Main Boulder Fuels - Air Quality Issue

Mark Story 12/19/03

Chapter 2

<u>Issue – Air Quality</u>

Understory and pile burning associated with the Main Boulder Fuels project may temporarily increase $PM_{2.5}$ levels along residential areas in the Main Boulder Canyon and impact the adjacent Absaroka Beartooth Wilderness.

Smoke from the Main Boulder Fuels project may temporarily obscure visibility along the Main Boulder Road and temporarily obscure views to scenery.

> **Indicator:** Smoke in as measured in $PM_{2.5}$ in tons of total emissions, tons/day, and in downwind concentrations in ug/m3.
>
> **Concern:** Increased smoke from understory and pile burning could adversely affect health of people in the Main Boulder River canyon area and reduce visibility along the Main Boulder Road.

Scale of Analysis: The geographic and temporal scale of the air quality analysis consists of air quality modeling of each burn at 0.1 mile to 50.0 miles with consideration to sensitive receptors south of the Main Boulder Canyon.

Chapter 3

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Affected Environment

Air quality within the Main Boulder Canyon area is excellent with very limited local emission sources and consistent wind dispersion. Existing sources of emissions in the Main Boulder Canyon area include occasional construction equipment, vehicles, road dust, residential wood burning, wood fires, and smoke from logging slash disposal. Emissions are very limited with no local visible sources of impairment. Wind dispersion throughout the entire Main Boulder Canyon area is robust, with no visible inversions or localized concentrations of emissions. Down valley drainage is frequently robust during nighttime and early morning hours. The Main Boulder Canyon Fuels Reduction Project area is primarily within Montana airshed 10 (Yellowstone) in Sweetgrass County with a small part in 8B Park County near the Main Boulder Station and from Hells Canyon south to Box Canyon (Montana DSL, 1988, p D-15). The entire the Main Boulder Canyon area is considered to be in attainment by the Montana DEQ. The nearest non-attainment area is Butte for PM_{10} (115 miles to the west). All of the area and the entire Gallatin NF is a Class II (for PSD purposes). The nearest Class I area is Yellowstone National Park which is varies from 16 to 37 miles to the south.

No specific information is available concerning existing air quality within the Main Boulder Canyon area. The nearest particulate data is from the East Boulder Mine EIS (MSDL, USFS, DHES; 1992, p 3-63) documented PM_{10} at the East Boulder mine site at an annual geometric mean of 9 ug/m^3 and a maximum 24hr PM_{10} concentration of 35 ug/m^3. The emissions from the East Bounder mine sources are predominantly dispersed to the northeast with no visible effects within the Main Boulder project area. The DEQ has estimated that for southwest Montana, including the Absaroka Range, a PM_{10} background of 5 ug/m3 (annual average) is appropriate. No other sources of industrial emissions occur in the analysis area.

The nearest non-attainment areas is Laurel and Billings (71 miles and 90 miles east of the mouth of the canyon at the Forest Boundary) which have 7 major $S0_2$ and particulate sources including the Exxon oil refinery, Conoco oil refinery, Montana Power coal fired electric power generating facility, Western Sugar beet factory, Yellowstone Energy Limited Partnership coke fired cogeneration power plant, Montana Sulphur and Chemical sulfur recovery facility, and the Cenex oil refinery. The Billings and Laurel sources are currently permitted for 1,928 tons of PM_{10}/year and 16,481 tons of $S0_2$ year. Currently Billings is in non-attainment for carbon monoxide and $S0_2$ and Laurel is in non-attainment for $S0_2$. The predominant west to southwest winds carry most of the Billings/Laurel emissions to the east and away from the project area. No other sources of industrial emissions occur in the analysis area other than very small local sources.

The major source of emissions in the Yellowstone valley are the cities of Big Timber and Livingston with vehicle exhaust, wood burning smoke, and road dust although both communities are in compliance with National Ambient Air Quality Standards

(NAAQS). Big Timber and Livingston emissions visibly do not impact the Boulder River valley and are strongly dispersed by predominant and robust S and SW wind direction with very robust wind gradients. Other types of emissions in the Yellowstone valley include vehicle and agriculture equipment exhaust, road dust, wood smoke from residential, smoke from pile burning, broadcast burning, and wildfires. Wildfires in the Absaroka Range within the last 20 years have had a low frequency (Sixmile fires in 1989 and 1999, Thompson Creek fire in 1991, Fridley and Monitor fires in 2001, and the Rough Draw Complex of the Rough Draw fire and Brundage fire in 2003). Regional wildfire smoke has accumulated within the area during periods of extensive wildfire activity in 1988, 1994, 2000, and 2003. The prime source of wildfire emissions is from central and southern Idaho, and SW Montana. Smoke can also impact the Boulder Canyon area from wildfires in Yellowstone National Park as occurred in 1988.

Generally the project area does not develop temperature inversions, which trap smoke and reduce smoke dispersal. Dispersion of emissions within the project area is very high due to the mountainous terrain and high wind activity. The Wind Energy Resource Atlas of the U.S. (Elliott et.al., 1986) shows the Boulder Canyon as an area of high wind energy. The Main Boulder Canyon has some potential for cumulative concentrations of smoke and residential and transportation emissions but visible inversion conditions do not occur. Up valley winds during daytime and down valley wind (cold air drainage) at night can dominate valley winds more than overall prevailing wind direction on ridgetops.

Direct and Indirect Effects

Alternative A: Proposed Action

Potential air quality effects of the Main Boulder Canyon Fuels Reduction Project were analyzed using USFS R1 NEPA evaluation procedures for prescribed fire projects (Acheson et.al., 2000) which can be downloaded from the USFS R1 air quality website at http://www.fs.fed.us/r1/gallatin/air.index.shtml. The decision analysis in the procedure document was not used in lieu of the Smoke Impact Spreadsheet (SIS) model (Air Sciences, 2003) which updates the modeling specified in the USFS R1 guidance. The SIS model uses an excel spreadsheet to link to the FOFEM5 model for broadcast burn fuel loading, the Consume model for pile burn emissions, and the CalPuff model for dispersion modeling. The SIS model was run for each of the units in prescribed burn (understory burn) mode and in pile burn mode for all of the units, which have piles. Air quality mitigation measures are listed in Appendix B.

Direct effects of the burns include particulate emissions from pile burning and the understory burns. The understory burns produce a centralized plume due to a concentrated burn area while pile burns result in multiple plumes which consolidate into a

central plume. The SIS model - FOFEM5 component was used for the understory burns while the Consume Pile Wizard was used for the pile burns. Model results include:

Understory Burns

unit	acres	PM2.5 tons	PM2.5 0.1 mile ug/m3	PM2.5 0.5 mile ug/m3	PM2.5 1.0 mile ug/m3	PM2.5 5.0mile ug/m3	minimum ambient distance
MBC	60	2.6	7.6	8.4	5.8	1.6	0.1
1	19	0.8	11.1	5.4	4.1	0.5	0.1
2	22	0.8	11.8	5.7	4.5	0.6	0.1
3	11	0.4	8.1	4.1	2.9	0.3	0.1
4	27	1	11.9	5.4	4	0.7	0.1
5/5A	28	1.1	12	5.5	4.1	0.7	0.1
5B	65	0.3	1.2	0.4	0.3	0.075	0.1
6	17	0.6	9.2	4.2	3.1	0.4	0.1
7	126	4.7	29.2	14	9.7	2.9	0.1
7A	11	0.05	0.07	0.2	0.16	0.03	0.1
7B	31	1.2	19.4	9.1	6.4	1.5	0.1
8	63	2.4	19.6	9.1	6.5	1.5	0.1
8A	35	0.16	1.4	0.56	0.3	0.1	0.1
9	40	1.5	15	6.9	5.1	1	0.1
10	24	0.9	11	5	3.7	0.6	0.1
11	30	1.1	12.5	5.7	4.3	0.7	0.1
12	71	2.7	21.1	9.9	7	1.7	0.1
13	59	2.8	21.6	10.7	7.9	1.8	0.1
14/14A	52	2	16.8	7.8	5.6	1.2	0.1
15	4	0.15	4.9	1.8	1.1	0.1	0.1
16	47	1.8	5	1.8	1.1	0.1	0.1
17	29	1.1	1.3	0.5	0.3	0.08	0.1
17A	27	1.4	14.8	7.7	5.7	0.9	0.1
18	75	4.9	30	15.4	10.2	3	0.1
18A	104	6.8	36	18.9	12.4	4.2	0.1
19A	15	1	14	7.2	5.4	0.7	0.1
19B	10	0.4	7	3.2	2.3	0.27	0.1
20	8	0.5	11	5.3	4	0.4	0.1
20A	3	0.01	0.3	0.1	0.08	0.01	0.1
21	54	3.1	23	12.9	9.1	2	0.1
22	39	2.2	20.9	11.1	8.2	1.4	0.1
23	30	1.7	16.6	7.7	5.6	1.1	0.1
24	218	12.4	49	24.4	15.8	7.2	0.1
25	104	5.9	32.7	16	10.8	3.6	0.1
25A	51	2.9	21.8	10.5	7.4	1.8	0.1
26	50	2.8	21.7	10.4	7.4	1.8	0.1
27	146	8.3	40	19.3	12.5	4.9	0.1
28	25	1.4	15.4	7.2	5.4	0.9	0.1
29	36	2.1	18.2	8.6	6.2	1.3	0.1
30	215	12.3	49	24.3	15.7	7.1	0.1
31	79	4.5	27.8	13.4	9.1	2.8	0.1
32	65	2.4	19.8	9.3	6.6	1.6	0.1
total	2058	100.5					

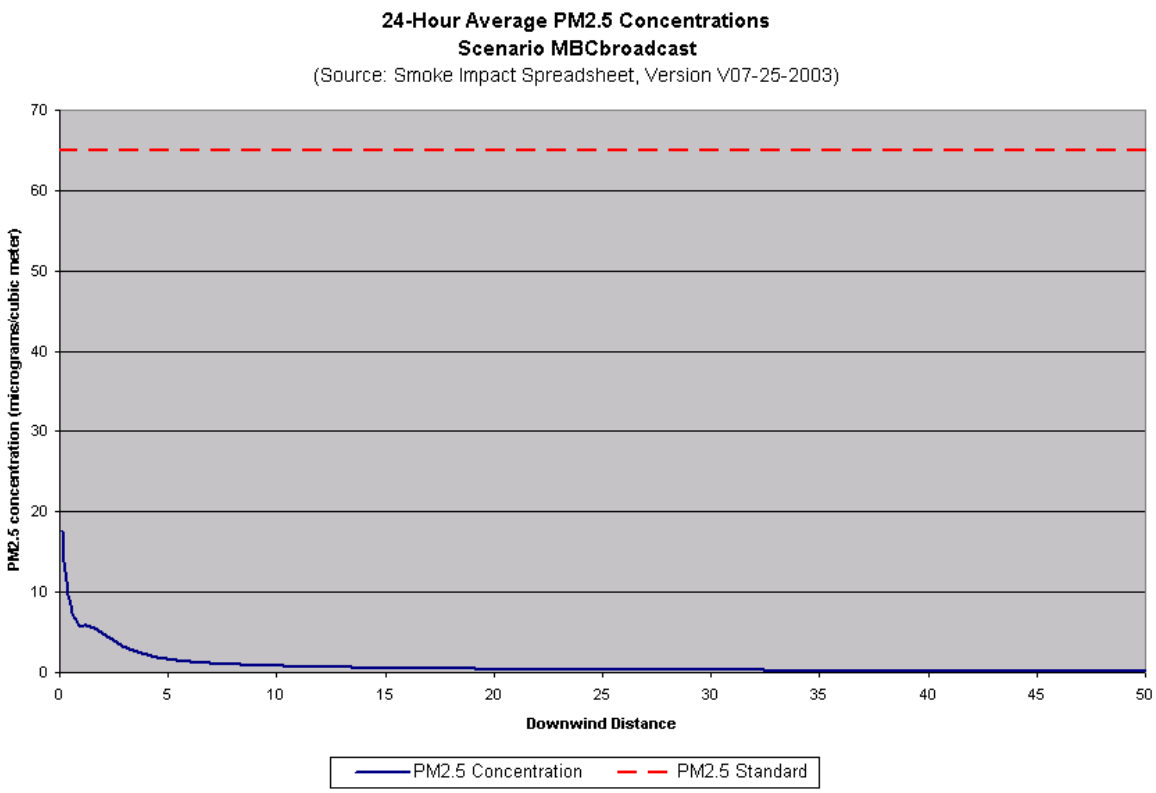
Pile Burns

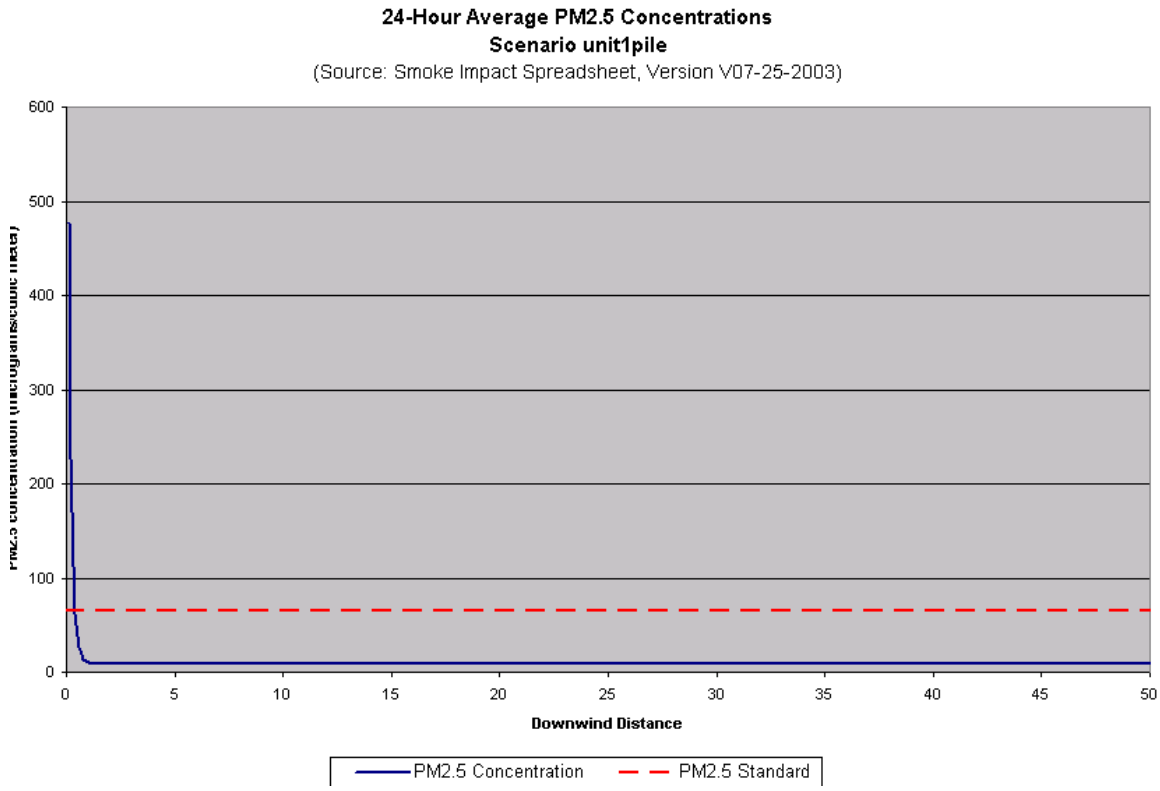
unit	acres	# piles	piles/day	PM2.5 tons	PM2.5 tons/day	PM2.5 0.1 mile ug/m3	PM2.5 0.5 mile ug/m3	PM2.5 1.0 mile ug/m3	PM2.5 5.0mile ug/m3	minimum ambient distance
MBC	155	50	50	0.44	0.09	59	4.9	1.3	1.1	0.1
1	19	285	57	0.5	0.1	68	5.6	1.4	1.2	0.15
2	22	330	83	0.72	0.15	98	8	2.1	1.7	0.2
3	49	735	73	1.2	0.12	87	41	0.18	1.5	0.15
3A	20	300	50	0.45	0.09	0.09	59	3.3	1.25	0.1
3B	10	150	50	0.23	0.05	59	3.3	1.25	1.1	0.1
4	26	390	78	0.72	0.18	120	9.8	2.5	2.1	0.2
5/5A	26	390	78	0.75	0.15	100	8.2	2.1	1.8	0.2
6	17	250	83	0.45	0.15	99	8.1	2.1	1.8	0.2
7	126	1900	500	4.45	0.89	597	48	12.4	10.6	0.5
8	56	840	420	1.68	0.84	563	45	11.7	10	0.5
9	40	600	200	1.08	0.36	238	19.1	4.9	4.2	0.3
10	24	300	300	0.36	1.08	358	28.8	7.4	6.4	0.4
11	30	450	450	0.8	0.8	537	43.1	11.1	9.6	0.5
12	71	1065	532	1.9	0.95	635	51	13	11.3	0.5
14	11	165	165	0.3	0.3	197	15.8	4.1	3.5	0.3
14A	41	615	615	1.09	1.09	734	59	15	13	0.5
15	4	60	60	0.11	0.11	71	5.8	1.5	1.27	0.2
16/16A	69	1080	540	1.92	0.96	644	51.7	13.4	11	0.5
17	29	725	725	0.71	0.71	477	38	10	8.5	0.4
18	75	1035	518	3.33	1.11	746	60	17.5	13.3	0.5
18A	105	2625	656	4.6	1.15	776	62	16	13.8	0.5
19	37	925	925	1.64	1.64	1104	88.7	22.9	19.7	0.6
19A	15	375	375	0.67	0.67	778	36	9.3	8	0.4
19B	10	250	83	0.45	0.15	99	8.1	2.1	1.8	0.2
20	8	200	200	0.36	0.36	238	19	4.9	4.2	0.3
21	54	1350	1350	2.4	2.4	1612	129.5	38	28.7	0.7
22	39	975	975	1.73	1.73	1164	93.5	24	20.7	0.6
23	30	750	750	1.33	1.33	895	72	18.6	15.9	0.6
24	218	5450	1362	9.6	2.42	1626	130.6	33.7	28.7	0.7
25	104	2600	1300	4.62	2.31	1552	124.7	32.1	27.6	0.7
25A	51	1275	1275	2.27	2.27	1522	122	31.6	27	0.7
26	50	1250	1250	4.44	2.22	1492	119.8	30.9	26.5	0.7
26A	30	750	1.33	1.33	895	72	18.6	19	15.9	0.6
27	146	3650	1216	6.48	2.16	1452	116.6	30	25.8	0.7
28	25	625	625	1.11	1.11	746	59.9	15.4	13.3	0.5
29	36	900	900	3.2	1.6	1075	86.3	22.3	19.1	0.6
30	215	5375	1344	9.56	2.39	1605	129	33.2	28.5	0.7
31	79	1975	988	3.5	1.75	1180	94.7	24.4	21	0.7
32	65	1625	812	2.9	1.45	969	77.8	20	17.2	0.6
total	2237			85.4						

The modeling results include projected emissions from all of the units which total 100.5 tons of $PM_{2.5}$ for understory burns and 85.4 tons of $PM_{2.5}$ for pile burns for a total of 185.9

tons. The burning would be implemented over a period of 5-8 years so any 1 year of emissions would likely not exceed 50 tons. Direct effects of the burns include particulate emissions from pile burning and understory burns. Actual concentrations would be about 4 to 10 uq/m3 greater depending on the background concentration of $PM_{2.5}$. The understory burns produce a centralized plume due to a concentrated burn area while pile burns result in multiple plumes which consolidate into a central plume.

The chart below is from the SIS run for the MBC unit understory burn. Projected $PM_{2.5}$ emissions are below the 65 ug/m3 $PM_{2.5}$ standard at all distances from the burn. This unit has a minimum ambient distance of 0.1 miles. The minimum ambient distance is the spacing from the burn the public would have access to the air when outside of a vehicle. Access to the air triggers the 24hour average $PM_{2.5}$ 65 ug/m3 standard.





The chart above is from pile burn unit 1 where $PM_{2.5}$ concentrations are much higher close to the unit although total $PM_{2.5}$ emissions are similar to the understory burns. The pile burns have minimum ambient distances of 0.1 to 0.7 miles. Within the minimum ambient distances the public will be warned about high smoke concentrations and advised not to travel outside of a vehicle. Most of the pile burn areas with the highest minimum ambient distances are in the southern part of the project and not heavily used when pile burning would be done (generally November and December or in April or May). Pile burn units would only be burned one unit at a time to avoid cumulative smoke effects between units. All burns would disperse to low concentrations beyond 5-10 miles. In units adjacent to the Absaroka Beartooth Wilderness some of the Wilderness could be within the minimum ambient distance where exceedences of the $PM_{2.5}$ standard are expected.

Spring burns would likely occur during a period of more wind dispersion than fall understory or pile burning, due to longer spring daytime length, and higher mixing heights. The understory and pile burn smoke plume would likely also disperse to the north and east along the north end of the Boulder canyon. $PM_{2.5}$ from burns would not likely be measurable at Big Timber since the smoke would tend to disperse to the SE. Some concentration of smoke could be occur near Boulder Canyon residences, particularly near units 2 and 3 if pile burn smoldering phase were trapped by nighttime inversions hence the constraining of units MBC and 1-4 with minimum ambient distances of 0.1 to 0.2 miles to avoid $PM_{2.5}$ exceedences at the residences. Outside of the minimum ambient distances the smoke concentrations are expected to be within within NAAQS and State of Montana air quality standards. Main Boulder Fuels Reduction Project burns would be coordinated with the Montana/Idaho State Airshed Group (http://www.smoke.org). The operations of

the Montana/Idaho State Airshed Group are critical to minimize cumulative smoke/PM_{10} air quality impacts. The State Airshed Group, Monitoring Unit in Missoula, evaluates forecast meteorology and existing air quality statewide by individual airshed and specifies restrictions when smoke accumulation is probable due to inadequate dispersion.

Indirect effects would include some localized visibility reduction from the plumes. Some obscurement of visibility for driving along the Boulder Canyon road could occur in narrow bands during understory or pile burning. Dispersion of the plumes would be expected to quickly mix the project smoke to insignificant visibility impact levels.

Alternative B – some burning in Wilderness

To be completed when more information on acreage of Alternative B is available

Alternative C: No Action

In the short run the air quality effects from the no action alternative are less than the action Alternatives A and B since the emissions from the pile and understory burning would not occur. In the long run, the no action alternative would not allow the opportunity to reduce the potential of wildfire ignition in the treatment areas. Wildlife in the Main Boulder River area has the potential to result in extensive smoke and air quality impacts from $PM_{2.5}$ and PM_{10} emissions. The no action alternative would forgo the fuels management opportunity to reduce the likelihood of intensive short term air quality impacts of a large wildfire in the Main Boulder Canyon.

Cumulative Effects:

Air resources are somewhat unique in that the past impacts to air quality are not usually evident or cumulative. The Main Boulder Fuel Reduction Project emissions would be cumulative only with the local emission sources described in the affected environment occurring at the time of burning. Main Boulder Fuels Project cumulative effects for air quality are very limited since there are very few sources of emissions in the Main Boulder Canyon. Cumulative concentrations from individual unit burns will not occur since only 1 understory burn unit or pile burn unit will occur at any one time with little potential for chronological overlapping. Cumulative effects would likely be the same as disclosed in the Direct and Indirect Effects and are constrained by the air quality mitigation measures in Appendix B.

Applicable laws, regulations, and Forest Plan Guidance

Congress passed the Clean Air Act in 1963, and amended it in 1972, 1977, and 1990. The purpose of the act is to protect and enhance air quality while ensuring the protection of

public health and welfare. The act established National Ambient Air Quality Standards (NAAQS), which must be met by state and federal agencies, and private industry. States are given primary responsibility for air quality management. Section 110 of the Clean Air Act requires States to develop State Implementation Plans (SIP) what identify how the State will attain and maintain NAAQS, which are identical to the Montana standards for PM_{10} (particulate mater with less than 10 microns). The $PM_{2.5}$ standard requires concentrations of $PM_{2.5}$ not to exceed a 24-hr average of 65 ug/m^3 (micrograms per cubic meter). Average annual arithmetic $PM_{2.5}$ concentrations are not to exceed 15 ug/m^3. The SIP is promulgated through the Montana Clean Air Act and implementing regulations. The regulations provide specific guidance on maintenance of air quality, including restrictions on open burning (ARM 16.8.1300). The act created the Montana Air Quality Bureau (now under DEQ) and the regulatory authority to implement and enforce the codified regulations.

The NAAQS have been established for carbon monoxide, nitrogen oxide, and sulfur dioxide, lead, and PM_{10}. There are numerous types of pollution that could be controlled, but particulate matter is the primary pollutant of concern. The NAAQS 24 hour standard requires concentrations of $PM_{2.5}$ not to exceed a 24hr average of 65 ug/m3 (micrograms per cubic meter) of air. Average annual arithmetic concentrations of $PM_{2.5}$ are not to exceed 15 micrograms per cubic meter of air.

The August 1977 amendments designated areas of the nation into PSD (Prevention of Signification Deterioration) classes. Class 1 airsheds are given the most protection from human caused air pollution in order to protect their pristine character. Class II airsheds allow for a greater amount of human caused pollution. The EPA has not yet identified any Class III airsheds.

The Montana DEQ is currently cooperating with the Western Regional Air Partnership (WRAP) to establish visibility goals, monitoring plans, and control measures to comply with regional haze visibility standards in all Montana Class I areas including Yellowstone National Park.

The Gallatin NF Forest Plan in Forest Wide Standards pp. II-23 requires that the Forest will cooperate with the Montana Air Quality Bureau (now DEQ) in the SIP and smoke management plan.

Literature Review

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Forest Hydrologist Date