Salt Timber Harvest and Fuel Hazard Reduction Project

Air Quality Report

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01-21-09

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Air Quality

Affected Environment

Introduction

Air quality is managed through a complex series of Federal, State, and local laws and regulations designed to assure compliance with the Clean Air Act. A summary of the regulations that apply to the Salt Project are provided under the heading Air Quality Regulatory Framework.
This project can be divided into two phases in terms of air quality impacts. First phase will be Timber Sale that will take three to five years for completion followed by prescribed fires phase (under-story and pile burns) that will also be spread over three to five years. The pollutants that will be released are the criteria pollutants i.e. PM_{10}, $PM_{2.5}$, Carbon Monoxide (CO), Nitrogen Oxides (NOx), Volatile Organic Carbons (VOCs) and minute quantities of non-criteria air toxics. These pollutants and air toxics are considered unhealthy for the public. In addition, Green House Gases like Carbon Dioxide (CO_2) and Methane (CH_4) are also emitted. These gases are known to impact climate change.

For air quality management, California is divided into fifteen air basins whose boundaries are based on geographical and meteorological considerations and follow political boundaries to the extent practicable (See Figure 1).

The Project area falls in the North Coast Air Basin and is managed by the North Coast Unified Air Quality Management District (NCAQMD), which consists of Del Norte, Humboldt, and Trinity counties.

Figure 1-California Air Basins

The area is located approximately 45 miles south of Weaverville, California in Trinity County which accommodates approximately 3000 residents and is the largest town in the county. The project vicinity is primarily forested federal and private lands.

Air Quality Regulatory Framework

This section presents the air quality regulatory framework and existing air quality conditions applicable to the project area.

Regulatory Agencies

In California air quality is managed at three levels of governments via federal (EPA), state (CARB) and local (APCDs) described below:

The Environmental Protection Agency (EPA) has the primary federal role of ensuing compliance with the requirements of the Clean Air Act. The EPA issues national air quality regulations, approves and oversees state implementation plans, and conducts major enforcement actions. In California, the state agency responsible for meeting the Clean Air Act requirements is the California Air Resource Board (CARB). The CARB has further delegated the authorities to local Air Pollution Control Districts (APCDs) or Air Quality Management Districts (AQMDs) for stationary sources, while retaining the authority for mobile sources. The Districts have the primary responsibility for meeting the requirements of the Clean Air Act. This responsibility is carried out through the development and execution of implementation plans, which must provide for the attainment and maintenance of air quality standards.

1. Federal Clean Air Act

The original Air Quality Act was passed in 1963. This act was followed by Clean Air Act Amendments in 1970, 1977, and 1990. The important sections under each amendment that impact agencies activities are summarized below:

a. Clean Air Act Amendment 1970

The Clean Air Act Amendments of 1970, Section 109, required the EPA to develop primary Ambient Air Quality Standards to protect human health and secondary standards to protect welfare.

National Ambient Air Quality Standards (NAAQS)

To protect human health and welfare, the EPA established primary and secondary NAAQS for the following six Criteria Pollutants:

- Particulate Matter (PM_{10}, $PM_{2.5}$)
- Ozone (O_3)
- Sulfur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)
- Carbon Monoxide (CO)
- Lead (Pb)

The primary standards for these pollutants are shown in Table 1 (along with California standard). If federal standards are violated in any area that area is designated as “non-attainment” for that pollutant, and the state must develop a plan for bringing that area back into “attainment”.

On July 16, 1997 the EPA revised Ozone 1 hour and PM_{10} standards. The revised ozone 8 hour standard and $PM_{2.5}$ standards (annual and 24 hour average) were announced.

On December 18, 2006 the EPA again revised the $PM_{2.5}$ (24 hour standard) by making it more stringent from 65 to 35 micrograms per meter cube.

On March 12, 2008, the EPA issued a revised ozone standard. The new primary 8-hour standard is 0.075 parts per million (ppm) and the new secondary standard is set at a form and level identical to the primary standard (not shown in the table).

Table 1. National and California Ambient Air Quality Standards

National and State Ambient Air Quality Standards in ugms/m³ (ppm)			
Primary Standards			
Pollutant	**Averaging Time**	**Federal**	**State**
PM_{10}	Annual	--	20
	24 hours	150	50
PM $_{2.5}$	Annual	15	12
	24 hour (07/12/1997)	65	35
PM $_{2.5}$	24 hour (12/18/2008)	35	35
NO_2	Annual	100 (0.053)	56 (0.03)
	1 hour	--	338 (0.18)
CO	8 hours	10,000 (9.0)	10,000 (9.0)
	1 hour	40,000 (35)	23,000 (20)
SO_2	Annual	80 (0.03)	--
	24 hours	365 (0.14)	105 (0.04)
	3 hours	--	--
	1 hour	None	655 (0.25
O_3	1 hour	--	180 (0.09)
	8 hour	157 (0.08)	137 (0.07)
Pb	Calendar Average	1.5	None
	30-day Average	None	1.5

•Annual standards are never to be exceeded. Other standards are not to be exceeded more than once a year.
•. 8hr ozone standard not to be exceeded three year average of the fourth highest 8-hour average ozone value --

b. Clean Air Act Amendment 1977

1. Prevention of Significant Deterioration (PSD) and Air Quality Related Values (AQRVs) for Class I Areas

The PSD program was established in 1978 as a result of lawsuit alleging that the Clean Air Act Amendment of 1977 required that a program be established to prevent degradation of air quality in pristine areas where air quality was very high. The program requires permits for new stationary air pollution sources above a certain size. The emission from these sources may not cause deterioration of ambient air quality beyond certain increments.

The 1977 Clean Air Act Amendments gave federal land managers an “affirmative responsibility” to protect the AQRVs of Class I areas from adverse air pollution impacts. Class I areas include national wildernesses greater than 5000 acres in existence on August 7, 1977 when the amendments were passed into law. AQRVs, as defined by Congress, include “the fundamental purposes for which Class I areas have been established and preserved by the congress and the responsible Federal Agency” (senate Report 95-127, p36) and include visibility. AQRVs are defined as feature or properties or properties of Class I area that can be changed by air pollution.

(In R5, the AQRVs, beside visibility include flora, water, soil, cultural and archaeological values and odor).

2. Regional Haze

Under Regional Haze Rule, released by the EPA, each state is required to develop visibility State Implementation Plan (SIP) for Class I areas by December 31, 2007. California is planning to release the draft plan for public review around May 15, 2008. The CARB has kept the federal land managers involved in the plan development process.

c. Clean Air Act Amendment 1990

i. Conformity

As required under the amendment the EPA published conformity regulations for non-attainment areas in the Federal Register on November 30, 1993. The conformity provisions of the Clean Air Act Section 176(c) prohibit federal agencies from taking any action that:

- Causes or contributes to any new violation of NAAQS;
- Increases the frequency or severity of an existing violation; or
- Delays the timely attainment of a standard in these areas

All management activities must conform to SIP. Each federal agency is responsible for making a conformity determination for resource projects it conducts or approves. The conformity rules apply only to the activities occurring in the federal non-attainment areas.

At present the EPA is revising the conformity rules. The draft rules were release for public review (review closed on March 10, 2008). The new rules exempt the prescribed burn projects from conformity determination if burns are conducted under an approved Smoke Management Program (SMP). The project emissions under de minimis level are still exempt from conformity determination. Any action subject to the conformity rule can be determined to conform if the total emissions are specifically identified and accounted for in the SIP. Additional details about conformity are given in R5 Conformity handbook (September, 2005).

ii. Reasonably Available Control Measures (RACMs) and Best Available Control Measures (BACMs)

Section 190 of the Clean Air Act required the EPA to issue technical guidance on RACMs and BACMs for prescribed fires. RACMs and BACMs can be used as mitigation measures. Some examples of the mitigation measures include annual plans, emission inventory system, implementation of emission reduction techniques, monitoring, surveillance, and enforcement programs, local and state regulatory oversight, and public education /awareness programs etc. BACMs are required measures for non-attainment areas.

iii. Interim Air Quality Policy

On May 15, 1998, the EPA issued “Interim Air Quality Policy on Wildland and prescribed Fires” 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. The interim policy was prepared in an effort to integrate the goals of allowing fire to function in an ecological role, for maintaining healthy ecosystem balanced while protecting public health and welfare, by mitigating the impacts of air pollutant emissions on air quality and visibility.

The policy encourages coordination between burners and regulators. It encourages states and tribes to develop smoke management programs (SMP) for prescribed burns. Under this policy provisions the EPA will ignore a violation occurred under a certified SMP and will not designate the area non-attainment.

California has revised Title 17 in accordance with Interim policy requirements and the EPA has certified it as a SMP.

The EPA is revising "interim policy" to make it consistent with the haze rule, agricultural burning and exceptional event rule. The new draft was released in November 2007 for public review.

iv. Western Regional Air Partnership (WRAP)

WRAP was formed in 1996 to implement the Grand Canyon Commission's recommendations. The commission was established in response to Clean Air Act Amendments of 1990 to improve visibility in Class I areas. The commission listed smoke from wildland fires and Agricultural burns as one of the source contributing to visibility degradation. The interim policy listed seven elements to be considered by the states in the development of smoke management programs. Fire Emission Joint Forum Page 6 of 30

(FEJF) under WRAP developed two documents called "Basic Smoke Management Program (BSMP)" elements and "Enhanced Smoke Management Program (ESMPs)"elements. BSMP consists of seven elements whereas ESMP consists of nine i.e. two more (interstate coordination and authorization) than BSMP.

v. Exceptional Event Rule

On March 10, 2006 the EPA released rules pertaining to "The Treatment of the Data Influenced by Exceptional Events". The "wildfire" and "wildfire use" is considered as an exceptional event. The EPA has proposed to implement section 319(b)(3)(B) and section 107(d)(3) authority to exclude air quality monitoring data from regulatory determination to exceedances or violation of NAAQS and avoid designating an area as a nonattainment. Also, the EPA has proposed four options with respect to whether, and to what extent, states should be required to take additional actions to address public health impacts related to the event.

vi. Hazardous Air Pollutants (HAPs)

The 1990 amendments to the Clean Air Act include a list of 189 pollutants identified as hazardous to human health. These pollutants are known to or have the potential to cause cancer, cause mutation, be toxic to nervous tissue, or cause reproductive dysfunction.

2. State-California Clean Air Act (CCAA)

A. CCAA 1988

The California Clean Air Act of 1988 is administered by the California Air Resource Board (CARB). The act added several requirements concerning plans and control measures to attain and maintain the state ambient air quality standards. One such requirement is for the CARB to establish designation criteria and to designate areas of the state as attainment, non-attainment or unclassified for any state standards. Figures 2, 3, 4, 5, 6 and 7 show the designated areas for federal and state standards for PM_{10}/$PM_{2.5}$ and ozone. California has also established ambient air quality standards for sulfate, hydrogen sulfide, vinyl chloride, and visibility reducing particles. The conformity rules apply to federal actions for federal standards only.

States have direct responsibility for meeting requirements of the Federal Clean Air Act and corresponding federal regulations. As authorized by Division 26 of the California Health and Safety Code, the CARB is directly responsible for regulating emissions from mobile sources. However, authority to regulate stationary sources has been delegated to air pollution control and air quality management districts at the county and regional levels. The state still has oversight authority to monitor the performance of district programs and can even assume authority to conduct district functions if the district fails to meet certain responsibilities.

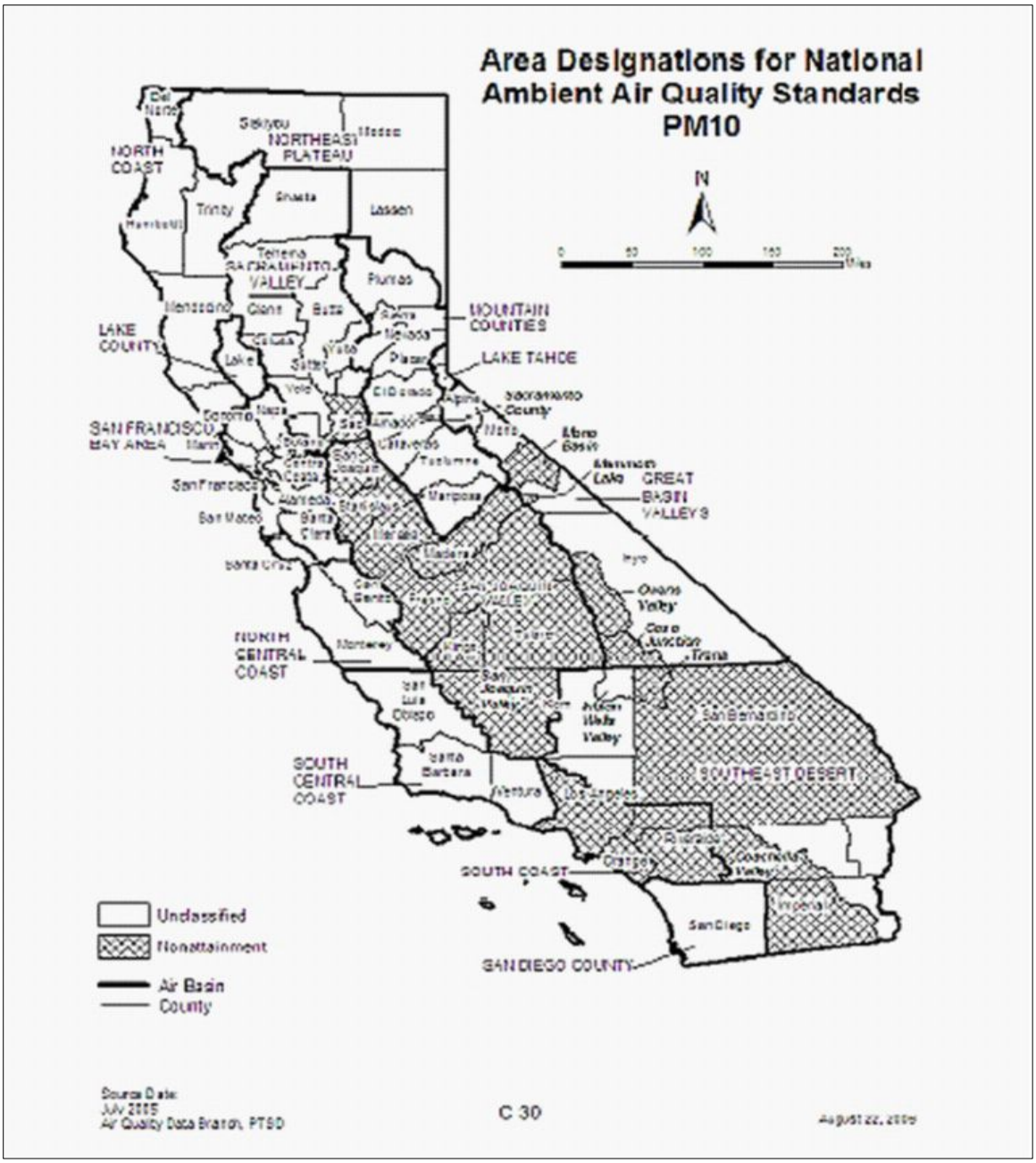

Figure 2-Area Designations for National Ambient Air Quality Standards PM_{10}

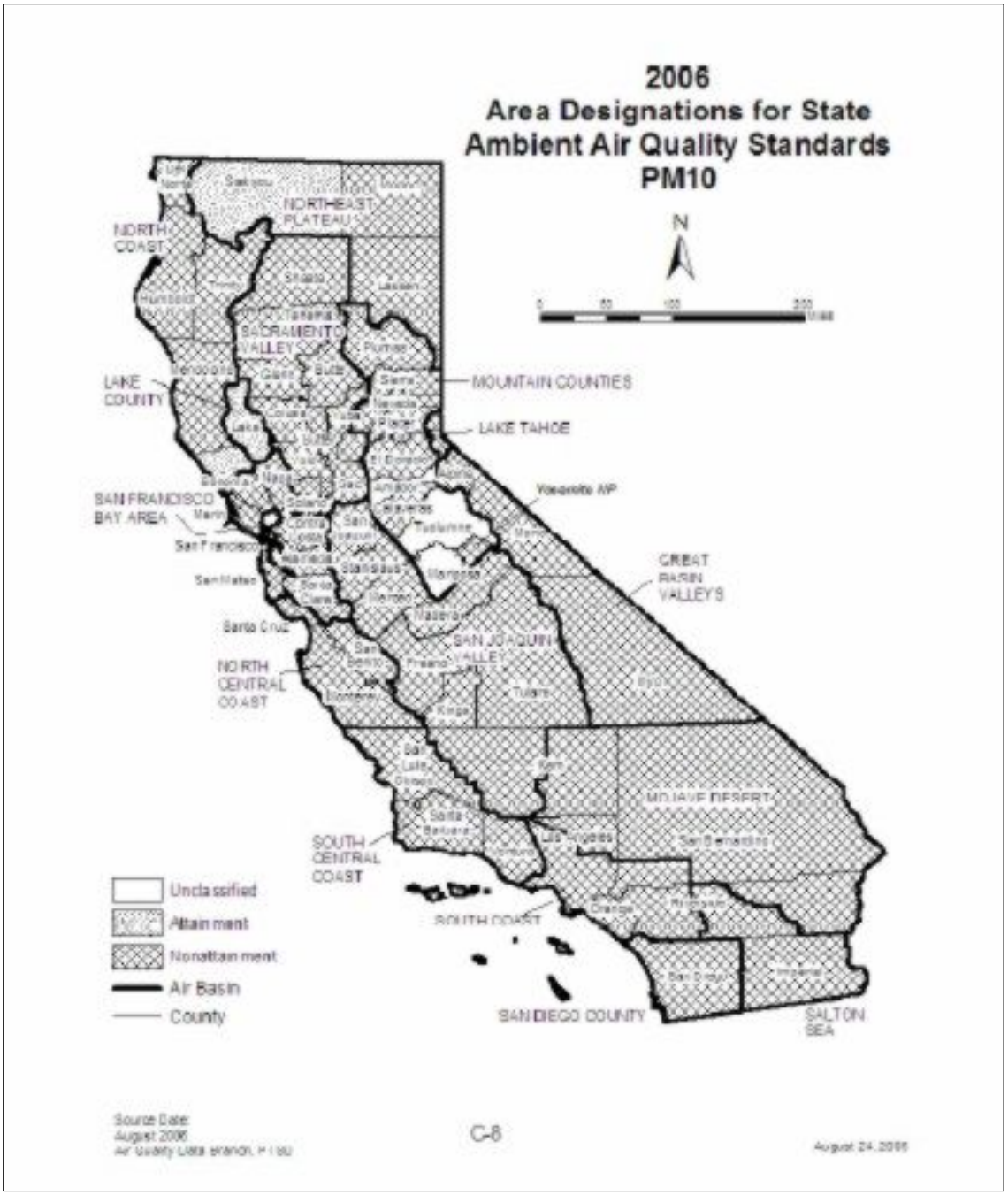

Figure 3- Area Designations for State Ambient Air Quality Standards PM_{10}

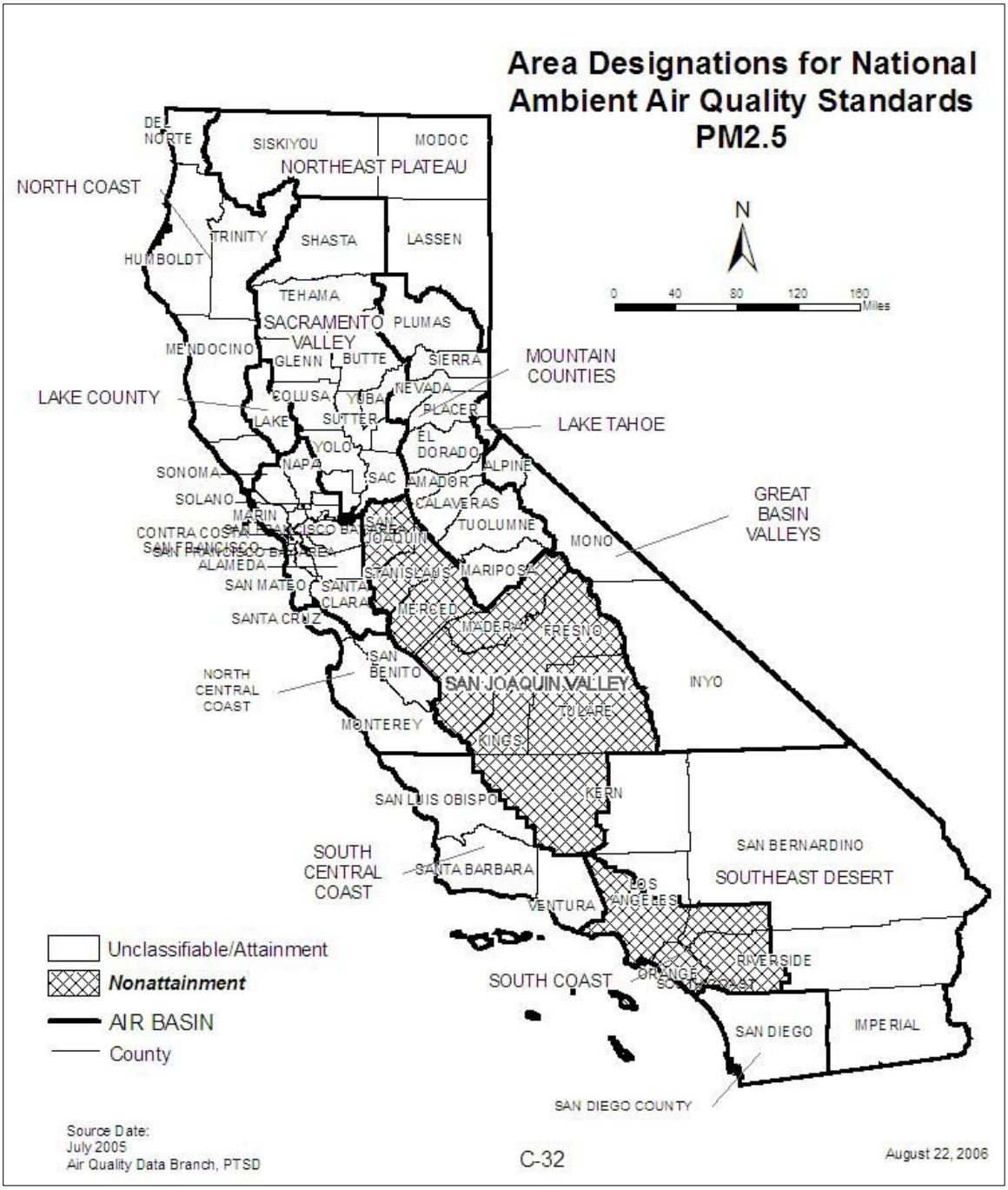

Figure 4-Area Designations for National Ambient Air Quality Standards $PM_{2.5}$

$PM_{2.5}$ (24hr) Non-Attainment area by Federal Standards

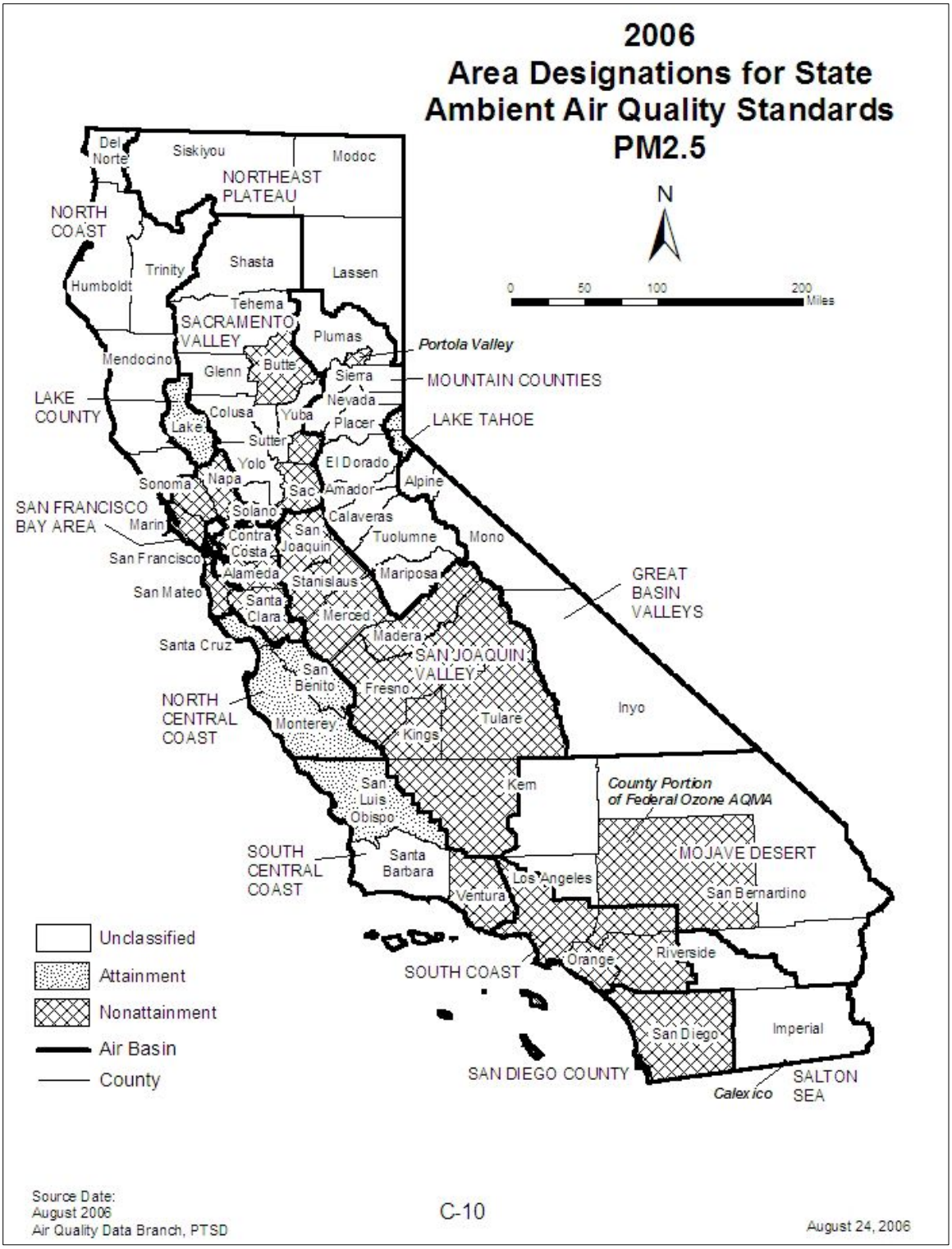

Figure 5- Area Designations for State Ambient Air Quality Standards $PM_{2.5}$

$PM_{2.5}$ (24 hr) Non-Attainment areas by State Standards

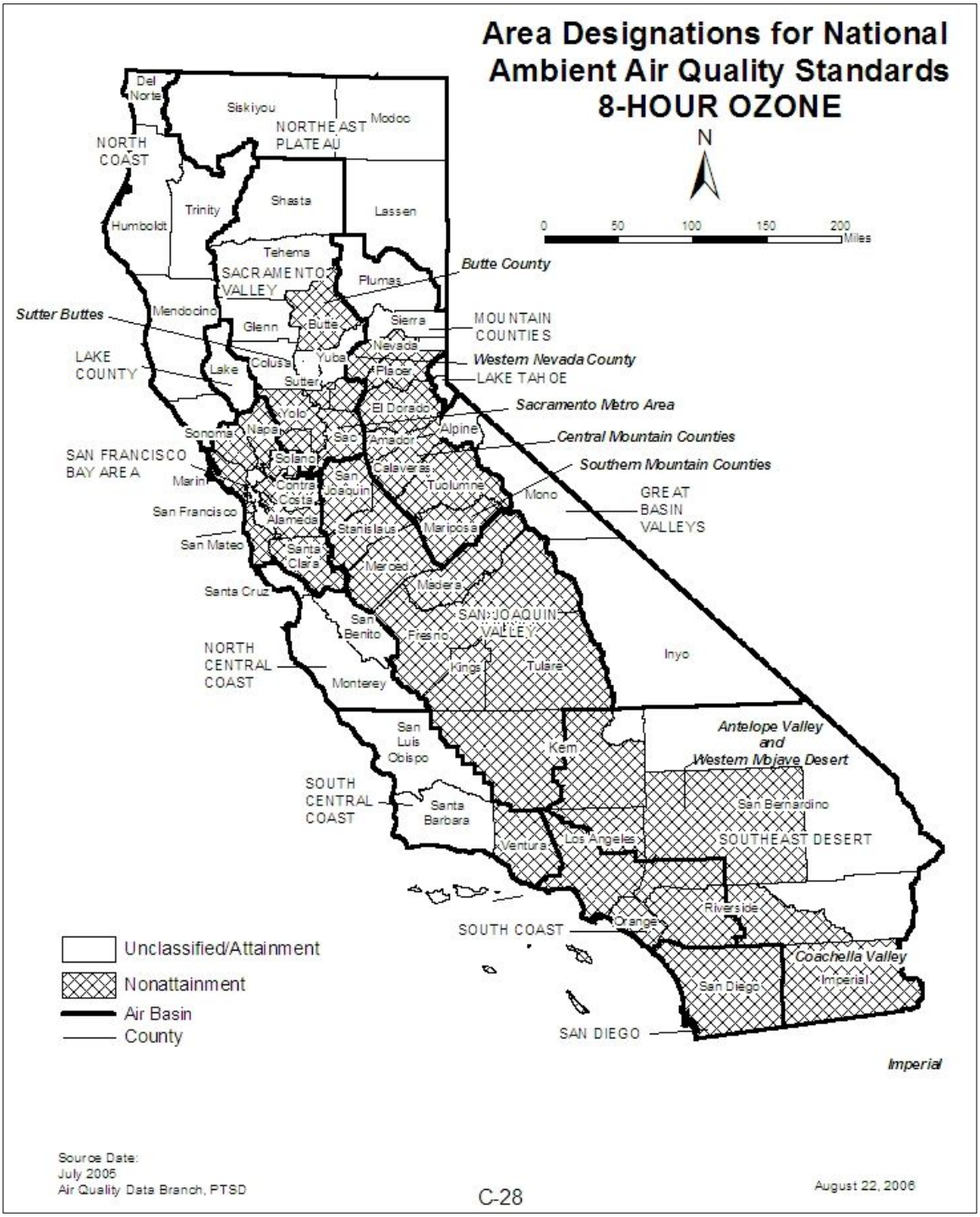

Figure 6-Area Designations for National Ambient Air Quality Standards 8-Hour Ozone

8hr Ozone standard (Federal)

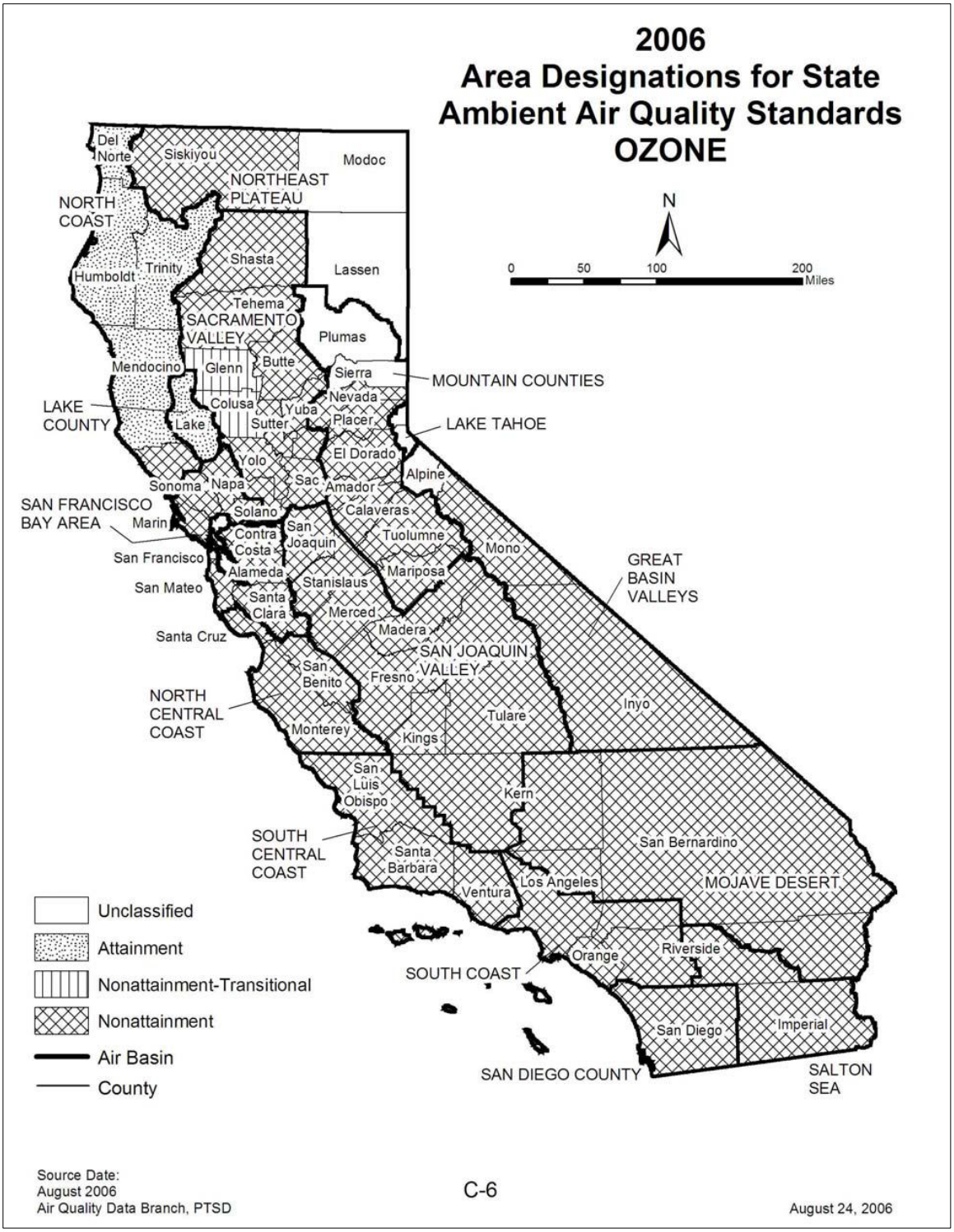

Figure 7-Area Designations for State Ambient Air Quality Standards Ozone

1hr Ozone Standard (State)

B. State Implementation Plans (SIPs)

Section 110 of the Clean Air Act requires states to develop SIPs for non-attainment areas that identify how the state will attain and maintain the NAAQS and other federal air quality regulations. How these areas will attain the standards is often based on the state's controls on new or existing air pollution sources. Controls can include more stringent pollution control requirements for industry, tighter requirements on wood- burning stoves or prescribed burning or more stringent controls on mobile sources of emissions. States and districts also have authority to make air quality standards and regulations more stringent than federal standards and regulations. The plan consists of adopted measures, commitments to adopt new measures (including adoption and implementation schedules), emission inventories, air quality modeling results, contingency measures and a demonstration of emission reductions sufficient for attainment.

The Forest Service is required to comply with all of the requirements of a SIP, once it is approved by the EPA.

C. Title 17

Title 17 of the California Code of Regulations Sub Chapter 2 describes the "Smoke Management Guidelines for Agricultural and Prescribed Burning" 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. These guidelines became effective March 14, 2001. Under the guidelines each APCD/AQMD developed a SMP that collectively was certified by the EPA as a state SMP. Under the guidelines a burn plan is developed by a burner to get a burn permit from the local APCD/AQMD. Authorization is received from the regulator on the day of burn declared by the CARB as a "burn day". BSMP elements are included in the Guidelines. Details about Title 17 can be downloaded from the site; http://www.arb.ca.gov/smp/regs/regs.htm

D. Assembly Bill 32 - Global warming Solutions Act of 2006

The state of California ranks as number 12 in the world for the highest emitted amounts of Green House Gases (GHGs). The Assembly and Senate have passed Bills to curb Global Warming. One of the Bills, AB32, was passed in 2006 and is summarized below:

In response to a warning from the scientific community that 90% of the California's Sierra snow-pack can be lost by 2050 if global warming emissions are not reduced by 80%, the AB32 commits the state to reduce its global warming emissions to 2000 level by 2010, to 1990 level by 2020 and 80% below 1990 levels by 2050. AB32 codifies the state's goal by requiring the state to achieve 1990 level by 2020 through enforceable statewide cap on these emissions. This reduction will be accomplished through an enforceable statewide cap (to be phased in by 2012) on global warming emissions. AB 32 directs the CARB to develop regulations and establish a mandatory reporting system to track and monitor global warming emission levels. To implement the cap it requires the CARB to use the following principles for emissions reduction:

- Distribute benefits and costs equitably
- No increase in direct, indirect or cumulative air pollution in local communities
- Protect entities that have already taken actions.

- Allow for coordination with other states and countries.

The R5 has joined the California Climate Action Registry to reduce the agency's environmental footprints.

3. Local Regulators—North Coast

The California Clean Air Act established a number of legal mandates to facilitate achieving health-based state air quality standards at the earliest practicable date. As an example, according to South Coast the common mandates for the APCDs/AQMDs to follow are:

- Demonstrate the overall effectiveness of the air quality program
- Reduce non-attainment pollutants at a rate of five percent per year, or include all feasible measures and an expeditious adoption schedule
- Ensure no net increase in emissions from new or modified stationary sources
- Reduce population exposure to severe non-attainment pollutants according to a prescribed schedule
- Include any other feasible controls that can be implemented, or for which implementation can begin, within 10 years of adoption of the most recent air quality plan
- Rank control measures by cost-effectiveness

The State is currently divided into 15 air basins and 58 counties. Some of these counties are split between two or more air basins. The map 1 shows the current air basin boundaries and the location of the counties that lie within each air basin.

The most recent changes to the air basin boundaries were adopted by the Board in May1996, and split the former Southeast Desert Air Basin into the Mojave Desert Air Basin and Salton Sea Air Basin. As part of the May 1996 action, the Board also added the San Gorgonio Pass area to the South Coast Air Basin. These changes became effective on September 19, 1996, and are reflected in Figure 8.

Figure 8-Air Basins and Counties in California

Existing Conditions

Project Location and Existing Air Quality

The Salt project area is located approximately 10 miles south of Hayfork, California which is located in Trinity County. Trinity County is a large remote county located in Northeastern California. The geography is rugged with heavily forested mountains.

The project vicinity is primarily forested federal and private lands. The Project lies in the North Coast Air Basin and is managed by the North Coast Unified Air Quality Management District (NCAQMD), which consists of Del Norte, Humboldt, and Trinity counties. The following is from the NCAQMD

According to NCAQMD website (www.ncuaqmd.org) the ambient air in portions of the NCAQMD exceeds the State PM_{10} standard during many of the winter months. Trinity County is identified as attainment for PM_{10} and $PM_{2.5}$ for federal standards (See map 2 & 4}. Therefore the project is exempt from conformity determination. For state PM_{10}/$PM_{2.5}$ standards Trinity County is designated as "non-attainment" area for PM_{10}

Data (published in 2007) http://www.arb.ca.gov/app/emsinv/emssumcat.php

Table 2-2006. Estimated Daily (from Annual Average) Emissions for Trinity County (tons/day)

Emissions	TOG	ROG	CO	NOX	SOX	PM	PM_{10}	$PM_{2.5}$
Stationary Sources								
Fuel Combustion	0.0	0.0	0.0	0.0	-	-	-	-
Waste Disposal	1.7	0.0	-	-	-	-	-	-
Cleaning and Surface Coatings	0.0	0.0	-	-	-	-	-	-
Petroleum Production and Marketing	0.0	0.0	-	-	-	-	-	-
Industrial Processes	0.0	0.0	0.3	0.0	0.0	0.1	0.1	0.0
Total Stationary Sources	**1.7**	**0.1**	**0.3**	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**
Area-Wide Sources								
Solvent Evaporation	0.7	0.7	-	-	-	-	-	-
Miscellaneous Processes	4.0	1.6	41.3	0.1	0.0	27.3	17.2	4.2
Total Area-Wide Sources	**4.7**	**2.3**	**41.3**	**0.1**	**0.0**	**27.3**	**17.2**	**4.2**
Mobile Sources								
On-Road Motor Vehicles	1.1	1.1	9.4	2.7	0.0	0.1	0.1	0.1
Other Mobile Sources	1.4	1.3	4.3	0.5	0.0	0.1	0.1	0.1
Total Mobile Sources	**2.5**	**2.4**	**13.7**	**3.2**	**0.0**	**0.2**	**0.2**	**0.2**
Natural (Non-Anthropogenic) Sources								
Natural Sources	143.9	119.2	198.1	6.9	2.1	21.4	20.6	17.5
Total Natural (Non-Anthropogenic) Sources	**143.9**	**119.2**	**198.1**	**6.9**	**2.1**	**21.4**	**20.6**	**17.5**
Grand Total for Trinity	**153.1**	**124.0**	**253.5**	**10.2**	**2.2**	**49.0**	**38.1**	**21.8**

In Trinity County, PM_{10} generally comes from motor vehicles, wood burning stoves, dust from construction and logging operations, wildfires and slash burning. Trinity County is in "attainment" status for ozone, a product of volatile organic compounds or nitrogen oxides; and is considered "unclassified" for CO.

Table 3-Additional Breakdown of Table 2- 2006

Emissions	TOG	ROG	CO	NOX	SOX	PM	PM_{10}	$PM_{2.5}$
Industrial Processes								
Food and Agricultural	0.0	0.0	-	-	-	-	-	-
Mineral Processes	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Wood and Paper	0.03	0.02	0.27	0.01	-	0.07	0.05	0.03
Total Industrial Processes	**0.03**	**0.02**	**0.27**	**0.01**	**0.00**	**0.14**	**0.08**	**0.04**
Miscellaneous Processes								
Residential Fuel Combustion	0.87	0.38	5024	0.09	0.02	0.87	0.82	0.79
Farming Operations	1.14	0.09	-	-	-	0.01	0.00	0.00
Construction and Demolition	-	-	-	-	-	0.07	0.03	0.00
Paved Road Dust	-	-	-	-	-	0.78	0.36	0.05
Unpaved Road Dust	-	-	-	-	-	22.88	13.60	1.36
Fugitive Windblown Dust	-	-	-	-	-	0.41	0.24	0.03
Fires	-	-	0.00	-	-	-	-	-
Managed Burning and Disposal	2.01	1.14	36.08	0.01	0.00	2.24	2.15	1.91
Cooking	0.00	0.00	-	-	-	0.01	0.01	0.00
Total Miscellaneous Processes	**4.02**	**1.61**	**41.33**	**0.09**	**0.02**	**27.27**	**17.21**	**4.15**
Total On-Road Motor Vehicles	**1.14**	**1.06**	**9.40**	**2.71**	**0.02**	**0.01**	**0.01**	**0.09**
Other Mobile Sources								
Trains	0.00	0.00	0.01	0.05	0.00	0.00	0.00	0.00
Recreational Boats	1.08	1.01	2.73	0.12	0.00	0.09	0.08	0.06
Off-Road Recreational Vehicles	0.19	0.17	0.62	0.01	-	0.00	0.00	0.00
Off-Road Equipment	0.13	0.11	0.86	0.24	0.00	0.02	0.02	0.01
Farm Equipment	0.02	0.02	0.11	0.10	0.00	0.01	0.01	0.01
Fuel Storage and Handling	0.01	0.01	-	-	-	-	-	-
Total Other Mobile Sources	**1.44**	**1.33**	**4.34**	**0.52**	**0.00**	**0.12**	**0.11**	**0.09**
Total Mobile Sources	**2.58**	**2.39**	**13.73**	**3.23**	**0.02**	**0.23**	**0.22**	**0.18**
Natural Non-Anthropogenic Sources								
Biogenic Sources	122.15	117.63	-	-	-	-	-	-
Wildfires	21.79	1.55	198.12	6.90	2.13	21.40	20.57	17.45
Total Natural Resources	143.94	119.18	198.12	6.90	2.13	21.40	20.57	17.45

The NCAQMD is required to develop and implement an air quality attainment plan with the goal of achieving and maintaining compliance with air quality standards. Specific output tables for Trinity County are available through the CARB website. Table 2 shows estimated (from annual averages) daily emissions for Trinity County in tons per day by source category.

Tables 2 and 3 show that in Trinity County Biogenic sources are the biggest contributors to the production of TOGs and ROGs. Wildfires and prescribed burns contribute the most to CO, particulates (PM_{10} and $PM_{2.5}$) and NOx. Mobile sources emit TOGs, ROGs, CO and NOx.

B. Climate

The climate is a Mediterranean subtype with warm dry summers and cool moist winters. The average minimum and maximum temperatures are 32° F and 96° F respectively. Average total precipitation is approximately 43 inches with an average snowfall of 65 inches in the surrounding mountains. Wind speeds range from 0 to 5 miles per hour on average with gusts to 10 and 20 miles per hour. The range of elevation within the project area is 2500 to 3500 feet.

Wind patterns fluctuate on a diurnal and seasonal basis. During summer months winds are generally terrain driven. Mountain-valley diurnal winds characterize the surface flow. The pattern of up slope to up canyon winds during the day and down slope, down canyon winds at night account for the pollution transport between the Sacramento Valley and the foothills and

mountains. Thus smoke produced from wildland or prescribed fires would tend to enter the valley during night and vent out by day. Winter months are often correlated with reduced venting during daytime hours. Atmospheric inversions can lead to situations of pollutants trapped in the lower elevations. Wood-burning stoves are a primary contributor to this situation.

C. Green House Gases (GHGs) and Climate Change

The temperature of the earth's atmosphere is regulated by a balance between the radiation received from the sun, the amount reflected by the earth's surface and clouds, and the amount of radiation absorbed by the earth and atmosphere. The so-called greenhouse gases, which include carbon dioxide (CO_2) and water vapor, keep the earth's surface warmer than it would be otherwise because they absorb infrared radiation from the earth and, in turn, radiate this energy back down to the surface. While these gases occur naturally in the atmosphere, there has been a rapid increase in concentrations of greenhouse gases in the earth's atmosphere from anthropogenic sources since the start of industrialization, which has caused concerns over potential changes in the global climate.

The primary anthropogenic greenhouse gases are:

- Carbon dioxide CO_2,
- Methane (CH_4),
- Nitrous oxides (N_2O), and
- Halocarbons.—CFC11,CFC12, CFC 13

A biogenic substance is a substance produced by life processes. It may be either constituents, or secretions, of plants or animals.

The atmospheric concentration of CO_2 has increased from a pre-industrial value of about 280 parts per million (ppm) to 379 ppm in 2005, which is an increase of about 35 percent. During the last 10 years, the rate of increase of CO_2 since 1980 was about 1.9 ppm (0.5%) per year. Most of the anthropogenic CO_2 emissions are primarily attributed to fossil fuel burning, with land-use changes, especially deforestation, providing another significant contribution (Intergovernmental Panel on Climate Change [IPCC], 2007). The level of CO_2 in the atmosphere is determined by a complex cycle that involves the exchange of carbon between the atmosphere, the biosphere and the oceans. It is estimated that the oceans and terrestrial biota absorb about half of all CO_2 emissions, while the rest accumulates in the atmosphere (IPCC, 2001a).

"..There are two aspects of global climate change that needs consideration:

(1) The potential for actions to influence global climatic change (increased emissions or sinks of greenhouse gases) and

(2) The potential for global climatic change to affect actions.

i.e. to what extent the project activities (both continuing and proposed) contribute, directly or indirectly, to the emission of greenhouse gases and thus to global climate change and to what extent the activities will be affected by the consequences of climate change.

D. Class l Wilderness Areas

The nearest Class I Area is Yolla Bolly-Middle Eel Wilderness which is approximately 10 air miles south of the proposed Salt project. The Marble Mountain Wilderness (also a Class 1 Area) is located approximately 90 miles northwest of the project area. The Trinity Alps Wilderness (a

Class II Wilderness Area) is located approximately 35 miles north of the project area. The EPA and CARB approved IMPROVE (Interagency Monitoring of Protected Visual Environment). A IMPROVE site managed by the forest service is located near Trinity helipad base. Figure 9 shows the monitoring site location. The collected samples are analyzed for PM_{10}, $PM_{2.5}$, SO4, NO3, Organic Carbon, Elemental carbon, dust and soot. The data will help identify sources that generate pollutants for visibility degradation. The data will be used in the development of the visibility SIP by the state and then showing progress towards achieving visibility goals.

Figure 9-Trinity IMPROVE Monitoring sites (red arrows) representing the Marble Mountain and Yolla Bolly Areas

Trinity monitoring station is located at clear-cut area on ridgeline at 1014 meters (approximate top of Central Valley inversion layer). The area is forested with no significant anthropogenic sources nearby, except helipad about 5 miles from recreational lake.

Transport of aerosols probably occurs from north along Willamette Valley and Pacific, east from Northeast Plateau, southeast from Sacramento Valley. Route 299 corridor along Trinity-Klamath Rivers allows oceanic-interior transport.

According to CARB (2008), long-range Sulfate transport is substantial. Out-of-state contributions to total sulfate concentration on worst days is almost 6 times that from California and approximately 5 times California's on best days.

Analysis of data 2001 to 2004 for worst and best visibility days are shown in the figure below as a pie chart. Deciview or total extinction rises slightly in warmer months, but, worst days occur as spikes throughout the year. Organic matter carbon (OMC) is the overwhelming cause of worst haze days followed by sulfate and nitrate. Average Sulfate concentration on worst days is twice that of best days. The ammonium sulfate particles are very efficient at scattering light and visibility impairment. Nitrate is occasional cause of a winter haze day. Coarse mass and fine soils contribute extremely small amounts to total extinction.

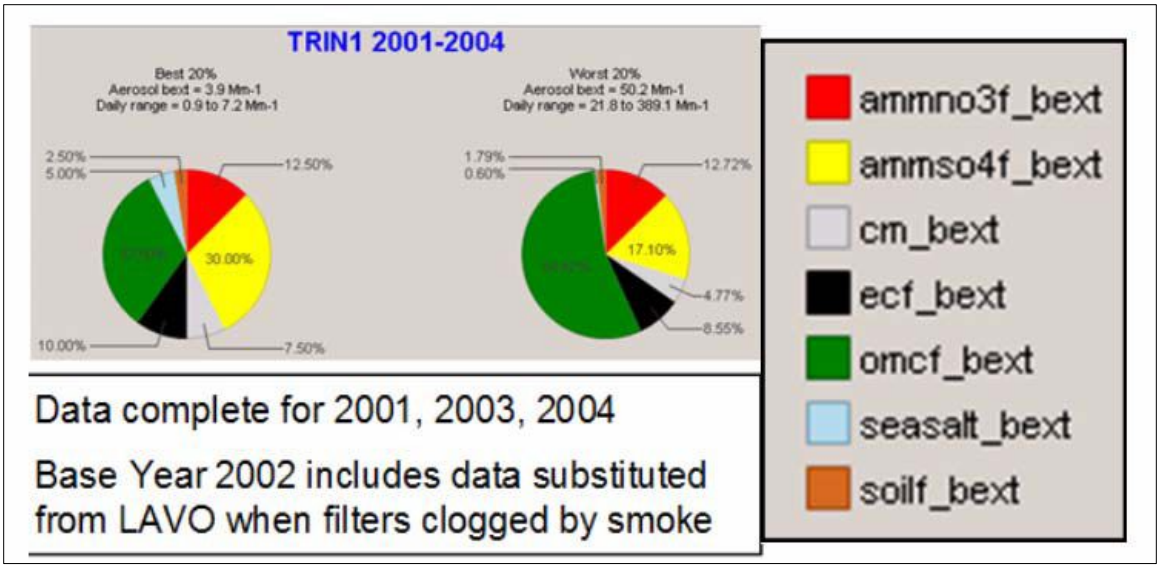

Figure 10-Analysis data for best and worst visibility days, 2001-2004

Most improvement is expected from nitrate reductions from mobile sources as CARB regulations are implemented. Some improvements may occur from residential wood smoke curtailment in localized areas and application of emission reduction techniques (ERTs) to prescribed burns. Smoldering emissions can cause big problems near a highway. During night, smoldering emissions can follow drainages and can accumulate in low lying areas or communities. Biomass removal and timber harvest reduce forest fuel loading. This can result in less intense wildfires and reduced OMC contribution to worst visibility days. Marine shipping and other long-range transport sources affect SOx contributions but are “uncontrollable” by California.

Under air quality regulations prescribed burning is usually considered a temporary, intermittent source of air pollution and therefore is not subject to the same visibility requirements as a major PSD source. Besides causing visibility impairment, smoke can also create a nuisance and generate numerous complaints from the public. Burns are allowed only on declared “Burn days.” Burn-day determination is based on metrological conditions that tend to disperse the smoke. The burning on worst visibility days and best visibility days would be avoided. The burns will be conducted when the prevailing wind direction is away from Class I area. Public education and information release are part of the prescribed burning procedures and will be followed. The forest will follow North Coast AQMD’s SMP in order to avoid creating a nuisance, visibility impairment or impacts to public health.

Environmental Consequences

Alternatives

Alternative 1 No Action

Direct and Indirect Effects of the No Action Alternative

Under this alternative, no treatments would occur, and there would be no anthropogenic emission contribution for air quality degradation. This will lead to increased accumulation of ground fuel leading to increased high intensity wildfires in future.

One objective of the project is to prevent the occurrence of large uncontrolled wildfires. Wildfires present a risk to the public health and result in damage to both the environment and property. Wildfires are known to result in high levels of emissions including GHGs and associated NAAQS violation and worst visibility. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems.

Cumulative Effects of the No Action Alternative

Past, present, and reasonably foreseeable activities were reviewed to determine cumulative effects to air quality. Because impacts to air quality in regards to smoke from past wildfires and prescribed fire activities are short-lived, past activities do not contribute to cumulative effects. Past activities do influence the amount of available material, which would be available for consumption in the event of a future wildfire.

Presently and within the future gaseous pollutants and airborne particulate matter would continue to be present. Primary emissions sources contributing would include wood burning stoves, motor vehicle exhaust, emissions from recreational campfires, emission associated with development of private lands, prescribed fire, fugitive dust, and wildfires within or adjacent to the project area. Burning associated with foreseeable actions, as well as adjacent agencies outside of the area can be expected, and would have short term effects.

Future wildfire frequency is expected to continue as it has been observed in the past. The effects from past prescribed and wildfires activities are no longer a concern because smoke impacts are short-term in nature and are only a concern while smoke is being produced and soon thereafter. However, if an unwanted wildfire occurs in the future these effects could lead to negative cumulative effects. These negative cumulative effects are dependant upon the size and intensity of the unwanted wildfire. Visibility impairment and hazardous health impacts, due to sudden and dramatic releases, are likely with a large unwanted wildfire event. These events may temporarily reduce visibility and air quality. These events lead to production of high amounts of GHGs and reduced carbon sequestration from the burnt area for next few years following the fires. The cumulative effects are unknown, because the intensity and size of a wildfire is unknown. Research has indicated that Wildfires can produce nearly twice the amount of smoke as prescribed fire … (General Technical Report PNW-GTR-355).

One objective of the project is to prevent the occurrence of large uncontrolled wildfires. Wildfires present a risk to the public and result in damage to both the environment (e.g., increased erosion, air quality degradation) and property. Wildfires are known to result in high levels of emissions and associated air quality problems. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems.

Alternatives 2, & 3 (action alternatives)

Direct and Indirect Effects (Air Quality)

a. **Vehicular Fugitive Dust**: Logging operations will produce some dust, primarily from tractor skidding of log bundles and hauling over earth surface roads. Dust from hauling will be minimized by requiring abatement with either water or an acceptable alternative. Logging operations are generally done over several years and localized dust from skidding and hauling dissipates rapidly.

b. **Mobile Equipment**: Tables 3 and 4 show exhaust emissions (tons) expected from logging equipment, pickup trucks, water trucks, chipper engines and transport vehicles for alternatives 2

and 3. Primary emissions generated from the mobile sources include emissions from engines during idle and operation mode.

Table 4. Emission Production from Equipment used for Timber Sale under Alt 2

Emission Production from Equipment Alternative 2					
Equipment Used					
	Total Hours	**CO**	**Nox**	**VOCs**	**PM_{10}**
Log and Chip Hauling					
Log truck	353	0.63	0.23	0.03	0.02
water Tender	78	0.07	0.16	0.01	0.02
loader	353	0.10	0.33	0.04	0.03
Road Work					
Dozer	59	0.01	0.05	0.00	0.00
Grader	59	0.01	0.04	0.00	0.00
On Site treatment					
chainsaw	470	0.00	0.00	0.00	0.00
Tractor logging, Yarding					
Skidder	353	0.63	0.23	0.03	0.01
Yarder	353	0.63	0.23	0.03	0.01
Total for Alt 2		2.09	1.26	0.17	0.11

2 U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-355, October 1995, in cooperation with: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. General Technical Report PNW-GTR-355

Alternative 2 generates higher amounts of CO, NOx, VOCs and PM_{10} than alternative 3. The emissions shown in the tables are over the life of timber sale. If the timber sale lasts three to five years then annual emissions will be 3 to 5 times less than shown in the tables. For comparison with Trinity County Daily Emissions (Table 2) these emissions will have to be divided by 1095. The result will be 0.00 in every case. Therefore, the pollutants correlated with equipment emissions associated with this project are estimated to be almost negligible and insignificant.

Table 5. Emission Production from Equipment used for Timber Sale under Alt 3

Emission Production from Equipment Alternative 3					
Equipment Used					
	Total Hours	**CO**	**Nox**	**VOCs**	**PM_{10}**
Log and Chip Hauling					
Log truck	130	0.23	0.08	0.01	0.01
water Tender	29	0.03	0.06	0.00	0.01
loader	130	0.04	0.12	0.02	0.01
Road Work	0	0.00	0.00	0.00	0.00
Dozer	22	0.00	0.02	0.00	0.00
Grader	22	0.00	0.01	0.00	0.00
On Site treatment	0	0.00	0.00	0.00	0.00
chainsaw	173	0.00	0.00	0.00	0.00
Tractor logging, Yarding	0	0.00	0.00	0.00	0.00
Skidder	130	0.23	0.08	0.01	0.01
Yarder	130	0.23	0.08	0.01	0.01
Total for Alt 3		**0.77**	**0.46**	**0.06**	**0.04**

Vegetation Combustion: The action alternatives would produce smoke from burning activities. Table 6 shows emissions under alternative 2 and 3. Smoke from the proposed project is expected to remain in the area for about one to two days each time burning occurs. Permissive burn days are determined by the North Coast Unified Air Quality Management District. The burning of slash piles, concentrations, and prescribed burning will produce smoke and ash from partially burned plant matter. This burning of organic matter will produce emission of particulates suspended in the atmosphere for one to several days. An estimated 169 tons (alt. 2) and 156 tons (alt. 3) of particulate matter (PM_{10}) would be produced from prescribed burning activities in the Salt project area. The tables also show emissions (in tons) of $PM_{2.5}$, NOx, CO, CO_2, CH_4 and NMHC (non-methane hydrocarbons) from burning activities.

NOx and VOCs (precursors of ozone) emissions are below the minimum even for non-attainment area under both alternatives. In addition, the burns are generally conducted under low temperatures and high humidity (a situation not conducive for ozone formation). The project area is in attainment for all criteria pollutants for federal standards so no Conformity determination is required.

Table 6. Emissions (in tons) from prescribed burning under Alternative 2

Emissions (in tons) from prescribed burning under Alternative 2 and 3								
	Acres	**PM_{10}**	**$PM_{2.5}$**	**NOx**	**CO**	**CO_2**	**CH_4**	**NMHC**
Alternative 2	1138	169.0	160.0	43.0	2283.0	22555.0	82.0	52.0
Alternative 3	1077	156.0	148.0	40.0	2119.0	20936.0	76.0	48.0

Under Title 17 burns must be authorized by the APCD/AQMD on the day of the burn. The California and Nevada Smoke and Air Consortium (CANSAC) has an MOU with the Desert Research Institute (DRI University of Nevada, Reno) to run MM5 and BlueSky models to predict smoke dispersion and $PM_{2.5}$ concentrations from prescribed fires and wildfire. The model will

help local regulators to avoid situations that can lead to NAAQS violation. The model is operational now but will be fully refined by the time the Salt project is implemented.

The action alternatives will reduce the overall fuel loading on approximately 1619 acres for alternative 2 and 1415 acres for alternative 3, treated by various prescriptions. This will decrease the expected emissions from a wildland fire if it occurs in the project area.

Action Alternatives Cumulative Effects (Air Quality)

Within the Fire and Fuels cumulative effects analysis area, there has been pile burning over the past ten years. There has also been an un-estimated amount of burning on private lands within this area. Compliance with burn day designations and permits from the North Coast Unified Air Quality District has minimized the effects of burning so that Federal and State air quality standards have not been exceeded.

The Salt Project fuels treatments will not occur until harvesting is completed, which could be four to six years from now. In that time the average number of acres of underburning should be about the same as the current ten year average.

The North Coast Air Quality Management District regulates permissible burn days for prescribed fire use within their district. A Smoke Management Plan (contained in all prescribed burn plans) must be submitted and approved by the NCAQMD prior to using prescribed fire on federal lands. Overall cumulative emissions are expected to be similar to the past years and are not expected to exceed Federal or State air quality standards.

The improved wildfire suppression characteristics created by prescribed burning and thinning should lead to a reduction in size and intensity of wildfires in the treated areas. In the long term, the emissions from wildfires are expected to be reduced as a result of reduced fuel loading.

The summary of other management actions considered in the evaluation of cumulative effects within the Salt Project Area is displayed in the Salt DEIS. Past, present and foreseeable projects have been listed and potential for air quality impacts indicated. Management actions include timber harvest activities, road work (construction and decommissioning), mining activities, prescribed burns and wildfires. Overall cumulative emissions are expected to be similar to the past years and are not expected to exceed Federal or State air quality standards.

Mitigation Measures (Air Quality)

Mitigations for PM_{10}/ $PM_{2.5}$ include:

1) Reduction of Fuels Loading - Pretreatment methods will be used to minimize smoke emissions and/or reduce fuel loadings, such as biomass removal, and public firewood utilization opportunities.

2) Fuel Moisture Content - Burning when piles are dry increases the combustion efficiency and therefore reduces the emissions from the burn. The burn prescription shall specify an acceptable range of fuel moisture contents for the burn to proceed. Allow for adequate cure time before igniting slash material, and cover hand-piled slash where necessary for more efficient burning conditions.

3) Smoke Management - A Smoke Management Plan (contained in all prescribed fire plans) must be submitted and approved by the NCAQMD prior to using prescribed fire on federal lands. As part of the Smoke Management Plan the Forest Service must provide a detailed meteorological

prescription that must be met prior to igniting a prescribed burn. At a minimum the prescription must include acceptable wind direction. Other considerations include wind speed, temperature profile, winds aloft, humidity, temperature, actual and predicted inversions, burn day status and forecast, precipitation forecast, and any other meteorological conditions which may effect smoke dispersion and/or the fire behavior.

The Smoke Management Plan also has to contain actions the Forest Service will take if smoke from burning unexpectedly impacts smoke sensitive areas, including the ability to extinguishing the fire with equipment on hand. Smoke sensitive areas include any towns and or major roads within a 5 mile radius that could be impacted by smoke from the burn project. If the project exceeds one hundred acres a map showing sensitive areas within a radius of twenty miles from the burn site and the expected direction of smoke travel is required as part of the prescribed fire plan

4) Burn Plan - All burning on Forest Service managed land must have an approved prescribed fire plan prior to any ignitions. Burning activities will be coordinated with affected landowners and control agencies. In addition to a management approved prescribed fire plan (which contains a smoke management plan) the unit has to submit a written request to the North Coast Unified Air Quality Management District and receive their permission prior to all burning. Smoke production and emissions are within State and local government guidelines, are of short duration (a few days), and will not adversely effect the Class I Air Sheds.

5) Fugitive Dust - Driving speeds on native surface roads are not expected to exceed 15 mph. This speed control is accepted fugitive dust mitigation. Native surfaced roadways will be watered to suppress dust when needed.

When logs are being transported from sale area all dirt based roads are required to be watered, by the timber sale purchaser, to abate dust that would be created by the increased road usage. Dust generated and the resultant particulate matter (PM_{10}) is directly related to vehicle miles traveled on un-surfaced roads in the project area. It can also be attributed to tractor work on harvest units. If agreed upon, a temporary road surface material especially made for dust reduction maybe applied to the roads instead of water. A Forest Service Timber Sale Administrator oversees all such operations, ensuring their implementation to contract specified requirements.

Mitigation Measures (GHGs emissions reduction and CO_2 sequestration)

Analyses of the impacts of such emissions or sinks at the project level are too low to provide meaningful information to translate the information into climate change. Efforts would be spent that lead to reduced GHG emissions or increased sinks of these gases.

Any mitigation measure outlined above that result in reduced fuel combustion will also release less GHGs. Any above measure that leads to production of greater biomass will result in greater carbon sequestration.

Some of the mitigation measures/strategies that the agency is heading towards include the following:

- Reducing Overstocking- Forest thinning leads to reduced fuels and lowers risks of catastrophic wildfires, insect and disease. The healthy forest acts better CO_2 sink.
- Encouraging species mixes that can act better sink and tolerant to environmental factors like higher temperatures, droughts.

- Encouraging environmentally sound human use through public outreach and other incentives –
- Restoring degraded ecosystems
- Implementing Emission Reduction Techniques that generate less emissions and create better CO_2 sink
- Applying non-burning alternatives for fuel reduction where ever possible
- Developing/manufacturing/transferring waste/dead wood into other useable form that has longer life for carbon sequestration.

Forest Plan Consistency

Shasta Trinity Land and Resource Management Plan

AIR QUALITY (Forest Plan 3-5): The Forests are in compliance with all national ambient air quality standards. However, like most air basins in the State, those within the Forests exceed the California ambient air quality standard for PM- IO (particulates less than IO microns in size). Primary sources for PM-IO are burning and dust generating activities. Less prescribed burning would be emphasized in the future in order to maintain soil quality and habitat diversity. There would be more emphasis on better utilization of excess slash for biomass and firewood. Therefore, emissions would be reduced and air quality would be better. Since no major industries are planned, other dominant pollutants would not be a problem.

(Forest Plan item 3. BIOMASS 3-7) The opportunity exists to increase biomass supplies for electricity without impairing the availability of firewood. The removal and use of excess biomass can produce related benefits including reduced loss from wildfires, improved air quality, improved land productivity, increased wildlife and range browse, and added employment. The ecological role of biomass in the forest environment must be considered in conjunction with its removal and use.

Chapter 4 – Management Direction Air Quality (page 4-4)

I. Maintain air quality to meet or exceed applicable standards and regulations.

Standards and Guidelines Developed, Through the Forest Planning Process, that Apply Forest-wide

1. AIR QUALITY (Chapter 4 - Standards and Guidelines)

a. Protect air quality while achieving land and resource management goals and objectives, Base line levels will be established, and available technology will be used to predict and monitor changes. Activities such as burning, which are under the Forests' control, will be coordinated with affected landowners and control agencies.

b. Identify, assess, and monitor significant air quality related values (AQRV) and sensitive indicators of those values in the Yolla Bolly-Middle Eel Wilderness in cooperation with the Mendocino National Forest.

c. Establish and maintain close coordination with Federal, State, and local officials in the research and application of new air quality standards particularly in relation to smoke and dust management.

d. Incorporate smoke management controls into the development of prescribed burn plans, and coordinate with local authorities.

Acronyms

• PM or PMT or TSP: Total suspended particulate matter: On this web site, PM and PMT actually refer to TSP (total suspended particulate matter)

• PM_{10}: Particulate matter less than 10 microns.

• $PM_{2.5}$: Particulate matter less than 2.5 microns.

• ROG: Reactive organic gases: Compounds of carbon, excluding: Carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, and the list of excluded compounds that can be found on the ROG definitions page, on this web site.

• TOG: Total organic gases: Compounds of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate.

• NO_2, NOx nitrogen dioxide, nitrogen oxides

• SO_2, SOx sulfur dioxide, sulfur oxides

• CO carbon monoxide

• CO_2 carbon dioxide

• Pb lead

• VOCs volatile organic compounds

Appendix A: Forest Carbon

Each of the action alternatives will remove biomass as a result of timber harvest and prescribed burning. This will reduce the amount of carbon stored in the treated stands. A portion of the carbon removed will remain stored for a period of time in wood products.

The regeneration harvest with green tree retention and shelterwood with green tree retention will substantially reduce existing carbon stocks. The harvest of live trees, combined with the likely increase in down, dead wood will temporarily convert stands from a carbon sink that removes more carbon from the atmosphere than it emits to a carbon source that emits more carbon through respiration than it absorbs. These stands will remain a source of carbon to the atmosphere until carbon uptake by new trees exceeds the emissions from decomposing dead organic material. The stands will likely remain a carbon source for several years, and perhaps for more than a decade, depending on the amount of dead biomass left on site, the length of time before new trees become reestablished, and their rate of growth once reestablished. As the stands continue to develop, the strength of the carbon sink will increase until peaking at an intermediate age and then gradually decline but remain positive. Similarly, once new trees are established, carbon stocks will accumulate rapidly for several decades. The rate of accumulation will slow as the stands age. Carbon stocks will continue to accumulate, although at a declining rate, until impacted by future disturbances.

Recent scientific literature confirms this general pattern of changes in net ecosystem productivity (NEP) and carbon stocks over the period of forest stand development. Law et al. (2003) evaluated changes in carbon storage and fluxes for Ponderosa pine stands in central Oregon. Their evaluation concluded that NEP is lowest and negative (carbon source) in young stands (9 – 23 years), moderate in young stands (56 – 89 years), highest in mature stands (95-106 years), and low in old stands (190-360 years). Most mature and old stands remained a net sink of carbon. Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon stocks and carbon fluxes for boreal, temperate, and tropical biomes. They found that in temperate forests NEP is lowest, and most variable, in young stands (0-30 years), highest in stands 31-70 years, and declines thereafter as stands age. These studies also reveal a general pattern of total carbon stocks declining after disturbance and then increasing, rapidly during intermediate years and then at a declining rate, over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease or other causes) kills large numbers of trees and again converts the stands to a carbon source where carbon emissions from decay of dead biomass exceeds that amount of carbon removed from the atmosphere by photosynthesis within the stand. Over the long-term (centuries) net carbon storage is often zero, if stands regenerate, because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

The intermediate thinning actions in both action alternatives will have similar effects on carbon fluxes and storage. However, the initial reduction in aboveground biomass will be less than the reductions with shelterwood with green tree retention and regeneration with green tree retention units. Commercial thinning will reduce the strength of the current carbon sink of these stands, but it is not clear whether commercial thinning activities will convert the treated stands from a carbon sink to a carbon source. Future prescribed burning and thinning will continue to maintain carbon stocks and NEP at a lower level than would occur if the stands were permitted to develop higher tree densities. Although commercial thinning will reduce standing carbon stocks, compared to the no action alternative, these treatments will reduce the amount of carbon likely to be released to the atmosphere due to insect, disease and fire disturbance (Finkral and Evans 2008).

By increasing the probability that large, fire and insect resistant trees will persist over time, commercial thinning of stands may sustain large carbon stocks and positive NEP over a longer time period than stands more prone to high severity fire and other disturbances (Canadell et al. 2007; Fellows and Goulden 2008). Krankina and Harmon (2007) observe that "higher carbon stores on land might mean the risk of higher future carbon emissions as the changing climate is expected to cause a higher rate of forest disturbance." They suggest several general measures that can increase the stability of forests in changing environments and reduce the risk of losses of carbon. These recommended measures include: (1) selecting for species with relatively high resistance to drought, fire, insects, and pathogens; and (2) reducing fuel loads through thinning to improve stand resilience. The action alternatives in the proposal are consistent with these recommendations for protecting carbon gains against the potential impacts of future climate change.

The impacts of the action alternatives on global carbon sequestration and atmospheric concentrations of CO_2 are miniscule. However, the forests of the United States significantly reduce atmospheric concentrations of CO_2 resulting from fossil fuel emissions. The forest and wood products of the United States currently sequester approximately 200 teragrams of carbon per year (Heath and Smith, 2004). This rate of carbon sequestration offsets approximately 10% of CO_2 emissions from burning fossil fuels (Birdsey et al., 2006). U.S. Forests currently contain 66,600 teragrams of carbon. The short-term reduction in carbon stocks and sequestration rates resulting from the proposed project are imperceptibly small on global and national scales, as are the potential long-term benefits.

The currently large carbon sink in U.S. forests is a result of past land use changes, including the re-growth of forests on large areas of the eastern U.S. harvested in the 19th century, and 20th century fire suppression in the western U.S. (Birdsey et al. 2006). The continuation of this large carbon sink is uncertain because some of the processes promoting the current sink are likely to decline and projected increases in disturbance rates such as fire and large-scale insect mortality may release a significant fraction of existing carbon stocks (Pacala et al. 2008; Canadell et al. 2007). Management actions - such as those proposed – that improve the resilience of forests to climate-induced increases in frequency and intensity of disturbances such as fire, and utilize harvested trees for long-lived forest products and renewable energy sources may help sustain the current strength of the carbon sink in U.S. forests (Birdsey et al. 2007).

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