



Air Quality

RESOURCE BRIEF

Importance

Even at relatively low levels, such as those found in the Greater Yellowstone, air pollution and deposition can leach nutrients from soil, injure vegetation, and acidify and fertilize lakes and streams. The Clean Air Act Amendments of 1977 designated Yellowstone and Grand Teton among the 156 national parks and wilderness areas that are Class I airsheds, requiring the most stringent air quality protection within and around their boundaries. The physical characteristics of high-elevation basins, such as thin and rocky soils, sparse vegetation, short growing seasons, and snowmelt-dominated hydrology, make them more susceptible to changes due to acid deposition and nutrient enrichment from nitrogen deposition.



Wet deposition monitoring station in Yellowstone National Park.

Status and Trends

Yellowstone and Grand Teton are in compliance with federal air quality standards for human health in regard to ozone, sulfur dioxide, and particulate matter. However, monitoring data has raised concerns about how air quality may be affecting other aspects of the ecosystem (Figure 1). For example, nitrogen in precipitation has increased at many Western monitoring sites as a result of ammonium ion concentrations associated with fertilizer use and feedlots. By stimulating plant growth, nitrogen can alter the structure and diversity of plant communities. When the algal composition found in sediment cores from several alpine lakes began changing in about 1980, nitrogen

loading had reached a critical threshold (1.4 kg/ha/year) that can alter their ecology; the average nitrogen load from 1993–2006 had increased to 1.8 kg/ha/year.

Ground-level ozone, which is produced by the reaction of UV radiation with nitrogen oxides and volatile organic compounds emitted by fossil fuel combustion, wildfire plumes, and other sources, can travel hundreds of miles on air currents. Ozone concentrations in Yellowstone typically peak in spring rather than summer, indicating that human influences are less significant than changes in atmospheric circulation and lengthening daylight. Nonetheless, data on ozone levels during the growing season (the W126 exposure index) may be high enough to cause biomass loss in sensitive species such as aspen.

Discussion

To remedy and prevent human-caused impairment of visibility in Class I areas, states in the Western Regional Air Partnership are developing programs to reduce emissions of pollutants. Because of prevailing winds, Wyoming oil and gas field development has not had a detectable effect on air quality in Yellowstone. However, less monitoring has been done in Grand Teton, which is influenced by different terrain, wind flow patterns, and surrounding land use. However, the largest source of particulate matter in Greater Yellowstone is natural wildfire smoke, which can impair human health but is not directly regulated (and is taken into consideration when determining the values shown in Figure 1). Prescribed fires are regulated and managed to minimize smoke encroachment in populated valleys downwind of the parks. Emissions from prescribed fires in Greater Yellowstone are projected to increase more than 50% in the next decade, but they are likely to remain relatively insignificant compared to emissions from wildfires, which typically cover more acres in a year and produce more smoke per acre.

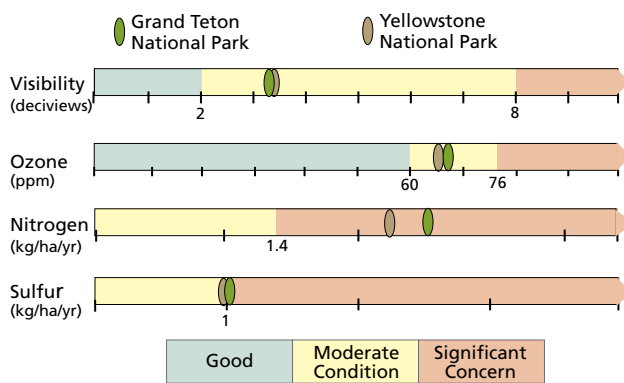


Figure 1. Average 2003–07 values relative to categories set by the NPS Air Resources Division for four air quality measures. A threshold for “good” condition has not been determined for nitrogen and sulfur wet deposition. Total natural background wet deposition in the West has been estimated at 0.13 kg/ha/yr.