Bitterroot, 2000, Wildfire Smoke

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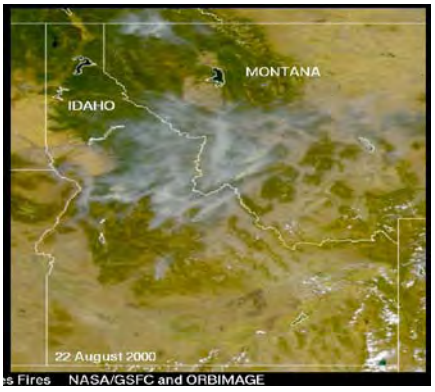
Introduction

The Bitterroot Valley and the Bitterroot National Forest historically experienced smoke from wildfire and prescribed fire in Montana, Idaho, Washington, and Oregon. In addition, upper level winds have the potential to transport smoke into the area from wildfire and prescribed fire from other regions (e.g. Canada, California). The presence and potential pollutants of smoke resulted in social and political issues dictating the need to minimize or prevent smoke impacts to communities and natural resources while using fire to accomplish land and resource management objectives. Managing smoke from forest prescribed burning began in 1978, when Federal, State and local government agencies formed the Montana State Airshed Group. In 1990, agencies and forest products industry in North Idaho joined the Montana/Idaho Airshed Group, and in 1999 South Idaho joined.

From 1994 to the present, smoke monitoring in the Bitterroot Valley indicates prescribed fire and wildfire smoke has allowed air quality to remain within national standards for human health and welfare except in 2000. Smoke from 2000 wildland fire is classified as a "natural event" and is not subject to standards for human health and welfare. Figure 1 displays satellite imagery of August 22, 2000, and illustrates wildfire smoke in the Salmon River, Idaho, and Bitterroot Valley, Montana.

Figure 1-Smoke Satellite Image, 8/22/00



Year 2000 drought and lightning in the northern Rocky Mountain forests created wildfires on several million acres. Smoke from these wildfires was concentrated during the month of August, 2000, in populous mountain

valleys of the Bitterroot River in Montana, and Salmon River in Idaho. Smoke filled the Bitterroot Valley from the ground to nearly 6000 feet above the valley floor, reducing sunlight penetration and atmospheric mixing. Persistent atmospheric inversions trapped smoke in the valley.

Sources of Particulate Matter Monitoring

The focus of smoke monitoring is fine particulate matter, particles less than 10 (PM-10) or 2.5 (PM-2.5), which impacts human health and visibility. A scale for comparison of PM10 and PM2.5 with visibility and human health effects was created by the Montana DEQ and Missoula City-County Health Department based upon their experience with the 2000 wildfires. Refer to the appendix for forest fire smoke categories for human health and visibility, with breakpoints for 24, 8, and 1 hour PM-10 values.

Particulate matter has been monitored in Ravalli County by Montana DEQ in Hamilton, and the Forest Service at Stevensville and West Fork Ranger Stations since 1994. In 1988, the U.S. Forest Service became a primary participant in the national visibility-monitoring program titled Interagency Monitoring of Protected Visual Environments (IMPROVE). IMPROVE monitoring indicates the public is increasingly concerned when PM-10 concentrations are greater than 30 micrograms per cubic meter per 24-hour average, levels affecting visibility well within human health standards.

Missoula County Health Department and Forest Service air samplers, called TEOMs, provide continuous PM-10 records of August, 2000, wildfire smoke in Missoula and Stevenville. Figures 2 and 3 display the August 2000 1-hour, 8-hour and 24-hour average PM-10 concentrations in micrograms per cubic meter, for Stevensville and Missoula, Montana, respectively, in graphs created by the Montana/Idaho Airshed Group.

Remember that August, 2000 wildfires are natural events which are not subject to National Ambient Air Quality Standards (NAAQS), which for PM10 (24 hour average) is 150 micrograms per cubic meter. Note that PM-10 concentrations from August, 2000, wildland fires were more than the NAAQS for several days at Stevensville and Missoula. TEOM PM-10 data available for other Montana communities includes Butte, Helena, Kalispell, Whitefish, and Libby. In August, 2000, PM-10 was less than the NAAQS in all these Montana communities with the exception of one day in Butte. Idaho DEQ air samplers in Salmon, show 11 excursions of NAAQS PM-10.

Figure 2

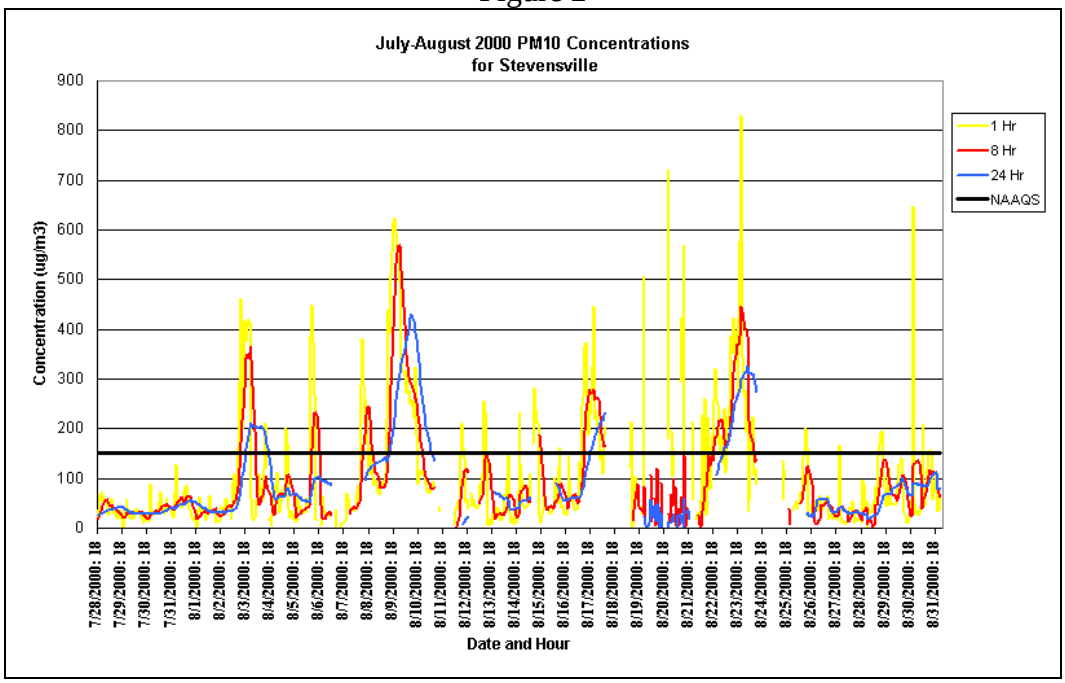
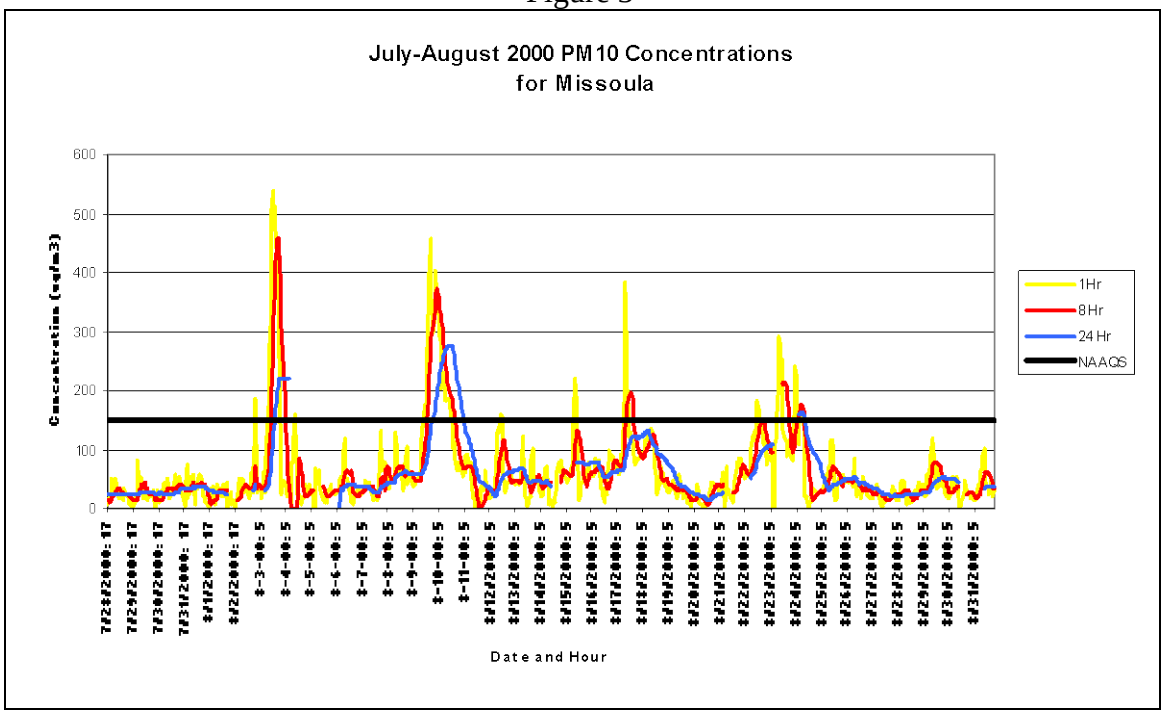


Figure 3



Forest Service Missoula Technology and Development Center (MTDC) also monitored smoke from the middle of August through the middle of September. They used a variety of air monitoring equipment to measure PM-2.5. MTDC data was gathered in Missoula, Hamilton, and the Valley Fire Complex near Darby, and is available in the MTDC report by Andy Trent. Forest Service Fire Sciences Laboratory personnel, in Missoula, drove a van instrumented for monitoring PM-2.5, through Montana's smoke filled valleys in the August, 2000, wildfires. The Forest Service Region 1 Air Quality website has Ron Babbitt's interesting PowerPoint slide presentation of the van's PM2.5 data. Generally, smoke concentrations increased as one moved south from Missoula through Hamilton, Darby, and Sula.

University of Montana, Chemistry Department personnel, led by Professor Garon Smith, monitored the 2000 Montana Wildfire smoke fine particulate matter and chemistry in Missoula, with evaluation for human health . Published papers by Garon Smith and Tony Ward are available and were reported in the Missoulian newspaper. Despite very high levels of fine particulate matter that can be harmful to human lungs and that reduce visibility, the cancer-causing compounds of wood smoke may be more common in Missoula's wintertime air than in the 2000 wildfires smoke.

Smoke Exposure Studies

Fine particulate matter concentrations rather than cancer causing compounds in wildfire smoke are the most important aspects of wildfire 2000 smoke on human health as well as visibility. Healthy people tolerated wildfire 2000 smoke with no known persistent health effects. People with cardio vascular and pulmonary sensitivity to smoke avoided wildfire 2000 smoke when possible. Brian Sharkey, at MTDC, evaluated and published a report on the health hazards of smoke. Center for Disease Control personnel from Atlanta, investigated possible increases in respiratory and cardiovascular hospital admissions in Montana counties with smoke. Shannon Therriault, Missoula City-County Health air quality specialist, wrote a report, "Wildfire Smoke, A Guide for Public Health Officials." The EPA NW Research Center for Particulate Air Pollution and Health, at the University of Washington, held fire, smoke, and health workshops in Seattle and Missoula, with a website for smoke and health.

Interpretive Tools

Wildfire 2000 smoke experience resulted in workshops in Seattle and Missoula on smoke and human health, with an excellent University of

Washington EPA website for smoke and human health. Forest fire smoke categories for human health and visibility evolved from Montana DEQ and Missoula County Health Department experience, with incorporation of nationally recognized EPA air quality indices in the smoke categories available on the Montana DEQ website. Missoula County Health Department's work with national smoke and human health leaders created a "Wildfire Smoke Guide for Public Health Officials." Wildfire 2000 fire and smoke updates are available on websites for the Montana and Idaho DEQ, and the Bitterroot and Salmon National Forests.

Summary

Ron Babbitt, of the Forest Service, Missoula, Fire Sciences Laboratory, summarizes important observations of our wildfire smoke experience, (9): "Within 100 miles of the source, PM2.5 short term concentrations in the range of 100 to 600 micrograms per cubic meter can be expected. In valley situations, buildup will likely occur during the night with some clearing in the afternoon. Duration of high smoke concentrations may last for several weeks. For shorter periods, several hundred miles downwind can be significantly impacted."

References

1)John Colefield, 2000. Forest Fire Air Quality Updates, Montana DEQ internet (1).
2)John Colefield, 2001. Forest Fire Smoke Categories. Montana DEQ internet (1).
3)Diane Riley, 2001. Supporting Technical Document for PM10 Excursions in Salmon, Idaho During the Summer of 2000. Idaho DEQ.
4)Brian Sharkey, 2001, Health Hazards of Smoke, MTDC, USFS.
5)Shannon Therriault. 2000. Wildfire Smoke; A Guide for Public Health Officials, Montana DEQ internet (1,2).
6)Andy Trent, et al, 2001, Real-Time Smoke Particulate Sampling, Fire Storm 2000, Forest Service, 0125-2832-MTDC, Missoula.
7)Tony Ward and Garon Smith, 2001. Air Sampling Study of the 2000 Montana Wildfire Season, University of Montana, Chemistry, Paper#1131.
8)Deb Wolfe, 2001. Flagged PM-10 Monitoring Data; Summer 2000 Wildfires, MT Wildfire Events Action Plan, Montana DEQ internet (1).
9)Ron Babbitt, et al, 2001, Particulate Matter (PM2.5) Concentrations in Western Montana During the Wildfires of 2000, PowerPoint slide presentation for Seattle meeting, on R1 air quality website (3).

Internet sources

1)Montana DEQ forest fire smoke website is
http://www.deq.state.mt.us/FireUpdates/index.asp

2)University of Washington's EPA smoke and human health website is
http://depts.washington.edu.wildfire/

3)USDA, Forest Service, Region 1, Air Quality website is
http://www.fs.fed.us/gallatin/r1/resources/air/index.shmtl

Appendix – Forest Fire Smoke Categories (PM-2.5 using TEOM PM-10)*

Categories	24hr (ug/m3)	8hr (ug/m3)	1hr (ug/m3)	Visibility(mi)
Good	0.0-15.4	0.0-22.0	0.0-40.0	>= 11.25
Moderate	15.5-40.4	22.1-57.7	40.1-80.0	5.62-11.24
Unhealthy to sensitive grps	40.5-65.4	57.8-93.4	80.1-175.0	2.57-5.61
Unhealthy	65.5-150.4	93.5-214.9	175.1-300.0	1.50-2.56
Very Unhealthy	150.5-250.4	215.0-357.7	300.1-500.0	0.9-1.49
Hazardous	>=250.5	>=357.8	>=500.1	<0.9

*reference http://www.deq.state.mt.us/FireUpdates/2001/Breakpoints.asp