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Region**

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Air Quality Supplemental Report

Forest Plan Revision DEIS

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Preface

The information in this specialist report reflects analysis that was completed prior to and in conjunction with the completion of the Draft Environmental Impact Statement (DEIS) for the revision of the 1987 Coconino National Forest Land Management Plan (the Plan). The primary purpose of specialist reports associated with the DEIS is to provide detailed information to assist in the preparation of the DEIS. As the DEIS was prepared, review-driven edits to the broader DEIS resulted in modifications to some of the information contained in some of the specialist reports. As a result, some reports no longer contain information and analysis that was updated through an interdisciplinary review process and is included in the DEIS in its entirety. This specialist report retains the additional information on the environmental consequences that was not included in the summarized information in the DEIS. However, analysis and information for this resource that is included in its entirety in the DEIS is not duplicated in this report. Efforts have been made to ensure that the retained information in the specialist reports is consistent with the DEIS. If inconsistencies exist between specialist reports and the DEIS, the DEIS should be regarded as the most current, accurate source of analysis.

Contents

Introduction

This specialist report evaluates and discloses the potential environmental consequences on air quality that may result with the adoption of a revised land management plan. It examines, in detail, four different alternatives for revising the 1987 Coconino National Forest Land Management Plan (1987 Plan). It discusses both activities that are regulated under the Clean Air Act and other activities that contribute to air pollution that would result from implementing the Forest Plan.

Relevant Laws, Regulations, and Policy that Apply

All alternatives are designed to guide the Coconino NF's management activities in meeting all applicable Federal and State laws, regulations, and policies

- Clean Air Act, as amended 1977 and 1990 (42 U.S.C. 7401, 7418, 7470, 7472, 7474, 7475, 7491, 7506, 7602)
- Executive Order 11514: Protection and enhancement of environmental quality (35 FR 4247, March 7, 1970).
- Regional Haze Regulations 40 CFR Part 51
- Arizona Regional Haze Implementation Plan available online at: http://www.azdeq.gov/function/forms/docs.html#sip
- Arizona Revised Statute 49-501 Unlawful open burning; exceptions; civil penalty; definition
- Arizona Administrative Code Title 18 Chapter 2 Article 15 Forest and Range Management Burns http://www.azdeq.gov/environ/air/smoke/download/prules.pdf

Methodology and Analysis Process

Plan alternatives, independent of PNVT, affect fire smoke impacts to communities. The PNVTs are assessed together because vegetation type is not as important as other physical factors in influencing smoke production from fire. The smoke impacts discussed below consider our actions in the short term (15 years) and in the long term (50 years).

Actual smoke impacts to communities are dependent on numerous factors that are difficult to predict over the long term such as ventilation parameters, live and dead fuel conditions, wind direction and speed, firing techniques, timing and duration of ignition, and various fuel arrangements and loading; the magnitude of smoke impacts are related much more closely to these factors than to plan guidance in any of the alternatives. Smoke models used at the project level allow the modeler to make assumptions about these factors. However, at a programmatic, Forest-wide scale, the uncertainties associated with these assumptions are too great to allow for reliable analysis using these tools. On this scale, emission concentrations or National Ambient Air Quality Standards (NAAQS)[1] could not be estimated. There are 6 criteria pollutants for which these standards have been set: carbon monoxide (CO), lead, nitrogen dioxide (NO2), particulate matter smaller than10 micrometers in diameter (PM10), particulate matter larger than 2.5 micrometers in diameter (PM2.5), ozone, and sulfur dioxide (SO2). Therefore, smoke impacts as

[1] NAAQS are set by Enviornmental Protection Agency regulations under their authority from the Clean Air Act (for more information see Affected Environment).

estimated in this report, focus on trends rather than a predicted quantity. This requires making assumptions based on the Arizona Department of Environmental Quality (ADEQ) monitoring and literature. ADEQ uses 3 eBAM [2]monitors in Sedona, Flagstaff, and Camp Verde to monitor particulate matter in the smoke management units (airsheds) associated with the Coconino National Forest. These monitors provide real time rolling concentrations in 1 hour 4 hour and 24 hour intervals. For this analysis, smoke impacts are assessed in terms of number of burn days and acreage burned/day.

A factor that would have more effect on smoke impacts than burn days or acreage burned/day is "season of implementation" which greatly influences ventilation. However, this factor is more appropriately evaluated at the project-level because the factors influencing smoke production vary by season. Under all plan alternatives, there is no direction or restrictions regarding the seasonality of burning that would drive difference between the alternatives. The project-level decisions on when to burn would vary by the specifics of the site conditions and the desired conditions for the project, as well as when the windows of opportunity for achieving those desired conditions may arise. Climate change may add increased uncertainty to attempts at predicting these factors seasonally.

Fugitive dust is particulate matter which detaches from the soil and becomes airborne. Like other particulate matter, fugitive dust has the potential to adversely affect human health and visibility. It can be caused by driving on dirt roads, uncovered haul trucks, or soil detaching and becoming airborne under dry, windy conditions with bare soil. Fugitive dust was qualitatively analyzed for the following vegetation types that are most likely to have soil detachment because of dry conditions and amount of bare soil typically present: pinyon-juniper woodland, pinyon-juniper evergreen shrub, semi-desert grasslands, pinyon juniper grasslands, interior chaparral, and desert communities. Since motorized vehicle use is limited to roads and trails except for administrative activities, only publicly open roads were considered for contributing to fugitive dust. These roads would have the most traffic, which facilitates soil detachment. Roads that are available for administrative use only would have much lower traffic on a regular basis and may for short periods, such as during an active timber sale, have higher traffic volumes that contribute to soil detachment. However, the timing and conditions of these more intensive administrative uses may be adjusted to mitigate fugitive dust, while use of a road by the public is not controllable unless there is a road closure. So the underlying condition that may vary by alternative is public access on the Forest.

Uncharacteristic wildfires are those that occur under vegetative and climatic conditions that are not typical to the vegetation type's historic fire regime. In many cases these fires occur under hotter, drier conditions with more continuous fuel, they grow faster and produce more smoke than fires that burn under conditions that are closer to the historic range of variability. When fires occur under conditions closer to this range, the agency may be able to manage them to maintain this range of conditions and to benefit wildlife, soils, watersheds, and other ecological components of the system. This report distinguishes between the types of impacts that occur under uncharacteristic wildfires and wildfires managed to meet resource benefits based on smoke modeling completed by Mary Lata, Fire Specialist for the Four Forest Restoration Initiative[3]

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[2] eBAM is an instrument used to monitor particulate matter. It is produced by Met One.

[3] The Four Forest Restoration Initiative is an ongoing project on the Coconino, Kaibab, Tonto and Apache-Sitgreaves National Forest whose purpose is to restore vegetation conditions in

Team, that estimates the different smoke outputs of fire under these conditions on sites typical of the ponderosa pine vegetation type on the Coconino and Kaibab NFs.

Assumptions

In the analysis for this resource, the following assumptions have been made:

- The land management plan provides a programmatic framework for future site-specific actions.
- Land management plans do not have direct effects. They do not authorize or mandate any site-specific projects or activities (including ground-disturbing actions).
- Land management plans may have implications, or environmental consequences, of managing the forests under a programmatic framework.
- The plan decisions (desired conditions, objectives, standards, guidelines, management areas, monitoring) will be followed when planning or implementing site-specific projects and activities.
- Laws, regulations, and policies will be followed when planning or implementing site-specific projects and activities.
- Monitoring will occur and the land management plan will be amended, as needed.
- We will be funded similar to past budget levels (past 5 years).
- The planning timeframe is 15 years; other timeframes may be analyzed depending on the resource (usually a discussion of anticipated trends into the future).
- 95% of our annual prescribed fire treatments are in Ponderosa Pine PNVT.
- 5% of our annual prescribed fire treatments are in Mixed-Conifer with Frequent Fire PNVT.
- Maximum range for prescribed fire treatment is about 30,000 ac/year and would only be possible under implementation of the Four Forest Restoration Strategy and/or major changes to fire policy, budgets, or external forces (above).
- Unplanned ignitions managed for resource benefits would be utilized when possible to reduce fuel loading in Wildland Urban Interface (WUI) areas (for alternatives B, C and D) and to restore natural fire regimes. We assume that on average 15,000 acres are burned each year in PNVT's (90% ponderosa pine, 5% mixed conifer with frequent fire, 2.5% pinyon juniper grassland, 2.5% pinyon juniper evergreen shrub) with a range between 5,000 and 50,000 annually. To mimic the natural fire regime, Ponderosa Pine, Mixed Conifer with Frequent Fire, and Pinyon Juniper Grassland would be managed under low severity, while, Pinyon Juniper Evergreen shrub would be managed as a mixed severity system. These percentages are representative of what we do now and are based upon fuel conditions, smoke management considerations, firefighting capability, leadership and resource availability, and fire policy.
- The Clean Air Act of 1970 mandates that every state have a Statewide Implementation Plan to regulate pollutants. Smoke is regulated with oversight and compliance by the State of Arizona. Arizona's implementation plan requires that federal and state land

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Ponderosa pine and mixed conifer vegetation types and reduce the risk of uncharacteristic fire on a landscape level.

management agencies submit, prior to implementation of a planned ignition: annual registrations, prescribed fire burn plans, and prescribed burn requests and obtain authorizations to burn (Available online at http://www.azdeq.gov/environ/air/smoke/download/prules.pdf).

- Prescribed fire produces lower emissions than wildfire because less fuel is typically consumed and the conditions are carefully chosen to minimize smoke impacts and to meet resource objectives. Any unplanned ignitions managed for resource benefit would have similar smoke effects to a prescribed fire (or planned ignition), given similar fuel conditions and weather.
- The majority of the Coconino NF is comprised of frequent fire PNVTs. Therefore, smoke from fires is inevitable, regardless of the source of ignition.
- The use of administrative roads contributes less fugitive dust than public access roads because their effects can be mitigated at the project level by timing restrictions and site-specific design of projects and permits.
- The presence of a road itself does not generate a measureable amount of fugitive dust unless it is located in the calcareous soils of the Verde Formation. Traffic is the main source of soil detachment from roads.

Issues Addressed in this Analysis

Plan needs for change addressed in the air quality section of the DEIS and this report:

Clarify regulatory authorities relating to air quality and include approaches for addressing smoke emissions. Fire is a necessary component of ecosystems on the Forest, but the resulting smoke from those fires affects visual quality and human health. To the extent possible, the revised Plan would identify regulatory authorities for air quality and include approaches for reducing smoke impacts on communities.

This need for change addresses the following issues resulting from current conditions:

Community-Forest Interaction may be influenced by smoke impacts and threats (uncharacteristic wildfire) to local communities and infrastructure. Similarly, fire management directly impacts the maintenance and improvement of ecosystem health. Since uncharacteristic wildfire is a threat to communities and ecosystem health, Wildland Urban Interface (WUI) is discussed. The WUI is where humans and infrastructure intermix with wildland fuels. The effect of smoke on air quality is addressed with a qualitative discussion. The indicator is expected smoke impacts to nearby communities from fire management activities on the Forest. The number of burn days and acreage burned/day are used as evaluation criteria.

The restoration of frequent-fire forest in the western United States requires the removal of small-diameter trees either through mechanical thinning, prescribed burning, or a combination of the two. These practices; 1) temporarily lower the amount of biomass in the forest and, thus, the amount of CO_2 the forest sequesters over the short term; 2) reduce the amount of competition for precious water and nutrients, allowing the remaining trees to grow larger and, subsequently, sequester more CO_2 over the long term; 3) Produce small-diameter logs that can be used for either wood products or to produce energy; 4) produce minimal levels of emissions due to logging practices and burning (ERI Fact Sheet 2009).

While forest restoration, like all management strategies, has its advantages and disadvantages, it does two things that are vital for protecting the carbon within a forested ecosystem. It works with the ecology of the given forest ecosystem to produce a situation in which the carbon is stored in its most stable form within the vegetation and soil. It dramatically softens the effects of catastrophic disturbances (e.g., wildfires, insects, disease) and allows natural disturbances (e.g., low-intensity, ground-level fires) to play their essential role (ERI Fact Sheet 2009).

The consistently high storage and low emissions of a pre-settlement restoration treatment suggests that a low-density forest, dominated by large, fire resistant pines, may be a desired stand structure for stabilizing tree-based carbon stocks in wildfire-prone forests (Hurteau & North 2008). The balance of carbon stocks due to a restoration thinning treatment would vary based on site characteristics, tree densities, machinery used, wood utilization rates, the fate of wood products, and the reduction in wildfire threat. However, there is potential for restoration thinning to play a beneficial role in reducing greenhouse gases when it reduces the threat of wildfire-released carbon to the atmosphere and when carbon can be stored in wood products or be used to offset fossil fuel use (Finkral & Evans 2007).

Forest Service activities also result in the release of other emissions that contribute to public health issues and climate change. Vegetation treatments that require large equipment result in the release of NO_2 emissions which degrade into ozone, a greenhouse gas. Forest roads and activities also contribute to windblown dust under certain conditions. These factors are evaluated qualitatively.

Supplemental Description of Affected Environment

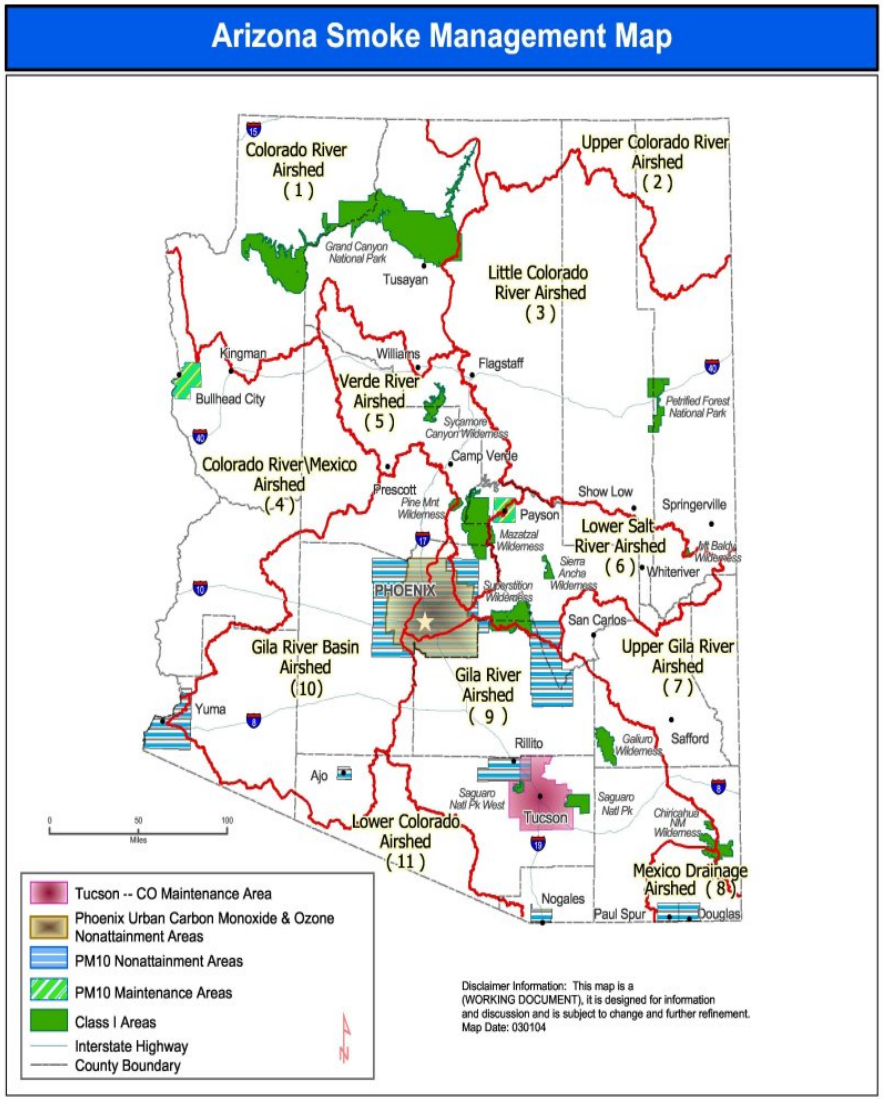
The Clean Air Act requires the Environmental Protection Agency to set up National Air Ambient Air Quality Standards (NAAQS) to protect public health. Many daily activities such as driving a car, buying groceries, or flipping on a light switch contribute to air emissions of some kind. However, these sources are typically regulated at only certain points on the supply chain. For instance, the use of electricity isn't regulated but the emissions of a power plant are. There are therefore many activities that contribute to air emissions that are not directly limited by NAAQS. So for instance, the driving of government vehicles is controlled for NAAQS through production of vehicles that meet national emission standards. The Forest's use of these vehicles contributes to certain NAAQS but is not regulated by ADEQ. Likewise disclosure of effects on air quality includes activities that contribute to air emissions that are regulated under the Clean Air Act as well as those that are not.

The Forest's responsibility to meet air quality regulations requires coordination with the Environmental Protection Agency (EPA) and other air regulatory agencies (state, county, and tribal) including ADEQ. Only prescribed fire activity is regulated for smoke management (visibility and criteria pollutants) because wildfires are considered "natural events" and therefore are excluded under the NAAQS regulations. The Forest Service coordinates with ADEQ on wildfires and uses Smoke Mitigation Techniques to mitigate their impact on air quality (USDA 2002). When a prescribed burn is underway, ADEQ communicates with the Forest on a regular basis about where smoke impacts are occurring and if the smoke is contributing to an exceedence of NAAQS. If ADEQ determines that the smoke from the prescribed fire is rising close to the concentrations in the NAAQS, the Forest stops ignitions (discontinues use of drip torches and other ignition sources) and contains the fire in a less active condition. When this preventative measure occurs, the fire may be finished or ADEQ may allow ignitions to resume when

ventilation conditions are better. This close coordination between the agency and the regulatory entity ensures an adaptive management strategy that is responsive to changing conditions that affect the production and retention of smoke. In addition to coordination with the regulatory agency for air quality, local emergency management agencies may also issue health advisories to inform citizens who may be sensitive to air quality impacts so that they can take action to protect themselves. The Coconino National Forest also sends out information to the public using a number of different media including news releases, social media, e-mail and mailing lists, and other available forms of communication. Cumulatively, these efforts show the extent to which regulation and communication are integral to maintaining air quality and protecting public health.

Smoke Management and Particulate Matter

The current conditions of the airsheds overlapping the Forest are below the national standards for all criteria pollutants, except for the southern portion of the Verde River Airshed. This portion of the Verde River airshed overlaps the Phoenix nonattainment area for PM10, CO and ozone (See Map 1). This means there is no departure in air quality associated with the Forest for most airsheds after taking all the actions that might contribute to air quality into consideration. Because of prevailing wind conditions, prescribed fire activities and wildfire on the Coconino NF rarely affect the nonattainment portion of the SMU 5 (see Map 2). The Arizona Department of Environmental Quality (ADEQ), Air Quality Division, considers airshed impairment across northern Arizona to be low. Special considerations to address smoke



Map 1: Smoke Management Units in Arizona

are required on the rare occasions when a fire is in a non-attainment area for NAAQS including insuring compliance and conformity with state and tribal implementation plans throughout Arizona.

Particulate matter is described as very fine solid particles suspended in smoke and is measured as a 24 hour average. "The major pollutant of concern in smoke from fire is fine particulate matter, both PM10 and PM2.5. Studies indicate that 90 percent of all smoke particles emitted during wildland burning are PM10, and 90 percent of PM10 is PM2.5 (Ward and Hardy 1991). The most recent human health studies on the effects of particulate matter indicate that fine particles, especially PM2.5, are largely responsible for health effects including mortality, exacerbation of chronic disease, and increased hospital admissions (Dockery and others 1993; Schwartz and others 1996)" [USDA 2002]. PM2.5 particles can become lodged in the deepest part of the respiratory system and are difficult for the body to expel.

Over the last ten years, the prescribed fire activities on the Coconino NF have only resulted in one instance of exceeding NAAQS. This occurred on only one monitor for one day for an exceedence in PM10 in Flagstaff around 2007. The Ecological Sustainability Report (USDA 2009) states that "air quality standards are maintained and visibility conditions are trending toward desired conditions. Under current management, airsheds that involve the Coconino are functioning and would continue to function in a way that contributes to ecosystem resiliency and diversity over time."

Uncharacteristic wildfires and associated poor air quality can last for weeks. For example, in 2002 the Rodeo-Chediski Wildfire burned 460,000 acres, across multiple jurisdictions, about 120 miles southeast of Flagstaff. This fire affected air quality in the communities along the Mogollon Rim (SMU 3) for weeks. Similarly, the Wallow Fire burned in the same general vicinity and burned over one half million acres, having similar smoke impacts along the Mogollon Rim and New Mexico. These are wildfires that escaped initial attack fire suppression efforts and can be described as "undesirable" due to their uncharacteristic fire behavior and resultant fire effects, threats to community infrastructure, and heavy smoke impacts. These undesirable wildfires consume much of the forest canopy as well as litter and duff on the forest floor, resulting in heavily concentrated emissions. These fires also consume fuels not typically consumed in wildland fires (outbuildings, homes, cars) due to their uncharacteristic behavior. The emissions from these non-forest fuels are very toxic. Regardless, these pollutants/emissions are beyond our Forest's control and are analogous to other events such as tornados or floods. Also, these events are unpredictable in terms of when they occur, how many would occur, and size but they are less likely to occur in areas that are treated in a manner that is closer to the historic conditions of the vegetation type. These undesirable wildfires are different than wildfires to meet resource objectives.

The Coconino NF uses wildfires to meet resource objectives. The Forest has only exercised this authority for 6 years and averaged about 10,000 acres per year of treatments using these fires. Because environmental factors and fire management capability vary from year to year, the acreage treated by these wildfires varies greatly and remains unpredictable because resource benefit fires originate from lightning.

Visibility

"Regional haze is visibility impairment produced by a multitude of sources and activities that emit fine particles and their precursors and are located across a broad geographic area. This contrasts with visibility impairment that can be traced largely to a single, large pollution source. Until recently, the only regulations for visibility protection addressed impairment that is reasonably attributable to a "permanent, large emissions source or small group of large sources" (USDA 2002).

The Grand Canyon Class I area is northwest of the Coconino National Forest and is occasionally impacted by smoke from the northern part of the Forest. The sources of reduced visibility in the Grand Canyon have been a regulatory issue since the mid-1980s and are constantly monitored for haze by cameras along the rim of the Grand Canyon. The three main pollutants of concern in the canyon are ozone, particulate matter (affecting visibility), and SO2. The National Park Service measures the 20 percent clearest days and the 20 percent haziest days to measure visibility conditions. A 2007 Report showed that visibility in the Canyon had improved on the clearest days but not on the haziest days over the last 10 years. Ozone levels on the other hand, were shown to be increasing but the annual average ozone concentrations still fell below the NAAQS (NPS 2007, NPCA 2010).

Other Forest Activities that Affect Air Quality

Carbon dioxide is another particle that can be emitted by numerous natural and human caused activities. Unlike particulate matter, which is primarily an emission, carbon dioxide is both an emission and an input to ecological functions. These roles are often referred to as sources and sinks. Forests are a particularly challenging area of study when looking at carbon dioxide because the net contribution to storage of carbon or its release is dependent on a complicated and interrelated set of chemical and physical processes that provide energy for plants and wildlife and recycles nutrients through decomposition and disturbances such as fire. Currently, human-caused carbon dioxide emissions are not a regulated pollutant under the Clean Air Act.

Supplemental Environmental Consequences and Cumulative Effects

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the land management plan does not authorize or mandate any site-specific projects or activities (including ground-disturbing actions), there can be no direct effects. However, there may be implications, or long-term environmental consequences, of managing the forests under this programmatic framework.

Effects Common to All Alternatives

Visibility

The effects to visibility to designated Class I areas from forest activities are most strongly correlated to smoke impacts. Because of prevailing wind patterns, Sycamore Canyon would rarely be affected by prescribed fire on the Coconino National Forest under any alternative. The Grand Canyon and Petrified Forest could be affected occasionally by wildfire smoke but would be impacted less frequently by prescribed fire because ADEQ and the Forest Service would

consider them as part of the assessment of risk for smoke hazards before ignition of prescribed fire. Under certain conditions, this would postpone a burn for days or even to the following year until conditions are right to prevent concentrated smoke from entering these areas. The protocols and the frequency at which prescribed fire activities occur does not vary by alternative and therefore there would be no difference in effects from these activities. The difference in the effects by alternatives would be that alternatives with a higher risk of uncharacteristic wildfire would have lower visibility on their haziest days and those with a lower risk of uncharacteristic wildfire would have more hazy days but those days would have better visibility because the smoke emissions would be lower.

Other Forest Activities that Affect Air Quality

It is anticipated that treatments under all alternatives, especially those on the upper end of the objectives for Alternatives B, C and D would improve the net carbon balance on the Forest. SESM Modeling conducted by Mary Lata compared emissions from a wildfire similar to the 2010 Schultz Fire to a scenario where an area is thinned and burned and subsequent prescribed fire maintenance. Her modeling showed that even though the thinning and burning only reduced emissions of carbon dioxide by 20% when compared to a wildfire, subsequent treatment's emissions would be reduced by more than 75% (Lata 2011). The improved ecological conditions that would result from areas being restored to their desired conditions and maintaining a fire regime consistent with historic fire intervals would be expected to reduce the carbon dioxide emissions on the Forest.

Fugitive dust is a source of PM10. The Forest system of roads is a contributor to fugitive dust in semi-arid and arid vegetation communities, including semi-desert grasslands, desert communities, interior chaparral, and pinyon-juniper communities. Of particular concern on the Coconino National Forest, are the calcareous soils of the Verde Formation, which are distinguishable by their white powdery texture. These soils have very high wind erodibility factors and unmaintained roads on this soil type would have the greatest potential contribution to fugitive dust. There is currently no regulation of fugitive dust by the State or local government in or around the Coconino National Forest and the extent and management of this system is not expected to vary by alternative where it is of the most concern. The areas with restrictions on road construction under Alternative C, such as recommended wilderness, are already largely unroaded because of their terrain and so increasing restrictions in them is not likely to change the Forest's contribution to fugitive dust.

The existing road system in the vegetation types that are associated with semi-arid and arid soil conditions is typically less of an impact on the landscape than roads in the more forested vegetation types. For pinyon-juniper woodland, pinyon, juniper evergreen shrub, interior chaparral, and desert communities, roads densities are 1 mile of road or fewer for every 400 acres (See Appendix B for more information). Interior chaparral has the lowest density with 1 mile of road for over 3800 acres. Road densities in mixed conifer or ponderosa pine vegetation types are 1 mile or more for every 250 acres. Even though there is an increased risk of fugitive dust being created because of drier soil conditions, there is less bare ground created by the Forest Service road system in these vegetation types. Semi-desert grasslands and pinyon juniper grasslands have a similar road density to mixed conifer and ponderosa pine vegetation types, most likely because of their popularity for use by the public. Both of these vegetation types have higher densities of public use roads than administrative roads. They are often close to residences and viewed as part of a neighborhoods "backyard." Recreation in these areas is often dispersed and therefore needs a

larger road network to support it. As a result, these vegetation types may have higher risk for soil detachment, more traffic to initiate detachment and therefore more fugitive dust impacts.

Additional Information Related to Comparison of Alternatives

Smoke Management and Particulate Matter

Many of the areas that are more restrictive on vegetation treatments in Alternative C are Semi-Primitive Non-Motorized (SPNM) recreation classification in Alternative B and D. Treatments in SPNM areas would require more post-treatment mitigation efforts in order to restore the desired recreation setting because permanent road construction is not suitable in these areas. If controlling costs is a major constraint on whether or not the work is completed, projects designed in these areas would be less intensive or fewer acres would be treated. In which case, there would be more risk of uncharacteristic wildfire if SPNM areas were avoided, only parts were treated or were inadequately treated. If landscape-scale projects, which would allow the forest to treat at the upper end of objectives in the Plan, can be designed to offset those expenses, SPNM areas are more likely to be treated. It is uncertain how these constraints would affect the risk of uncharacteristic wildfire. Figure 6 illustrates the short term relative trends of smoke impacts to communities by alternative.

Visibility

Alternative A treats all wilderness areas as Class 1 areas. Some of the wilderness areas on the Coconino National Forest are impossible to manage in a way that achieves this objective. For instance, visibility in the Kachina Peaks Wilderness is affected by weather systems and many of the regional air emission sources that affect the Grand Canyon Class I area. However, the plan desired condition is to manage this area as a Class I area which does not give the agency the regulatory authority to coordinate outside of Forest boundaries to achieve it.

Supplemental Cumulative Effects Information

Cumulative effects of fire related to smoke impacts are examined from the standpoint of the sum of the effects of past management activities over the past 10 years on the Coconino NF. Cumulative effects are then explored in the larger spatial context of the Forest's vegetation and fire management practices to the surrounding landscape and assessed in 15 and 50 years. This larger landscape is roughly 20 miles south and west, about 30 miles east and about 100 north northeast of the Coconino NF administrative boundary (Map 3).

Since smoke impacts are transient in nature, the assessment of cumulative effects is different than other issues and resource areas. Regarding NAAQS pollutants, these concentrations have a varying time weighted period depending on the pollutant. For PM2.5 and PM10, they are measured as a 24 hour average, as an annual mean.

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Specialist Information

Sara Dechter, Social Science Analyst, 8 years of Forest Service experience. Prior to working for the Forest Service, Sara worked as a contractor for EPA preparing air and water quality environmental indicators for the American Indian Environmental Office.

Mary Lata, Wesley Hall and Victor Morfin contributed fire and smoke-related modeling and regulatory information to this report.

Appendix A: National Ambient Air Quality Standards

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [(1)]	None	
	35 ppm (40 mg/m^3)	1-hour [(1)]		
Lead	0.15 $\mu g/m^3$ [(2)]	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	53 ppb [(3)]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [(4)]	None	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour [(5)]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual [(6)] (Arithmetic Average)	Same as Primary	
	35 $\mu g/m^3$	24-hour [(7)]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [(8)]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [(9)]	Same as Primary	
	0.12 ppm	1-hour [(10)]	Same as Primary	
Sulfur Dioxide	0.03 ppm [(11)] (1971 std)	Annual (Arithmetic Average)	0.5 ppm	3-hour [(1)]
	0.14 ppm [(11)] (1971 std)	24-hour [(1)]		
	75 ppb [(12)]	1-hour	None	

[(1)] Not to be exceeded more than once per year.

[(2)]Final rule signed October 15, 2008. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[(3)] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

[(4)] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

[(5)] Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(c) EPA is in the process of reconsidering these standards (set in March 2008).

(10) (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(11) The 1971 sulfur dioxide standards remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

(12) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Source: http://www.epa.gov/air/criteria.html Accessed on 8/26/11

Appendix B: Miles of Public Access Roads by PNVT

PNVT and Road Access	Miles	Acres	Mile : Acres	Approximate Ratio	Total Ratio
Cottonwood Willow Riparian Forest		4729			1 : 722
Public Use	1.4		1 : 4729	1 : 3385	
Admin Use	5.1		5 : 4729	1 : 918	
Desert Communities		83200			1 : 443
Public Use	81.9		82 : 83200	1 : 1016	
Admin Use	106.1		53 : 41600	1 : 784	
Gallery Coniferous Riparian Forest		251			1 : 592
Public Use	0.0		0 : 1	1 : 7935	
Admin Use	0.4		0 : 1	1 : 639	
Great Basin Grassland		96336			1 : 265
Public Use	198.9		199 : 96336	1 : 484	
Admin Use	164.5		165 : 96336	1 : 586	
Interior Chaparral		50729			1 : 3850
Public Use	8.7		1 : 6341	1 : 5801	
Admin Use	4.4		1 : 12682	1 : 11451	
Mixed Broadleaf Deciduous Riparian Forest		4547			1 : 628
Public Use	3.7		4 : 4547	1 : 1233	
Admin Use	3.6		4 : 4547	1 : 1279	
Mixed Conifer with Aspen		38309			1 : 250
Public Use	42.0		42 : 38309	1 : 913	
Admin Use	111.0		111 : 38309	1 : 345	
Mixed Conifer with Frequent Fire		49851			1 : 153
Public Use	123.4		41 : 16617	1 : 404	
Admin Use	202.4		202 : 49851	1 : 246	
Montane Subalpine Grassland		42905			1 : 180
Public Use	116.6		117 : 42905	1 : 368	
Admin Use	121.7		122 : 42905	1 : 353	

PNVT and Road Access	Miles	Acres	Mile : Acres	Approximate Ratio	Total Ratio
Montane Willow Riparian Forest		4254			1 : 478
Public Use	5.9		6 : 4254	1 : 716	
Admin Use	2.9		3 : 4254	1 : 1444	
Pinyon Juniper Evergreen Shrub		271626			1 : 429
Public Use	347.5		347 : 271626	1 : 782	
Admin Use	285.3		95 : 90542	1 : 952	
Pinyon Juniper Grassland		270596			1 : 247
Public Use	512.0		128 : 67649	1 : 528	
Admin Use	585.2		585 : 270596	1 : 462	
Pinyon Juniper Woodland (Persistent)		77140			1 : 854
Public Use	47.6		48 : 77140	1 : 1621	
Admin Use	42.7		14 : 25713	1 : 1807	
Ponderosa Pine		865017			1 : 201
Public Use	1816.5		227 : 108127	1 : 476	
Admin Use	2488.6		311 : 108127	1 : 348	
Semi-Desert Grassland		108649			1 : 250
Public Use	212.2		212 : 108649	1 : 512	
Admin Use	221.7		222 : 108649	1 : 490	
Spruce Fir Forest		13950			1 : 733
Public Use	2.6		1 : 6975	1 : 5340	
Admin Use	16.4		8 : 6975	1 : 850	
Urban or Agricultural		17260			1 : 17804
Public Use	0.9		0 : 1	1 : 19737	
Admin Use	0.1		0 : 1	1 : 181776	
Water		3484			1 : 436
Public Use	2.5		2 : 3484	1 : 1407	
Admin Use	5.5		6 : 3484	1 : 632	
Wetland or Cienega		11313			1 : 953
Public Use	2.5		1 : 5656	1 : 4464	
Admin Use	9.3		9 : 11313	1 : 1212	

Source: 2011 Travel Management Final EIS Alternative 3