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Report for the Houston South Environmental Assessment

Effects to

Air Quality and Fuels

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Introduction

Although the proposed Houston South Project includes several different activities, not all proposed activities result in increases in the emission of air pollution. This analysis will only focus on one proposed activity resulting in an increase in air emissions, prescribed burning as modified by proposed management actions. This report will address changes in fuel loading, the ambient air quality concentrations in nearby areas, current emissions of air pollutants, and emissions from the proposed prescribed fire activities.

The primary air quality concerns related to prescribed fire are the potential effects of emissions on human health and visibility (both in terms of safety on roadways and regional haze affecting scenic views). Emissions from wildland fire include carbon dioxide, water, carbon monoxide, particulate matter, hydrocarbons or volatile organic compounds, and nitrogen oxides. Carbon dioxide and water generally make up over 90 percent of the total emissions.

The Clean Air Act requires that the U.S. Environmental Protection Agency (EPA) set national ambient air quality standards (NAAQS) at two levels for six criteria air pollutants. A primary NAAQS is set to protect public health, while a secondary NAAQS is set to protect public welfare (e.g., damage to animals, crops, vegetation, and buildings). Each standard is reviewed every few years, and revised if the most recent scientific research indicates that the current standard is not protective enough of sensitive populations. The six criteria pollutants are lead, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), and particulate matter (PM). When measured concentrations of any of these pollutants consistently exceed the NAAQS, the area is usually designated as a "non-attainment" area by EPA.

A brief discussion of the criteria air pollutants and whether they are emitted by prescribed fires is below:

- The lead and sulfur content of forest fuels is negligible, so these two forms of air pollution are not considered further.
- Carbon monoxide is the most abundant pollutant emitted from wildland fire. It is of concern to human health, because it binds to hemoglobin in place of oxygen and leads to oxygen deprivation and all of the associated symptoms, from diminished work capacity to nausea, headaches, and loss of mental acuity (Peterson et al. 2018). Carbon monoxide concentrations can be quite high adjacent to the burn unit, but they decrease rapidly away from the burn unit toward cleaner air. Carbon monoxide exposure can be significant for those working the line on a prescribed fire, but due to rapid dilution, carbon monoxide is not a concern to urban and rural areas even a short distance downwind. Fortunately, most of the health effects from carbon monoxide are reversible because carbon monoxide is rapidly removed from the body once a person is in cleaner air.
- Nitrogen oxide emissions from wildland fires are very small, and hydrocarbon emissions are moderate. Alone they are not very important to human health, but they are precursors to the criteria pollutant, ozone. Ozone is formed in the atmosphere when nitrogen oxides and hydrocarbons combine in the presence of sunlight. Fire-related NOx and hydrocarbon emissions become more important to ozone levels only when other persistent and much larger pollution sources already present a substantial base load of precursors. To a limited degree, additional intermittent emissions may aggravate an already bad situation. Ozone will be discussed in this analysis.
- The most important pollutant from wildland fire emissions is fine particulate matter ($PM_{2.5}$) due to the amount emitted and the effects on human health and visibility (Peterson et al. 2018). The term fine particulate refers to particulate matter 2.5 microns or less in diameter. This analysis will

address effects of the fine particulate emissions from prescribed fire on air quality within the analysis area.

Methodology

Existing ambient air quality will be described using information from state-operated monitors located near the proposed burn units. An inventory of total emissions in the project area, compiled by state regulatory agencies and the US Environmental Protection Agency, will be assessed. Finally, emissions from the proposed burning activities will be assessed and compared to the total emissions previously described, in order to assess potential impacts to air quality.

Fuels data for this analysis will originate from Fire and Fuels Tools (FFT) program (https://www.fs.fed.us/pnw/fera/fft/). FFT is a software application that integrates the Fuel Characteristics Classification System (FCCS), Consume, FEPS, Pile Calculator, and Digital Photo Series into a single user interface. All of the tools were developed by the Fire and Environmental Research Applications Team (FERA) as open-source and freely sharable software and are supported as separate modules (USDA Forest Service, 2019). Fuelbeds are the common currency in FFT. FCCS requires a list of one to many fuelbeds to run calculations. Because Consume and FEPS can predict consumption by burn unit, they require fuelbeds to be assigned to a unit with a percentage area entered for each fuelbed. FFT allows for the selection fuelbeds based on multiple factors including ecoregion, vegetative form (e.g. broadleaf, conifer, mixed, grassland, etc.), and change agent (e.g. logging, prescribed burning, thinning, ice storm, etc.).

Information Sources

Ambient air quality information is available for download at https://www.epa.gov/outdoor-air-quality-data. Emissions inventory information is available for download at https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data and https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data. Emission factor information is available from https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

Affected Environment

Existing Condition

The proposed project area lies on the Brownstown Ranger District of the Hoosier National Forest, within Jackson and Lawrence Counties, Indiana. Due to the fact that air pollution is transported locally and regionally, an area larger than the Brownstown Ranger District of the Hoosier National Forest is used to describe air quality and the effects of emission from proposed activities.

To understand how the proposed activities might affect air quality, current pollution loading in the analysis area must be considered. State air regulators are responsible for monitoring air quality. Ambient air quality is described by comparing current pollutant concentrations, as measured by state air regulators, to the NAAQS established in the Clean Air Act. As mentioned above, NAAQS are threshold concentrations of criteria pollutants set by the EPA to protect human health and welfare. The NAAQS are set at conservative levels with the intent of protecting even the most sensitive members of the public including children, asthmatics, and people with cardiovascular disease. When measured concentrations of any of these pollutants consistently exceed the NAAQS, the area is usually designated as a “non-attainment” area by EPA. The counties where this project is proposed are not designated nonattainment for any criteria pollutants (source: http://www.epa.gov/oaqps001/greenbk/index.html).

The criteria pollutants of most concern to prescribed burning on the Hoosier National Forest are particulate matter and ozone. Fine particulate matter is the leading cause of regional haze (also known as visibility impairment), while ozone can harm sensitive vegetation within the forest. Additionally, at elevated concentrations these two pollutants can impair the health of both employees of and visitors to the national forests. An ozone federal reference monitor (FRM) is located 21 kilometers NW of the closest proposed Houston South Burn Unit in Monroe County, IN. The closest fine particulate matter FRM is located approximately 11 kilometers SE of the closest proposed Burn Unit in Jackson County, IN (Figure 1). The counties where this project is proposed are not designated nonattainment for any criteria pollutants, including ozone and particulate matter (source: https://www.epa.gov/green-book).

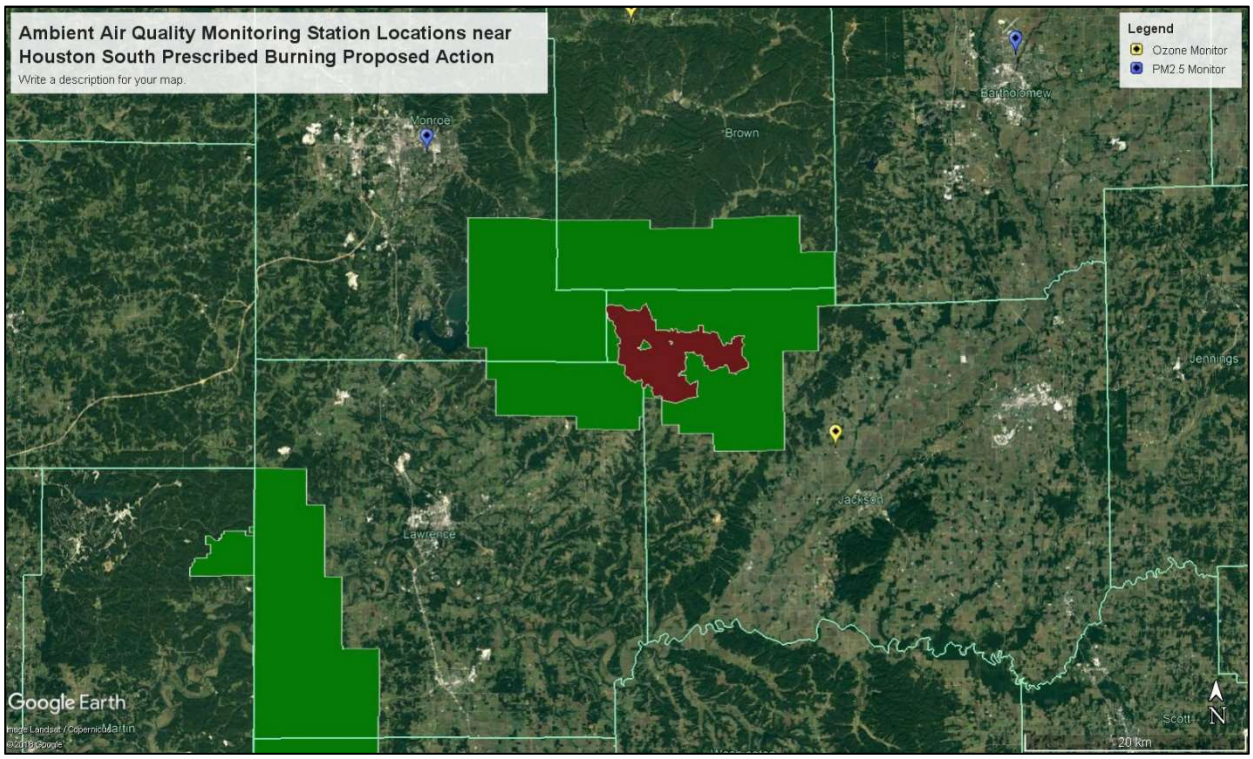

Figure 1. Ozone and fine particulate matter monitoring locations near the Houston South Prescribed Burning Proposed Action (shown in red), Hoosier National Forest. Source: https://www.epa.gov/outdoor-air-quality-data

Ozone

Ozone is a secondary pollutant formed by emissions of nitrogen oxides and volatile organic compounds in the presence of sunlight. At elevated concentrations, it causes human health concerns as well as negative impacts to vegetation. The ozone NAAQS primary and secondary standards are currently set at 0.070 ppm.

The Monroe County, IN ozone monitor does not have measured design values greater than the air quality standards (NAAQS) set by EPA, and is therefore not designated as a nonattainment area. The only ozone nonattainment areas in Indiana are located in Lake County near Chicago, IL, and Clark and Floyd Counties near Louisville, KY. In addition to meeting the 2008 ozone NAAQS, the 2018 design value for the monitor near the project area is also below the 2015 revised ozone NAAQS, with Monroe County yielding a 2018 design value of 0.042 ppm (https://www.epa.gov/outdoor-air-quality-data accessed on June 10, 2019).

While air quality monitoring describes ambient pollution levels, emissions inventories provide information on the contribution of various pollution sources to total emissions for specific geographic areas. Emissions from prescribed fires are unlikely to be a significant contributor to ozone. In much of the rural South, ozone formation tends to be NOx-limited and prescribed fires are usually not a major NOx source when compared to other sources, such as vehicles. In addition, the amount of NOx and VOC coming from forestry activities is small compared to other sources. And most importantly, weather and climate conditions in this area tend to preclude prescribed burning from becoming a significant contributor to ozone formation. Most ozone events occur in mid-spring through late summer when hot temperatures and high-pressure air masses may stagnate over an area, and pollution is not dispersed. Prescribed burning is not typically conducted under these types of weather conditions because of the smoke dispersion issues.

Fine Particulate

Particulate matter is a mixture of extremely small particles made up of soil, dust, organic chemicals, metals, and sulfuric and nitric acids. The size of the particles is directly linked to health effects, with smaller particles causing the worst impacts to human health. As a result, EPA has set a primary NAAQS for fine particulate matter (less than 2.5 microns in diameter) on both a short-term (24-hour) and annual basis. The 24-hour fine particulate matter ($PM_{2.5}$) NAAQS is currently set at 35 $\mu g/m^3$, while the annual $PM_{2.5}$ NAAQS is set at 12 $\mu g/m^3$. The 24-hour $PM_{2.5}$ design value is calculated as the 98^{th} percentile of the 24-hour samples, based on a three-year rolling average, and the annual $PM_{2.5}$ design value is calculated as the annual average of the 24-hour sample values, based on a three year rolling average. The secondary standard is set at the same level as the primary standard for the 24-hour NAAQS and at 15 $\mu g/m^3$ for the annual NAAQS.

The monitor closest to the proposed treatment units is located in Jackson County, IN. Monitoring data from the past several years indicate that Jackson County does not exceed either the 24-hour or the annual $PM_{2.5}$ standards. The most recent 24-hour design value from this monitor was 18 $\mu g/m^3$ and the most annual design value was 7.8 $\mu g/m^3$ (https://www.epa.gov/outdoor-air-quality-data accessed on June 10, 2019). There are no $PM_{2.5}$ nonattainment areas in Indiana.

In summary, air quality within the analysis area is currently meeting the NAAQS for ozone and fine particulates. This means that current sources of pollution, including intermittent emissions from prescribed fire, are not causing air quality to exceed the current thresholds established to protect human health and welfare.

Emissions Inventories

While air quality monitoring describes ambient pollution levels, emissions inventories provide information on the contribution of various pollution sources to total emissions for specific geographic areas. Fine particulate matter is emitted from prescribed fires and is a contributor to ambient levels of this pollutant. Table 1 shows the total fine particulate matter emissions in Jackson and Lawrence Counties (where burning is proposed) and adjacent counties, as well as the emissions contribution from prescribed burning, based on EPA's most recent National Emissions Inventory. Within the counties where burning is proposed, prescribed fire emissions in 2014 accounted for approximately 9 percent of all fine particulate emissions. In the counties adjacent to the proposed project, prescribed fire emissions accounted for approximately 8 percent of all fine particulate matter emissions. Other sources of fine particulate emissions include unpaved road dust, residential fuel combustion and agricultural activities.

Table 1. Fine particulate emissions (tons per year) from the 2014 EPA National Emissions Inventory. Source: https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data

	Fine Particulate Emissions in Tons per Year		
Geographic Area	**From All Sources**	**From Prescribed Fires Only**	**Percentage of Prescribed Fire Emissions to All Emissions**
Within Jackson and Lawrence Counties	2179	195	9%
Within Counties Including and Adjacent to Jackson and Lawrence Counties	4024	322	8%

Table 2 shows $PM_{2.5}$ emissions from all counties adjacent to the proposed action, based on EPA's most recent National Emissions Inventory, along with emissions from the county hosting the nearest $PM_{2.5}$ FRM, Jackson County, IN. Because emissions from counties within the analysis area are similar to emissions in Jackson County, IN, the data from this monitor is considered representative of the analysis region, and the air quality in the analysis area is expected to be at least as good as air quality in Jackson County, IN.

Table 2. Fine particulate emissions for counties in proximity to the Houston South Burn Units (2014 EPA National Emissions Inventory).

County, State	PM2.5 Emissions (Tons/Year)
Brown, IN	541
Jackson, IN	975
Lawrence, IN	1,205
Monroe, IN	1,303

Regional Haze and Visibility

Within pristine wilderness areas, visitors expect to find clean conditions and magnificent views unobscured by manmade air pollution. The EPA has developed two separate strategies in order to improve visibility as well as protect human health. As discussed above, the EPA has established a NAAQS for fine particulate matter, a cause of visibility impairment. EPA also established the Regional Haze Rule, which calls for state and federal agencies to work together to improve visibility in all Class I areas, including most national parks and many wilderness areas. The Regional Haze Rule requires that states, in coordination with the EPA, the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service, develop and implement an air quality protection plan to reduce the pollution that causes regional haze. The goal of the program is to improve visibility at all Class I areas to natural background conditions by the year 2064. Each Class I area has its own goal for reasonable progress, with a 'glideslope' that should be met at various time intervals. EPA has established the IMPROVE monitoring network in order to measure progress in meeting the goals established in the Regional Haze Rule.

The closest Class I area to the proposed burn units is Mammoth Cave National Park, located approximately 200 kilometers the south; the IMPROVE monitoring station is located on site at Mammoth Cave, and measures visibility-impairing pollutants. The primary cause of regional haze in the eastern United States is ammonium sulfate, a result of sulfur dioxide emitted from coal-fired power plants.

Wildland fire contributes to the organics portion of the fine particulate matter levels that are measured by the IMPROVE monitors. The regional planning organization VISTAS demonstrated that wildland fire emissions play a very minor role in development of regional haze in the eastern United States.

Smoke Sensitive Areas

Fire managers prepare a burn plan for each prescribed fire. The burn plan includes a smoke management section which specifies minimum requirements for smoke dispersal to ensure potential effects to safety, human health and other resources are mitigated. One of the primary purposes of smoke management is to minimize impacts to smoke sensitive receptors. Sensitive receptors are usually defined as locations where human populations tend to concentrate and where smoke could impact the health of those populations or significantly impact visibility that may be detrimental to either health or the enjoyment of scenic qualities of the landscape. Travel routes such as highways may be labeled as sensitive receptor sites where smoke can be a factor in potential motor vehicle accidents. The following sensitive receptors are located within 15 miles of the proposed burn units: Nashville, Brownstown, Heltonville, Norman, Freetown, Vallonia, Medora, I-65, US Highway 50, and state highways 46, 446, 58, 258, 135, and 235. The burn plan currently specifies specific meteorological conditions under which burns will occur that will avoid or minimize impacts to sensitive receptors. Additionally, the plan identifies possible mitigation measures, and specifies actions for communicating information about the burn to the public at sensitive receptors and contingency procedures to reduce the exposure to sensitive receptors if smoke intrusion were to occur. Mitigation measures include implementing the most recent basic smoke management practices (Godwin et al. 2014), and can include conducting smoke dispersion modeling before the burn to anticipate smoke impacts, and conducting smoke monitoring during the burn in order to monitor and record effects at smoke sensitive areas and validate smoke dispersion modeling results. The burn plan will be written, and prescribed fires will be conducted according to Indiana state regulations and the most recent basic smoke management practices will be followed (Godwin et al. 2014).

Fuels

Fuels within the project area, based on walkover surveys, are relatively homogenous and best represented by fuelbed #269, sugar maple-yellow poplar-American beach-oak forest, using FFT. Data regarding specific fuel metrics are included in Table 3.

Environmental Consequences

Alternative A – Proposed Action

Prescribed burning is proposed on a total of approximately 10,000 - 14000 acres, depending on adjoining private landowner participation, within the Houston South project area to help achieve and maintain desired conditions. There is likely to be a minimum of 15 burn units and, depending on possible subdivision due to co-occurring management activities, up to 22, or more, burn units in the project area. Fire would be implemented cyclically on each unit at an approximately 3-10 year intervals with only 2 or 3 units will likely be burned in any given year.

Burn unit size varies from approximately 50 to 2000 acres, and each unit would be treated as many times as needed to meet objectives, typically 3-5 times. Maintenance after project completion would likely consist of burning some units, specifically those not having any co-occurring silvicultural treatments, every five to eight years. Annual acres burned for this project would average approximately 1,500 acres.

Units are intended to be burned on different days with some likelihood that two units may be burned in the same day.

The goal of prescribed burning is to promote oak-hickory regeneration, establish and maintain early successional habitats, and establish and maintain dry forest (woodland) natural communities, including embedded shale and sandstone barrens. The prescribed burning will also reduce fuel loads and the potential for intense wildfires during drought years.

Effects

Fuel loading is expected in increase over a portion of the project area in areas corresponding with silvicultural treatments. Using FFT, fuelbeds were assigned to areas proposed for management based on anticipated changes in fuel loading. Not all treatments would result in pronounced change in areas where they occur while others likely will. Anticipated changes are outlined in Table 3. Changes in fuel loading, especially as it relates to air quality in the form of increased emissions, is anticipated to occur on 25% of the project area with balance remaining similar to pre-treatment fuel loading levels.

Table 3. Fuelbed assignments, proportions, and fuel loading in prescribed burn areas of the Houston South Project.

Fuel Bed Assignment From FFT	Treatment	% of Rx Burn Acres Pre-Management	% of Rx Burn Acres Post-Management	1-hour Fuels (tons/acre)	10-hour Fuels (t/a)	100-hour Fuels (t/a)	1000-hour Fuels (t/a)
134	Shelterwood, Hardwood Thinning	0	21	1.4	3.2	6.9	14.2
178	Clearcut	0	3	0.9	3.6	6.2	16.4
212	Pine Thinning	0	1	1.0	3.2	3.0	45.7
269	No Treatment, Selection, Croptree Release, Midstory	100	75	1.0	1.0	2.0	8.3

Air quality impacts from prescribed burning are generally short-term and the majority of smoke from a burn unit disperses within 24 hours. Prescribed fire emissions would have a direct, short-term effect on air quality in the project area. Once the smoke has dispersed, the impact is gone. The amount of smoke and how it is dispersed depend on the size of the burn, the type of fuel, and the meteorological conditions at the time of the burn. In general, smoke from prescribed burning disperses into the atmosphere and combines with other existing pollutants. The wind transports the smoke and pollutants to areas many miles away where they are added to and possibly react with other gases/pollutants present in the atmosphere. The fate of emissions from prescribed fires is twofold. Most of the emissions are "lifted" by convection into the atmosphere where they are dissipated by horizontal dispersion from the fire. The balance of the emissions remains in intermittent contact with the ground. Ground level smoke does not have enough heat to rise into the atmosphere. It stays in intermittent contact with the human environment and turbulent surface winds move it erratically. Human exposure to ground level smoke can be more intense, relatively brief (hours rather than days) and limited to a smaller area than exposure from smoke aloft. Smoke aloft is already dispersed before it returns to the human environment while ground level smoke must dissipate within that environment. Ground level smoke is dissipated through dispersion and deposition of smoke particles on vegetation, soil, and other objects.

The direct effects of smoke include human health and safety issues. Fine particulates, including those found in wildland fire smoke, affect human health through the respiratory system, although eye irritation is also common. Individuals with cardiopulmonary diseases are especially susceptible (Peterson et al. 2018). Residents near the burn unit might have some temporary respiratory discomfort from ground level smoke, however it is expected that most impacts would be in the form of nuisance smoke and/or smell. These impacts can be minimized by implementing the burn under weather conditions that are good for dilution and dispersion of the smoke away from smoke sensitive targets.

Fine particulates can also reduce visibility at scenic views by scattering and adsorbing light. A sufficient concentration can result in a reduction in how far a person can see a distant object, and how well a person can see the color and texture of a distant object. Surveys indicate that viewing scenery is an important reason of why people visit National Forests. The visibility impairment caused by the proposed prescribed fires is likely to be short term (less than 24 hours) in duration, and reductions in visibility (distance, color and texture) are likely to decrease as a person moves away from the prescribed fire.

Visibility on roads can be reduced by ground level smoke, causing a safety issue. This can be particularly concerning if smoke continues into the night when emissions are likely to be trapped near the ground and slowly transported from the burned area. The smoke will follow the drainages and collect in low lying areas. In a humid atmosphere the fine particles along with the water vapor released from the fuels can be a primary contributor to the formation of fog, which can become very dense. A person operating a vehicle in the vicinity of the prescribed fire may first experience good visibility conditions and then suddenly have visibility reduced significantly (perhaps to a few feet) when they drive into the fog formed by the smoldering emissions. Conditions like this can increase the likelihood of highway accidents; however, the likelihood of traffic accidents can be reduced by assisting vehicles driving through the fog or directing the traffic along a different route away from the fog. These impacts can be minimized by implementing the burn under weather conditions that are good for dilution and dispersion of the smoke, and by implementing traffic control measures if needed.

Table 1 showed the emissions of fine particulate matter currently within the counties where the Houston South Project is proposed. Calculations of emissions from the proposed units were also conducted, with the resulting emissions shown in Table 4. The emissions were calculated using modeled estimates from BlueSky Playground (https://sites.google.com/firenet.gov/wfaqrp-airfire-info/playground). Specifically, the project area was delineated into different fuel beds and emissions were estimated using fuel consumption and emissions models.

Table 4. Fine particulate emissions (in tons per year) from the 2014 EPA National Emissions Inventory and projected maximum annual emissions increases from the Proposed Action.

	Fine Particulate Emissions in Tons per Year		
Geographic Area	**From All Sources**	**Total from Prescribed Fires in all of the Proposed Units (Estimated Range[a])**	**Percentage Increase[a]**
Within Jackson and Lawrence Counties, IN	2179	454	20.8%
Within Counties Including and Adjacent to Jackson and Lawrence Counties	4024	454	8.9%

[a] These calculations conservatively assume that the total project area will be burned 4 times over the course of the 20-year project period. Total emissions were calculated using the fuel bed information located in Table 3 and then annualized relative to the 20-year project period.

The indirect effects of smoke are similar to the direct effects, but are experienced at greater distances from the burn. These effects are usually the result of the "lifted" portion of the smoke. Prescribed fires are managed to disperse and dilute smoke to avoid the negative effects of emissions, especially downwind of the burn. Mass ignition techniques (such as aerial ignition from helicopters) treat more acres over a shorter time period. Mass ignition is considered an emission reduction technique because it alleviates local smoke problems, however if the smoke is trapped in the mixed layer it can return to the ground and lead to potential air quality problems further downwind.

Alternative B – No Action

This alternative would have no immediate (direct) impacts on air quality since no actions would be implemented. Indirectly, this alternative could impact air quality later due to resulting build-up of forest fuels, which could cause more smoke over longer durations if intense wildfires were to burn areas not treated (unlikely except in a drought year).

The cumulative impact of the no action alternative would result from the indirect effects over time on forest vegetation and litter, or "fuel loadings," and the resulting effect on wildfires. Wildfires occurring in areas with increased fuel loadings produce more smoke and are more difficult to contain and therefore often burn for a longer duration. Wildfires may occur at times when wind carries smoke into sensitive areas, and at times when smoke dispersal is poor.

Cumulative Effects

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Emissions were estimated using emissions and consumption models for the project area based on best available information, BlueSky Playground modeling platform and professional judgment. An emission factor of 12 pounds of fine particulate matter per ton of fuel consumed was used (Fire Emission Production Simulator manual). Total fine particulate emissions for the Houston South Project are estimated to be 9,080 tons over the life of the project, though this figure likely represents a higher value than the actual emissions over the course of the project. Past analysis of emissions resulting from prescribed burning indicate that consumption models have the propensity to overestimate consumption thus overestimating emissions (Kolaks 2011, 2014). Furthermore, fuels available for consumption will be reduced in a stepwise manner with each successive prescribed burn treatment, a nuance that is not accounted for in current consumption modeling technology. In addition to using prescribed fire as is proposed, the Forest may also conduct prescribed burns in nearby areas, although no other projects are planned or anticipated at this time.

Past Actions

Smoke from individual prescribed fires usually disperses quickly (in hours rather than days) and once the smoke has cleared the effect is over. Therefore prescribed burning from the previous year does not contribute to a cumulative effect. However, when prescribed fire is used on closely located burn units over consecutive days, then it is possible to have residual smoke accumulate and effects could be increased. Communication between prescribed fire managers can mitigate this to some extent by planning burns to minimize the number of consecutive days of burning in any particular area. This gives the smoke time to disperse and concentrations of fine particulate to diminish. As documented earlier in this report, existing data shows no lasting impacts from prior prescribed burns that have occurred in the project area.

Present Actions

Multiple prescribed fires could occur on the same day within the analysis area if burning conditions were favorable, and equipment and staffing were available. It is acknowledged that multiple burns occurring at the same time could cumulatively increase particulate levels. These short-term impacts are best assessed through smoke dispersion modeling to determine how plumes intersect, the resulting particulate concentrations, and the likelihood of exceeding a NAAQS threshold. Should other burns be scheduled, communication between prescribed fire managers is essential to minimize the chances of smoke from multiple burns merging, whether they are ignited on the same or consecutive days.

Reasonably Foreseeable Actions

No additional impacts from reasonably foreseeable actions are anticipated.

The direct, indirect, and cumulative effects to air quality of the proposed prescribed burning would be of short duration at most (less than 24-hours). As a result of the pre-planning and effective smoke management as required throughout the burns, the overall magnitude of effects are within the standards set to protect public health and safety. No significant cumulative effects would result from implementation of the proposed action.

Conclusion

As a federal agency, the Forest Service must comply with all federal, state, and local laws and regulations concerning air quality. In Indiana these include State Implementation Plans for attaining and maintaining national ambient air quality standards (NAAQS) and visibility goals under the Regional Haze Rule. The desired condition for air quality is continued compliance with the NAAQS within the analysis area and minimizing the intermittent impacts of smoke to all sensitive areas.

Based on existing air quality information, no long-term adverse impacts to air quality standards are expected from the proposed Houston South Project. The proposed project is designed to ensure that the Basic Smoke Management Practices are followed, and as such does not threaten to lead to a violation of any Federal, State or Local law or regulation related to air quality. However, there may be times when smoke from the proposed prescribed fires causes short-term respiratory discomfort, is a nuisance, or reduces visibility of those near the burn units. Although burns are planned to minimize these impacts to smoke sensitive areas and nearby residents, there is the potential for the smoke plume to change direction and temporarily affect those in its path. These impacts are short-lived and last less than 24 hours. Impacts may also occur some distance downwind depending on the weather conditions. This is particularly the case for burn units that may contain higher than normal fuel loads due to insect and storm damage, and lack of regular fire treatments. For these reasons, smoke management planning is an integral part of each prescribed burn operation.

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