Air Quality

This section summarizes the condition of air resources on the Bighorn National Forest. Much of the background material for this report is summarized from the Upper Columbia River Basin Draft Environmental Impact Statement (USDA 1997).

SUMMARY OF FORESTWIDE CONDITIONS AND TRENDS

- The current condition of the air quality on the forest is considered to be one of the cleanest in the lower forty-eight states.
- Wildfires significantly affect air quality. Prevailing winds in the summer often bring smoke in from outside the forest. Modern wildfires may produce higher levels of smoke emissions than what occurred historically, because current fuel loadings are much higher than in the past.
- The current trend in prescribed fire use is expected to increase the amount of smoke emissions.

DISCUSSION OF FORESTWIDE CONDITIONS

Sulfur Dioxide (SO^2), nitrogen dioxide (NO^2), and ozone (O_3) are gaseous pollutants that can harm vascular vegetation. Effects include injury of plant leaves or needles, reduced growth, and increased susceptibility to insects and disease. Generally, because SO^2 and NO^2 quickly convert to other compounds, they are only a threat to vascular vegetation in the immediate vicinity of the pollution source. Ozone, on the other hand, can affect vegetation far downwind of the source. Lichens may also be affected by SO^2 and ozone. Reported effects include changes in community composition and sulfur accumulation.

SO^2 and NO^2 convert to sulfate and nitrate, respectively. Sulfate and nitrate are acidic pollutants that can be deposited in dry or wet (snow or rain) form and can acidify soils and surface waters. Nitrate deposition can also affect soil nutrient cycling and plant community composition. Particulate mater, volatile organic compounds, SO^2 and nitrogen oxides (NO_X) all contribute to visibility impairment. The impairment can be in the form of a cohesive visible plume, or the pollutants can be dispersed, forming a diffuse regional haze.

The only wilderness in the Bighorn National Forest is Cloud Peak, a Class II air quality area. Bighorn National Forest personnel developed a proposed air quality monitoring plan for the Cloud Peak Wilderness (USDA, 1992). The plan includes monitoring objectives, resource susceptibility and current status, proposed monitoring protocols, and monitoring data uses. Portions of this plan have been implemented since 1992 (see Table 17).

Visibility and lake chemistry data have been collected on the forest, and ozone and deposition data have been collected at nearby sites. Table 17 lists the air quality data that have been collected on the Bighorn.

Data Source	Parameter	Dates
Forest Service	Lake Chemistry (long-term)	1994-Present
Forest Service	Lake Chemistry	1992-1993
Forest Service	Visibility (Camera only)	1995-Present

Camera data have been collected on the forest since 1995. Summer season slides were evaluated to provide a rough estimate of the standard visual range (SVR). SVR is inversely

related to light extinction and can be interpreted at the farthest distance a large, black feature can be seen under prevalent atmospheric conditions. The theoretical maximum SVR is 391 km. The slides suggest that visibility in the Bighorn NF on the best days is 327 km. This makes the visibility on the Bighorn National Forest one of the best in the lower 48 states.

The Wyoming Department of Game and Fish conducted sporadic lake chemistry sampling in and near the Bighorn NF between 1984 and 1991. The USDA Forest Service conducted synoptic sampling of 35 lakes in the Cloud Peak Wilderness in 1992 and 1993. The surveys identified a number of lakes in the wilderness with acid neutralizing capacity (ANC) below 100 micro equivalents per liter (µeq/l), indicating the lakes are sensitive to acid deposition. In fact, many of the lakes are extremely sensitive, with ANC below 25 µeq/l. The Cloud Peak Wilderness had a higher percentage of sampled lakes with acid sensitivity than the Collegiate Peaks, Eagles Nest, Mount Evans, Weminuche, or San Juan wildernesses in Colorado.

Two lakes in the Cloud Peak wilderness, Emerald and Florence, were selected for long-term monitoring. While monitoring has not been conducted long enough to detect trends, data collected from 1994 through 1997 have consistently shown that the lakes are acid-sensitive (low buffering capacity). Data have not been collected for other air quality related values[1], except that a list of plant species with known sensitivity to air pollution has been developed for the Cloud Peak wilderness (USDA, 1992).

The Wyoming Department of Environmental Quality (WDEQ) District 4 engineer compiled a 1997 summary of permitted emissions for all major and minor sources in Big Horn, Hot Springs, and Washakie counties. Permitted emissions are the pollution limits contained in the source permit. Often sources emit less than their permitted limits because pollution controls work better than anticipated or lack of demand for their product curtails the number of operating hours. Permitted emissions are shown in Table 18.

County	Sulfur Dioxide (SO^2)	Nitrogen Oxides (NO_X)	Volatile organic compounds (VOC)	Particulate Matter (PM)
Big Horn	2568	546	69	510
Hot Springs	1709	33	588	0
Washakie	1591	1330	288	170

The city of Sheridan is in non-attainment for the PM10[2] standard under the North American Air Quality Standards. Under the 'conformity' section of the Clean Air Act, federal agencies such as the USDA Forest Service are prohibited from conducting or approving activities that could impede the clean up of these areas. Consequently, Forest Service activities, such as prescribed fire, that produce pollutants in or near Sheridan may be subject to special restrictions, documentation requirements, and or mitigation.

Ozone data have not been collected on the Bighorn NF. However, Yellowstone National Park data are likely to be representative of conditions on the Forest. The Yellowstone NP values for these statistics are far below those believed to result in foliar injury or growth effects in vegetation. In conclusion, ozone concentrations at Yellowstone NP, and probably at the Bighorn NF, are not currently high enough to affect human hearth or vegetation. It is not likely that ozone concentrations will increase significantly in the future (USDA, 1999).

[1] Air quality related values (AQRVs) include flora, fauna, soil, water, cultural resources, odor and visibility.
[2] Particles with a diameter less than or equal to 10 micrometers.

AIR QUALITY TRENDS

A review of the 1996 actual emissions from counties within 100 km of the Bighorn NF shows the major stationary source categories that are the largest contributors of air pollutants near the forest. The largest contribution of SO2 emissions is from oil and gas production/distribution, followed by electric services, then petroleum refining, then chemical production. The largest contribution of Nox emissions is from oil and gas production/distribution, followed by electric services. The largest contribution of VOC emissions is from oil and gas production/distribution, followed by petroleum refining, then electrical services. The greatest contribution of particulate matter is from coal and lignite mining.

Other than statewide information, there are no data on emission or source category trends near the Bighorn NF.

A number of activities and industries emit air pollutants that can affect the air quality and resources on National Forests. Examples include power plants, pulp and paper mills, motor vehicles, wildfire, prescribed burning, oil and gas, and mining. Actual emissions information for major stationary sources (those that emit more than a threshold amount of at least one pollutant) is entered into the US Environmental Protection Agency AIRS database by the Wyoming DEQ on an annual basis. Actual 1996 emissions, by country, from the stationary source categories in Wyoming responsible for the greatest amount of pollution were compiled from an AIRS database retrieval of February 1998, and are shown in table 19. Note that emissions from most minor stationary sources and all non-stationary sources are not included and may comprise a significant portion of total statewide emissions.

County	Source Type	Sulfur Dioxide (SO^2)	Nitrogen Oxides (NO_X)	Volatile organic compounds (VOC)	Particulate Matter (PM)
Bighorn	Oil and Gas	1327	103	37	0
	Bentonite	0	13	0	7
	Clay and related minerals	0	46	0	0
	Beet sugar	0	38	0	0
	Gypsum products	0	40	0	0
	Nonmetallic mineral products	0	54	0	0
Sheridan	Oil and gas	0	0	22	0
	Hospitals	47	46	0	0
Washakie	Bentonite	0	10	0	0
	Beet sugar	11	79	0	0
	Metal cans	0	0	105	0
	Oil and gas	460	1150	146	0