn smoke permit applications, show how people living in these areas would be notified about prescribed burning well in advance of burning operations, how they would monitor for possible smoke impacts to smoke sensitive areas, and fire managers would be required to provide smoke contingency plans for in case conditions are forecasted to deteriorate in smoke sensitive areas.

Cumulative Effects

Forest prescribed fire smoke emissions are the largest contributor to air pollutants in the forest and in the forest's contribution to the regional airshed. In addition to prescribed fire smoke currently produced by forest fuels management operations and the proposed Grass Valley project, there are three proposed projects that would increase prescribed fire smoke emissions if the projects are approved and implemented, Table 6. There are several factors that controls the amount of forest prescribed fire smoke emissions including funding, the amount of project acres scheduled for prescribed burning, fuel loading, prescribed burning prescriptions, time of year (most burning occurs in the fall, winter and spring), and SCAQMD authorization to burn on a burn day. Cumulatively, large amounts of smoke can be produced by forest burning. However, the regulation of timing, location and the amounts of smoke emissions permitted by the SCAQMD controls the exposure of communities downwind to smoke and the SCAQMD works

to limit exposure to air pollutants to not exceed NAAQS or cause unhealthy air quality conditions.

Table 6. Proposed new forest projects that potentially could produce prescribed fire emissions.

Project Name	Project Purpose	Planning Status	Decision	Expected Implementation
Santa Ana Watershed Hazardous Fuels Reduction and Forest Health EIS	- Fuels management	On Hold	N/A	N/A
	Description: Fuels reduction within a 21,000-acre analysis area to reduce the risk of high intensity wildfire to adjacent communities, organizational camps, and recreation residences. Occurs within Sugarloaf IRA. **Web Link:** http://www.fs.usda.gov/project/?project=24122			
	Location: UNIT - San Gorgonio Ranger District, Big Bear Ranger District. STATE - California. COUNTY - San Bernardino. LEGAL - T1N, T2N; R1W, R1E, R2E. North of San Gorgonio Wilderness along State Highway 38 up to the south end of Big Bear and Snow Summit Ski Resorts.			
	Location: UNIT - Big Bear Ranger District. STATE - California. COUNTY - San Bernardino. LEGAL - Not Applicable. Holcomb Valley area, east and north of (but not including) Polique Canyon Road (2N09) to Highways 38 and 18 and the San Bernardino National Forest boundary.			
North Big Bear Fuels Reduction and Forest Health EA	- Fuels management	In Progress: Scoping Start 06/19/2009 Est. Comment Period Public Notice 01/2018	Expected:06/2018	07/2018
	Description: Cut and remove dead and dying trees as well as some green trees to reduce hazardous fuels in the community defense and threat zones along the North Shore of Big Bear Lake. **Web Link:** http://www.fs.usda.gov/project/?project=3836			
	Location: UNIT - Big Bear Ranger District. STATE - California. COUNTY - San Bernardino. LEGAL - T2N, R2E SRC7 portions of SRC 1,2,3,10,11,12,13, 14,15,22, T2N R1R SRC7-12, 15, 16, 17, 18. In the Fawnskin Valley adjoining private land NW of the community of Fawnskin.			
Cajon Pass Ignition Reduction Project CE	- Fuels management	Developing Proposal Est. Scoping Start 09/2017	Expected:11/2017	04/2018
	Description: This project intends to reduce and maintain available fine fuels directly adjacent to roadways that are a consistent source of fire propagation along Interstate 15, Highway 138, and Old Cajon Road.			
	Location: UNIT - Cajon Ranger District. STATE - California. COUNTY - San Bernardino. LEGAL - Not Applicable. Cajon Pass including Interstate 15, Highway 138, and Old Cajon Roads on NFS lands.			

COMPLIANCE WITH REGULATORY DIRECTION

All prescribed burning operations are required to be permitted by the SCAQMD and comply with Rule 444, Open Burning stipulations – State Laws and Regulations above. The main purpose of Rule 444 is to ensure that smoke emissions are limited to stay within the capacity of the atmosphere to disperse smoke and not cause exceedances of NAAQS in occupied smoke sensitive areas, and protect Class 1 air sheds from degradation.

Currently, there are no legal or regulatory requirements concerning GHG emissions or carbon sequestration for ecosystem management projects such as Grass Valley.

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