PHYSICAL ENVIRONMENT

Air Quality

The SNF Travel Management project is intended to designate routes for public motor vehicle use for the SNF, as required by the new Travel Management Regulation. The regulation requires that each National Forest or ranger district designated the roads, trails and areas on National Forest System lands that are open to motor vehicles, including off-highway vehicles (OHV).

This report contains an evaluation of how air resources will be affected by the SNF route designation. The document contains policy and direction as well as a discussion of the affected environment and existing air quality conditions. This section describes the plausible environmental consequences and the potential impacts of different alternatives. Further details are available in the project record.

Policy and Direction

Federal Laws Relevant to Travel Management Projects

Federal Clean Air Act

The Federal Clean Air Act (CAA) is the Federal law passed in 1963 and last amended in 1990, (42 U.S.C. §7401 et seq.) which is the basis for National control of air pollution. The CAA was designed to "protect and enhance" the quality of the Nation's air resources. Basic elements of the CAA include National ambient air quality standards (NAAQS) for criteria air pollutants, technology based emission control standards for hazardous air pollutants (HAPs), State attainment plans (SIPs), a comprehensive approach to reducing motor vehicle emissions, control standards and permit requirements for stationary air pollution sources, acid rain control measures, stratospheric ozone protection and enforcement provisions (California Air Resources Board [CARB], 2007).

Regional Haze Rule (1990 Clean Air Act Amendments), 40 CFR Part 51

In 1999, U.S. EPA passed the Regional Haze Rule, which calls for states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment.

General Conformity Rule (1990 Clean Air Act Amendments) (Section 176 (c) of the Clean Air Act (part 51, subpart W and part 93, subpart B.)

U.S. EPA passed the final General Conformity rule in 1993. Under the rule, Federal agencies must work with State and local governments in a non attainment or maintenance area to ensure that Federal actions conform to the initiatives established in the applicable State implementation plan (U.S. EPA 2008). A project is non-conforming if it conflicts with or delays implementation of any applicable attainment or maintenance plan. The rule divides the conformity process into two phases: applicability and determination.

State Laws Relevant to Travel Management Projects

California Clean Air Act (H&S §§ 39660 et seq.)

California adopted the California Clean Air Act (CCAA) in 1988. The Act provides the basis for air quality planning and regulation in California independent of Federal regulations and establishes ambient air quality standards for the same criteria pollutants as the Federal clean air legislation (CARB 2007a). Under the Federal CAA, States can adopt air quality standards that are more stringent than the Federal NAAQS. California has chosen to adopt standards for criteria pollutants that are generally more restrictive than the Federal standards. The California Air Resources Board (CARB) is the agency responsible for establishing California ambient air quality standards (CAAQS), setting vehicle emission standards and fuel specifications and regulating emissions from certain types of mobile equipment and consumer products.

Table 79. California Air Quality Standards Pertinent

Pollutant	Averaging Time	State Standards
Ozone	1-hour	0.09 ppm
	8-Hour	0.07 ppm
Respirable Particulate Matter (PM10)	24-Hour	50 µg/m3
	Annual Arithmetic Mean	20 µg/m3
Nitrogen Dioxide (NO2)	Annual Arithmetic Mean	0.030 ppm
	1-Hour	0.18 ppm
Fine Particulate Matter (PM2.5)	Annual Arithmetic Mean	12 ug/m3
Carbon Monoxide (CO)	8-Hour	9 ppm
	1-Hour	20 ppm
Sulfur Dioxide (SO2)	24-Hour	.04 ppm
	1-Hour	.25 ppm
Lead	30 Day average	1.5 µg/m3

Source: CARB 2008.

California Air Resources Board (CARB) Off-Road Recreational Vehicle Emissions Standards Rulemaking

In 1994 the CARB approved new off-highway recreational vehicle regulations (since amended in 1998). The rulemaking established emission standards for off-highway vehicles (OHVs) including off-road motorcycles (dirt bikes) and all-terrain vehicles (ATVs) (CARB 2006). OHV registration became contingent on vehicle compliance to California emissions standards. Dirt bikes and ATVs that meet emission standards are eligible for OHV Green Sticker registration and have a year round operating period, while noncompliant vehicles fall under the OHV Red Sticker program which has a limited operational season.

Local Regulations

The San Joaquin Valley Air Pollution Control District (Valley Air District) is responsible for implementing and regulating air quality programs for the Madera and Fresno county portions of the SNF. The Valley Air District regulations can be found at: http://www.valleyair.org/index.htm. The Valley Air District has set rules to limit fugitive dust emissions. However, activities conducted at elevation of 3,000 feet or higher above sea level are exempt.

The Mariposa County Air Pollution Control District (APCD) is responsible for implementing and regulating air quality programs for the Mariposa county portion of the SNF. No local regulations related to travel management on the SNF are defined by the Mariposa APCD.

Public Health

Particulate Matter, Ozone, Nitrogen oxides and natural occurring asbestos may pose a threat to human health and forest ecosystems in the SNF and Sierra Nevada. Some locations due to elevation, topography, geology may pose a greater risk than others. Discussion of possible public health concerns is discussed under each of the Pollutants of Concern listed below.

Pollutants of Concern

Some of the pollutants regulated under the National Ambient Air Quality Standards and the California Ambient Air Standards are created by motor vehicles and can cause detrimental effects to public health ecosystems. The air pollutants of concern in this area include particulate matter, ozone and nitrogen oxides and natural occurring asbestos.

The San Joaquin Valley Air Basin is in non attainment for Ozone (O3) and Particulate Matter (PM). As population and temperature increases in California and particularly in the foothills of the Sierra Nevada mountain range, concentrations of ozone, nitrogen oxides and possibly PM2.5 concentrations are expected to increase.

Particulate Matter (PM)

Particulate matter (PM) in ambient air is composed of complex mixtures of inorganic and organic substances. The mixture is made up of liquid or solid particles suspended in the air. These particles vary in origin, size and composition.

In the regulatory framework PM is divided into fine and coarse particles. Fine particles (PM2.5) are defined as particles with an aerodynamic diameter of less than 2.5 PM. Fine particles are made up of combustion particles and recondensed organic and metal vapors and contain secondarily formed aerosols from gas to particle conversion (Liu et al. 2003; Harrison et al. 2001; WHO, 2003). Coarse particles (PM10) are defined as particles with an aerodynamic diameter between 2.5-10 PM. The coarse particles are mostly composed of crust materials and dust from roads and industries (Liu et al. 2003; WHO 2003).

PM Health Effects

Short term exposure to PM has been associated with negative effects to human health. Long term exposure to PM is believed to have a much greater impact on human health, but has more uncertainty because less is known about it (Koelemeijer et al. 2006).

There is strong evidence to suggest that PM25 is more hazardous to human health than PM10 in terms of cardio pulmonary disease and mortality (WHO 2003).

Ozone

First discovered in the 1840s, O3 was shown to be toxic to animals in the 1870s and to cause crop damage in the 1940s (Caroll et al., 2003). Ozone is produced photochemically by NOx (oxides of nitrogen) and VOC (volatile organic compounds) emissions from combustion engines and biogenic emissions of reactive VOC from plants in the Sierra Nevada and coupled with strong sunlight and high temperatures (Murphy et al. 2007). High isoprene emissions occur in the foothills of the western Sierra Nevada from a dense population of oak trees, while MBO is emitted from pines at a higher elevation (Steiner et al. 2008). Ozone exposure in the SNF is higher than in the valley locations (Cisneros and Perez 2007). The increased temperature in this region caused by climate change will create more ozone. There are other factors that are important for local ozone production in the central valley, including: large-scale meteorology, mixing depths and transport of ozone formed in other areas such as San Francisco (Steiner et al. 2008).

Health Effects

According to Hayes (1993) a number of health effects have been documented or suspected to occur due to ground level O3 exposure. Some of the effects were: lung function decrements, airway hyper-reactivity, epithelial cell damage and bronchoalveolar inflammation. All are known to occur during the exposure of humans to low levels of ozone.

Effects on Forests and Ecosystems

Ozone can also affect forest health and change biodiversity (Bytnerowicz et al. 2002). In the Sierra Nevada Mountains of California atmospheric monitoring suggests that O3 concentration occurs in doses sufficient to damage pines (Bytnerowicz et al. 2002). Most of the significant injuries continue to be evident in the Sierra and Sequoia National Forests. Ozone also affects the production of foliar chlorophyll. Ozone may be toxic to vegetation at concentration greater than 30 to 40 ppb and the severity of plant damage depends on the characteristics and length of exposure as well as abiotic and biotic factors (Bytnerowicz et al. 2002).

Nitrogen oxides (NOx)

Nitrogen oxides form when fuel is burned at high temperatures and come principally from motor vehicle exhaust and stationary sources such as electric utilities and industrial boilers. Nitrogen oxides can negatively affect aquatic systems, can affect visibility and are a precursor compound to ozone and to PM2.5.

The primary releases of nitrogen compounds (oxides, ammonium and nitrates) to the air in the native regime were from microbial activity, lightning and wildfires. The historical levels have almost doubled on a global basis as a result of fossil fuel combustion, animal husbandry practices and fertilization.

Effects on Forests and Ecosystems

Nitrogen oxides in the air are a significant contributor to nitrogen deposition which causes a number of environmental effects such as acid rain and eutrophication. Eutrophication occurs when a body of water suffers an increase in nutrients that reduce the amount of oxygen in the water, producing an environment that is destructive to aquatic life. Even moderate concentrations of NOx and other Nitrogen compounds could contribute substantial amounts of deposited Nitrogen to the forests affecting their growth, species composition, surface and ground water quality (Fenn et al. 2003; Bytnerowicz and Fenn 1996; Tarnay et al. 2001).

Nitrogen dioxide (NO2)

Health Effects

Nitrogen dioxide can irritate the lungs and lower resistance to respiratory infections such as influenza.

Natural Occurring Asbestos

Asbestos is a generic term for multiple types of naturally-occurring fibrous minerals distributed throughout California. Although chrysotile is the most common form of asbestos, other types (such as amphibole) are also found in California. Chrysotile asbestos is usually found in serpentine rock and its parent material, ultramafic rock, which is located in abundance in the Sierra Nevada foothills, the Klamath Mountains and Coastal Ranges. Additionally, asbestos is commonly found near fault zones. The quantity of asbestos in serpentine and ultramafic rock ranges from less than 1 percent to about 25 percent and occasionally an even higher concentration is found.

The following types of bedrock geology in the project area may contain naturally occurring asbestos (NOA): serpentinite, ultramafic and mafic intrusions, marble and crystalline limestone, dunite and igneous intrusions with local bodies of dunite, peridotite, pyroxenite and hornblendite. Only potential NOA rock bodies intersecting routes in alternatives are described. Potential NOA regions within the spatial boundary are ultramafic to maficigneous intrusions and metamorphosed marble bodies. No serpentinite or serpentinized igneous bodies are found within the project area.

Health Effects

Asbestos fibers may be released from ultramafic and serpentine rock when the rock is broken or crushed; for example, when cars drive over unpaved roads or when land is graded for development purposes, asbestos can be released. Also, it may be released naturally through weathering and erosion. The long, thin fibers may remain airborne for as long as ten days, posing a potentially significant human exposure hazard. Ambient atmospheric concentrations of NOA vary greatly depending on proximity to a local source. Currently, there is insufficient data concerning the concentrations of NOA and its associated health risks.

Most of the scientific data on health effects of asbestos comes from occupational exposure. The challenge is that people who recreate in the forest will most likely be exposed in an episodic manner to very different concentrations of naturally occurring asbestos (NOA) depending on their activity. How and whether this very different non-occupational exposure pattern may alter disease outcomes and latency periods is partially unknown due to the uncertainty surrounding naturally occurring asbestos (NOA) and the lack of data.

Over the course of several decades, a vast body of asbestos-related research has been conducted in an attempt to characterize the mechanisms of asbestos and how they may depend upon the specific properties of different fiber types. What conclusions may be drawn from the available data remains the subject of much debate (Vu and Lai 1997). Asbestos is known to cause several forms of respiratory disease including asbestosis, mesothelioma and lung cancer (Smith and Wright 1996; Suzuki et al 2005; Stayner et al 1996). What is less clear, however, is the exposure level(s) at which asbestos poses a significant health risk. Although chronic exposure is a primary factor in the development of asbestos-related diseases and tobacco smoke clearly increases risk, it is likely that other unknown factors are involved as well, since individuals with similar exposures do not universally experience similar health effects.

Affected Environment

Most of the land in the SNF is located in the San Joaquin Valley Air Basin (SJVAB). A small portion of the SNF is located in the Mariposa County which forms part of the Mountain Counties Air Basin. The SJVAB is recognized as one the most polluted areas in the United States. Because of the current situation this area is susceptible to air pollution impacts from different sources. Currently the SJVAB is designated as a non attainment area for O_3 and PM2.5 under the National and California air quality standards. This has resulted in conservative policies that the San Joaquin Valley Air Pollution Control District uses to protect valley air quality conditions.

The San Joaquin Valley Air Basin is the second largest air basin and represents 16 percent of California’s geographic area basin delineated by the California Air Resources Board (CARB).

The population in the SJVAB is expected to reach 4.2 million by 2010, 5.3 million by 2020, 6.5 million by 2030 and 7.9 million by 2040 (California Department of Finance 2007).

Intercontinental Transport

Significant amount of the Asian aerosols were observed at high elevation mountain location sites in the western United States which includes a site in the SNF (VanCuren and Cahill 2002; VanCuren 2003; Liu et al. 2003). This an important factor because it constitutes about 10 percent for PM10 and about 9 percent for PM2.5 of ambient air quality standards adopted in California.

Ozone in air arriving from Asia during the spring time (spring time is the season of strongest transport of Asian emissions) has increased by 10 ppbv or 30 percent since the 1980s (Jaffe et al. 2003).

The Asian dust has a big impact on air quality on high elevation sampling sites in the western United States (Liu et al. 2003).

Existing Condition

Currently part of the SNF is located in a area designated as a non attainment for ozone and PM2.5 under the National and California air quality standards. The San Joaquin Valley Air Pollution Control District (SJVAPCD) and the Mariposa County Air Pollution Control District (APCD) oversee the regulation of air quality in the SNF land. The small portion of the SNF that is currently under attainment is the north part of the forest which is located in the Mariposa County and regulated by the Mariposa County APCD. Fresno, Madera and Mariposa counties are within the Federal non-attainment area for ozone 8 hour. Fresno and Madera counties are within the Federal non-attainment area for pm2.5.

Not much is known about natural occurring asbestos (NOA) air concentrations in this area.

Environmental Consequences

Impacts to Air Quality

The effects of the alternatives are analyzed to determine the potential for public motor vehicle travel to cause or contribute to violations of National Ambient Air Quality standards (NAAQs), degrade air quality, affect Class I areas or to cause or contribute to visibility impairment beyond the existing conditions. Air quality impacts would be considered significant if they are expected to cause or contribute to an air quality violation in a nonattainment or maintenance area. However, if total direct and indirect project emissions fall below designated Applicability threshold levels established under the Conformity Rule, no adverse change in attainment status is expected.

Effects Common to All Alternatives

Motor vehicles (including off-highway vehicles) emit criteria pollutants such as nitrogen oxides, sulfur oxides, carbon monoxide and volatile organic compounds (VOCs) (Ouren et al. 2007). Both NOx and VOCs are the precursors for the nonattainment pollutant O3. Motor vehicle exhaust and travel on unpaved roads and trails emits particulate matter. Inhalable coarse particles (PM10) are emitted directly from the source; such as soot from engine exhaust, windblown dusts from bare soil and reentrained dust from vehicle travel on unpaved roads. Fine particles (PM2.5) are associated with the products of engine exhaust including the reaction of NOx with ammonia and diesel soot. Inhalable particulate matter poses a serious health hazard, since it can be deposited in the lungs and can cause permanent damage by interfering with the body’s mechanism for clearing the respiratory tract or by acting as a carrier of a toxic substance. Dust from motor vehicle us on unpaved surfaces can directly reduce plant photosynthesis near roads and trails by coating needles and leaves (Ouren et al. 2007). PM2.5 is one of the major causes of reduced visibility in the southern Sierra Nevada, including in National Forest Class I wilderness areas (EPA 2007).

Both the no action and the action alternatives will release PM10/PM2.5 into the environment from motor vehicle travel on NFTS roads and trails and from road and trail system maintenance projects. Tailpipe emissions from motorized equipment will produce criteria pollutants such as carbon monoxide, as well as the precursor gases for ozone and PM2.5.

Alternatives

Direct and Indirect Effects

The number of vehicle miles traveled annually by forest users is not expected to change in any of the alternatives through the prohibition of cross-country travel and the redirection of motor vehicle use onto a designated system of roads, trails and areas. As a result, effects that would cause or significantly contribute to air quality impairment beyond the existing conditions are not anticipated for any of the alternatives. Based on the 2002 and 2007 National Visitor Use Monitoring report (USDA-FS 2008), use data suggests that the number of total motor vehicle visits to the forest has decreased and is expected to stay the same or decrease even with the increase in population.

A summary of how proposed additions to the NFTS for Alternatives 2, 3, 4 and 5 is listed below in Table 80. Some of the miles added will have planned maintenance work. Under Alternative 1, 660,000 acres of SNF lands would remain open to motorized cross-country travel. Accessible road and trail miles will increase under Alternative 2, 4 and 5; no additional miles of NFTS would be made available in Alternative 3.

No new visits per year are projected under each of the action alternatives. Thus it will not affect the number of vehicle miles traveled (VMT) annually within the study area.

Table 80. Proposed Additional NFTS Miles per Alternative

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Additional miles (roads and trails) available for motorized use	46	0	51	85

Criteria pollutant emissions from recreational vehicle use (which includes both engine exhaust and fugitive dust) are expected to stay the same for all action alternatives.

Maintenance activities will include road and trailbed work using heavy equipment and fencing or blocking of some unauthorized routes. The use of heavy equipment and worker vehicles will produce exhaust emissions, while travel on unpaved roads will produce fugitive dust. Insignificant increases in short term, localized emissions will occur under each action alternative for maintenance activities.

Cumulative Effects

Potential cumulative impacts of the proposed project in conjunction with other past, present or reasonably foreseeable probable actions are the focus of this section. The actions analyzed for potential cumulative impacts include activities listed in Appendix E. The project is expected to have limited cumulative impacts to air quality. Road and trail maintenance will create small localized, temporary increases in fugitive dust and emissions from motorized equipment. Overall, Alternatives 1 through 5 will not impact air quality since the implementation of any alternative will not change the amount of vehicle miles traveled.

Impacts to Public Health from Natural Occurring Asbestos

Most of the proposed motorized trails and all of the use areas are located in granitic rocks that are not known to have NOA.

The minerals resource data system (MRDS) is a USGS location database of active and historic mine claims. Two asbestos occurrences were found within the SNF administration boundary, the Ralph Hill asbestos mine and a reported occurrence (USGS 2005). The reported occurrence is located in the Kaiser Peak quadrangle at 37.318 N and 119.1728 W near Sample Meadow Campground. The reported occurrence is 2.3km from one route in alternative 1: TH-06z. The Ralph Hill mine is located beyond the SNF boundary in the Trimmer quadrangle at 36.8961 N and 119.1519 W near Lakeview campground and Secata ridge in an undifferentiated metasedimentary (ms) unit. Unauthorized route ZZ-25 in Alternative 5 is located approximately 4.8 km from the Ralph Hill mine. The mine is outside of the project area; however, route ZZ-25 is located within the same geological unit, ms.

Nine routes in Alternative 1 are located within 6.1 km of the Ralph Hill mine: JM-1, JM-14, KB-1, KB-2, ZZ-24, ZZ-25, ZZ-26, ZZ-27 and ZZ-31.

No use areas were found to be located on potential NOA terrain in Alternatives 2, 3, 4 or 5.

Table 81. Number and Miles of Routes (Alternative 1) or Proposed Additions to the NFTS (Alts 2 through 5) Intersecting with Potential NOA Terrain

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Number of Routes in potential NOA terrain	157	9	0	10	11
Miles	47	4	0	5	7

Direct, Indirect and Cumulative Effects

Alternative 1 – No Action

Continued use and proliferation of unauthorized routes including 47 miles of routes that intersect with potential NOA terrain would be unmanaged. Effects to public health are unknown and could only be assessed with further analysis and determination of quantity of NOA produced by continued use.

Alternatives 2, 4 and 5

Mitigation measure AQ-1 requires that identified routes be field assessed to locate rock outcrops and examine for asbestos type minerals (Appendices A and B). If these minerals are present, samples would be collected and sent for laboratory analysis to confirm the presence/absence of asbestos type minerals. If no NOA is detected, the proposed route could be added to the MVUM.

Priority of routes to assess for NOA

(priority left to right)

KD-219	TH-28z	KD-218	TH-25w
KD-220	TH-3y	KD-197	TH-97
TH-41y	TH-7y	TH-29z	TH-99
TH-67y	ZZ25	TH-145z	
TH-20w	ZZ26	TH-146z	

Because no proposed addition to the NFTS would be opened to public use until the presence/absence of NOA was established, (see Appendix B, mitigation measure AQ-1); no direct, indirect or cumulative effects to public health are expected due to motorized traffic generating airborne asbestos in any action alternative.

Alternative 3

Because no proposed additions to the NFTS would be opened to public use, no direct, indirect or cumulative effects to public health are expected.