

PHYSICAL & BIOLOGICAL RESOURCES

AIR QUALITY AND SMOKE MANAGEMENT

Monitoring Conducted

Air Pollution From Sources Outside The Forest And Its Effects On Ecosystems, Human Health, and/or Human Enjoyment Of Forest Resources

The Superior National Forest (SNF) monitors the effect of air pollution from sources outside the SNF by measuring: A) the chemistry of the air and precipitation directly, and B) the health of sensitive parts of the ecosystem (these activities are summarized under *CI. Riparian-Aquatics; from the Watershed Health, Riparian, And Soils* section).

Measuring Air And Precipitation Chemistry

For the time period of this report the Forest funded, in partnership with a number of other federal and state agencies, the collection of air and precipitation chemistry monitoring data at the Forest's air monitoring site at Fernberg, 20 miles east of Ely.

Fernberg and many other air monitoring sites are part of national networks. One advantage of being a part of a national network is access to free data analysis done by outside parties. For example, numerous detailed analyses of the visibility data are currently being completed by a number of groups in preparation for the implementation of the Regional Haze Rule in every state in the US in 2007 and 2008.

One measure of the performance of our site is the data collection rates. These rates are generally exceeding each network's standards, as shown in Table 1 (for the most recent calendar year available). We had some exceptions to this rule. For the IMPROVE monitor, there was a power issue in late 2006 that caused the loss of a large amount of data. While the extreme environment the equipment runs in presents a challenge, the SNF is always striving to improve data collection rates. For example, in 2007 backup power was installed along with a custom heating/cooling system for the pumps for the IMPROVE monitor.

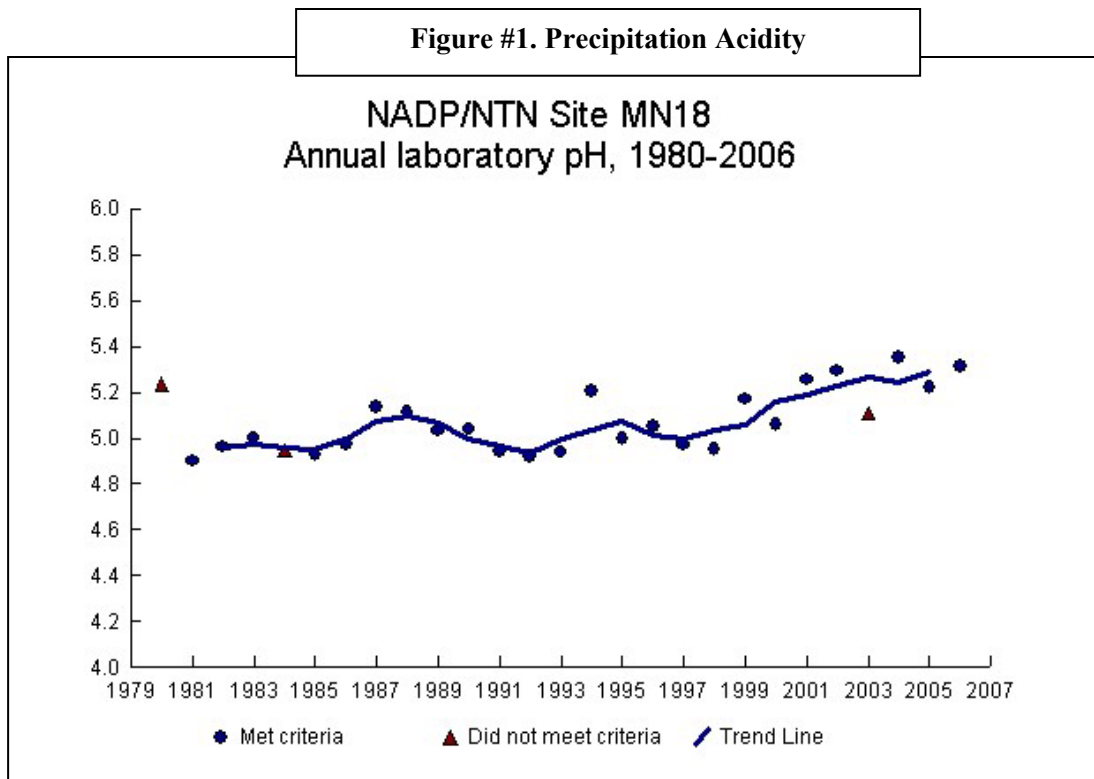
Air Quality Summary Points

- * The SNF monitors the effects of air pollution from sources outside the Forest and from on-forest sources including wildfires and Superior National Forest management activities, particularly prescribed burning.
- * Overall, air quality monitored at Fernberg in 2006 and 2007 showed no major changes from that seen over the past five years. Air pollution from sources outside the Forest is not degrading forest ecosystems, human health or enjoyment of forest resources except for the following areas: visibility and mercury deposition.
- * Smoke monitoring of the Ham Lake wildfire showed one day with values over the EPA health standard. More days over the standard were likely on days, and in locations, where monitoring was not conducted.
- * With the number of new industrial projects proposed for the Iron Range, it will be important to continue to monitor the condition of the air, precipitation, and the resources they affect such as lake and fish chemistry since the trends in these data sets often take years to materialize. This is especially import for visibility and mercury.

Table 1. Air Monitoring Data Sets

Data Sets	Date Monitoring Began	Network Data Collection Std	Data Collection Achieved
Ozone, <i>smog</i>	1976 - present	75%/90% - EPA/MPCA	98% (2007)
NADP-NTN, <i>acid rain – precipitation chemistry</i>	1980 - present	75%	78% (2006)
IMPROVE, <i>visibility – fine particulate chemistry</i>	1991 - present	75%	82% (2006)
NADP-MDN, <i>mercury in precipitation</i>	1995 - present	75%	90% (2006)
Meteorology	2000 - present	90%	99% (2007)
BAM 1020, <i>continuous fine particulate</i>	2005 - present	75%/90% - EPA/MPCA	91% (2007)
HazeCam, <i>digital camera to document visibility</i>	2005 - present	75%/90% - EPA/MPCA	69% (2007)

Trends in air quality often take many years to manifest themselves. Overall, air quality monitored at the Fernberg site over the period of this report showed no major changes from that seen over the past five or so years, as illustrated by the Figure 1 chart showing precipitation acidity.



Changes in 2007

In partnership with the Minnesota Pollution Control Agency (MPCA), a passive ammonia sampler was added to the site in 2007 and will continue to take samples in 2008. Ammonia is a key chemical in relation to fine particulate formation and regional haze. The level of ammonia currently in the atmosphere is not well known but is a key input parameter to atmospheric models used to predict the visibility impact of industrial sources.

In partnership with the Lake Michigan Air Directors Consortium (LADCO), a particulate sampler was temporarily added to the site that collected samples in 2007 and early 2008 to assess the contribution of biomass burning and fossil fuels to the organic carbon fraction of fine particulate. Organic carbon (OC) is an important contributor to regional haze on some days on the SNF. Sources of OC are: (1) mobile sources, including on-road and non-road sources (both gasoline and diesel), (2) burning (both residential wood combustion and wildland fires), (3) local industrial sources, and (4) secondary organic aerosols. The purpose of this study is to increase certainty in the identification and contribution of biomass burning and fossil fuels to fine particulate (and OC) concentrations.

Monitoring Of Air Pollution From Superior National Forest Management Activities

By far, the forest management activity that generates the most air pollution on the SNF is prescribed burning. The SNF screens all burning activities for possible air quality impacts during the development of each burn plan. Those burns identified as having the potential to adversely impact air quality are closely studied using models or other tools. Air quality monitors that measure fine particulates are deployed during the implementation of potentially problematic burns. The goal is to measure the maximum smoke impact at sensitive receptors. Sensitive receptors could be hospitals, roads, or a collection of homes. The data collected is fed back to fire managers so they can learn, in an adaptive management framework, what types of conditions lead to adverse smoke impacts.

During Fiscal Year 2007, no smoke monitoring took place on prescribed burns since none were lit. Instead, smoke monitoring took place on the Ham Lake wildfire. The final area of the Ham Lake wildfire was about 75,000 acres. Figure 3 shows satellite imagery of the fire. This fire took place during May 2007. Figure 2 shows 24-hour impacts exceeding EPA’s new health standard on one day at the Gunflint Ranger Station. Higher values undoubtedly were experienced nearer the fire along the Gunflint Trail. It should be noted that the smoke monitors used to determine an exceedance of EPA standards are not EPA-approved because they do not have high enough precision or accuracy. They do provide an estimate of the severity of the smoke at any given place and time. A complete report on the SNF’s smoke monitoring program for any year is available by request.

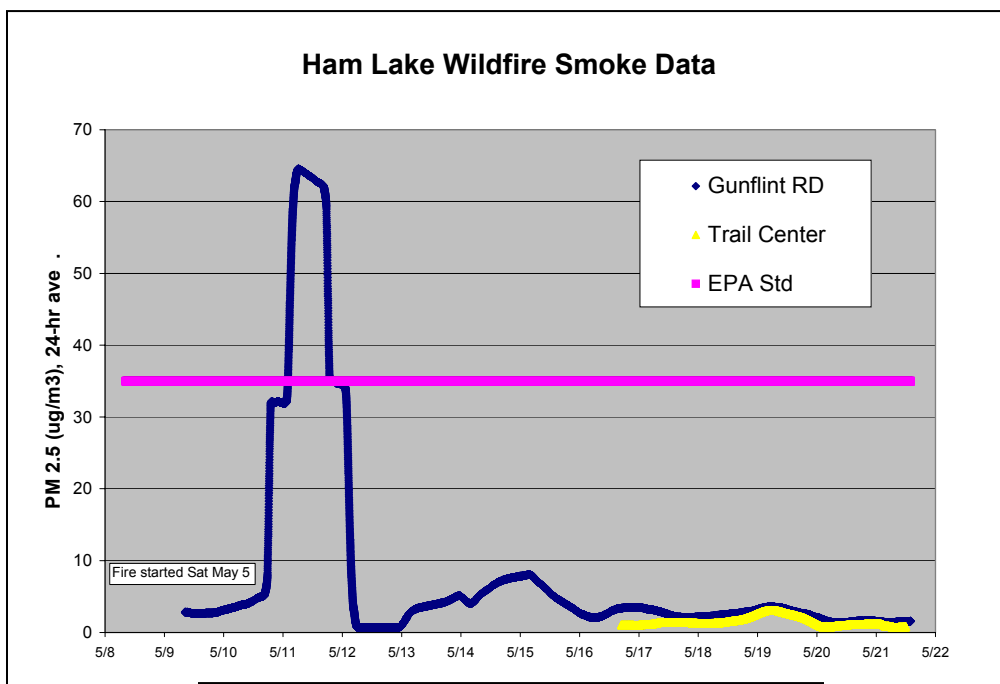


Figure 2. Smoke Monitoring and Health Standards



Figure 3. Satellite Photo on May 10 Showing Smoke From the Ham Lake Fire

Evaluation and Conclusions

The SNF continued to achieve data collection at the Forest’s air monitoring site at Fernberg at rates exceeding each network’s standards. Overall, air quality monitored at the Fernberg site for the most recent year of complete available data (2006 or 2007 depending on the network) showed no major changes from that seen over the past five years. Based on current understanding and the data from the Fernberg site, at this time it is concluded that air pollution from sources outside the forest are not degrading forest ecosystems, human health or enjoyment of forest resources except for the following areas: visibility and mercury deposition. The implications of the current levels of mercury in the SNF ecosystem are discussed in section *C1. Riparian-Aquatics; from the Watershed Health, Riparian, And Soils*. Nonetheless, it should be recognized that air deposition is the source of mercury. In regards to visibility, Figure 4 shows the current visibility conditions along with a “glide path” for improvement toward the goal of natural visibility in 2064. This Figure was taken from the MPCA’s recently proposed first 10-year plan to improve visibility.

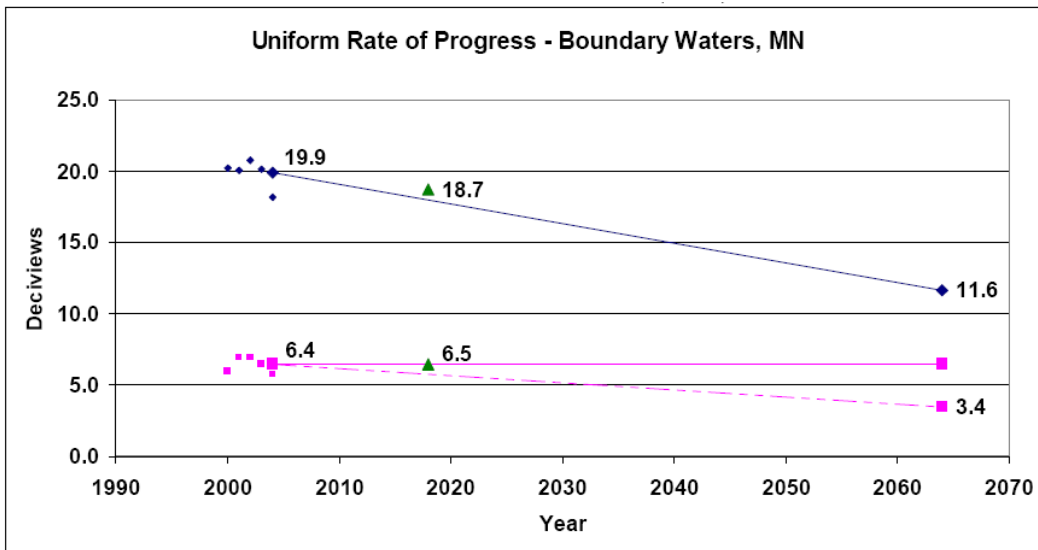


Figure 4. Graph of the Current 20% Worst (blue) and Best (pink) Visibility Days at the Boundary Waters and Predictions for 2018 along with the Long Term Goal in 2064. A Decrease in Deciviews Reflects Clearer Air. (source: MPCA regional haze plan, chapter 8)

Smoke monitoring of the Ham Lake wildfire was accomplished. This data was provided to the public in real-time over the internet so that they could make decisions on how to respond based on their personal health circumstances. The monitoring data showed some days with values potentially over the EPA health standard. Since smoke from prescribed fire can generally be managed to avoid impacting sensitive areas, impacts such as those documented from the Ham Lake wildfire show the importance of completing prescribed fire projects so that large wildfires and their smoke impacts can be prevented.

Management Considerations

- With the number of new industrial projects proposed for the Iron Range, it will be important to continue to monitor the condition of the air, precipitation, and the resources they affect such as lake and fish chemistry since the trends in these data sets often take years to materialize. This is especially important for visibility and mercury.