

A Question of Economics and Values

There are many social, scientific, recreational, and economic values of clean air and healthy forests. A home for many rare plants and animals, the forests of the Southern Appalachians are also a popular destination for millions of summer visitors. These visitors have become an important source of income to local economies. For example;

- When compared with other public lands in the United States, the Pisgah National Forest near Asheville, NC, is the most visited national forest and the Great Smoky Mountains National Park is the most visited national park.
- Each year, visitors spend a half-billion dollars and support nearly 10,000 jobs in the three Tennessee counties that border the Great Smoky Mountains.

In addition to a cool, moist climate and tree-covered mountains, summer visitors to the Southern Appalachians expect to find pristine settings for recreation and relaxation. Surveys of national park visitors show that clean air ranks among their top four considerations, that "viewing scenery" is the most common visitor activity, and that people are willing to spend additional time and money to get to places that offer clear visibility.



Finding Solutions

Air pollution does not respect local or regional boundaries. Solutions to air pollution problems in the Southern Appalachians will depend on the joint action of government, industry, the scientific community, academia, and the public at large.

In March 1992, SAMAB sponsored a forum on air quality management for Class I areas in the Southern Appalachians. The forum brought together researchers, regulators, managers, and users of natural resources to share information, discuss problems and solutions, and identify opportunities for future collaboration. Some examples of future SAMAB involvement:

- *Public Involvement:* Involving the public in air quality issues and programs through forums, conferences, and educational materials.
- *Research and Monitoring Plan:* Generating support for the development of a research and monitoring program in the Southern Appalachians to determine the magnitude of air quality problems and to develop strategies for addressing them.
- *Cooperation:* Helping agencies to pool resources and cooperate on air quality monitoring and biological effects research, predictive air pollution models, emissions inventories, and regulations.
- *Conservation:* Encouraging the use of cost-effective reductions in air pollution among industry, government agencies, schools, and individual consumers.



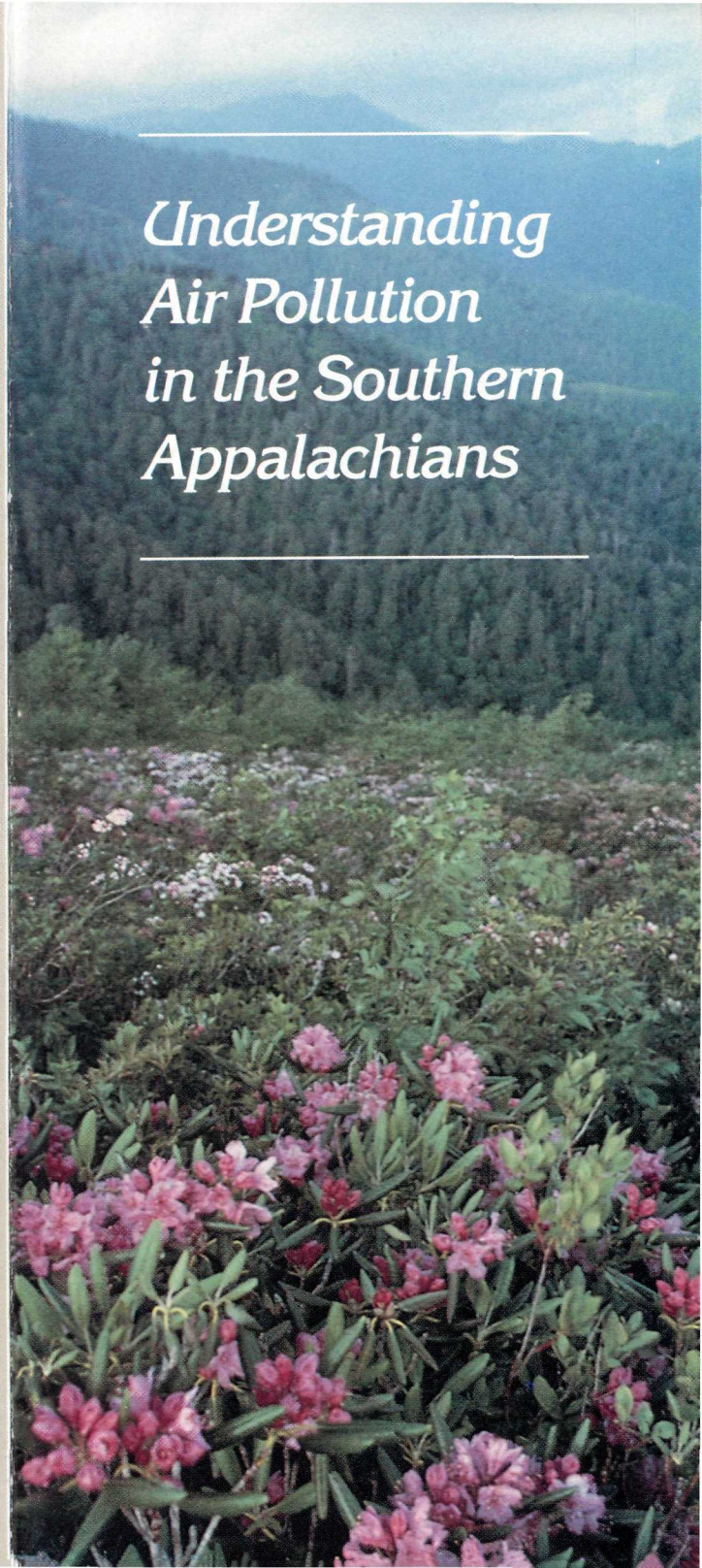
SAMAB invites groups and individuals to join in this ambitious effort. To discuss how you or your organization might get involved, please contact SAMAB's Executive Director at 1314 Cherokee Orchard Road, Gatlinburg, TN 37738, (615) 436-7120. Or call one of the member agencies listed below:

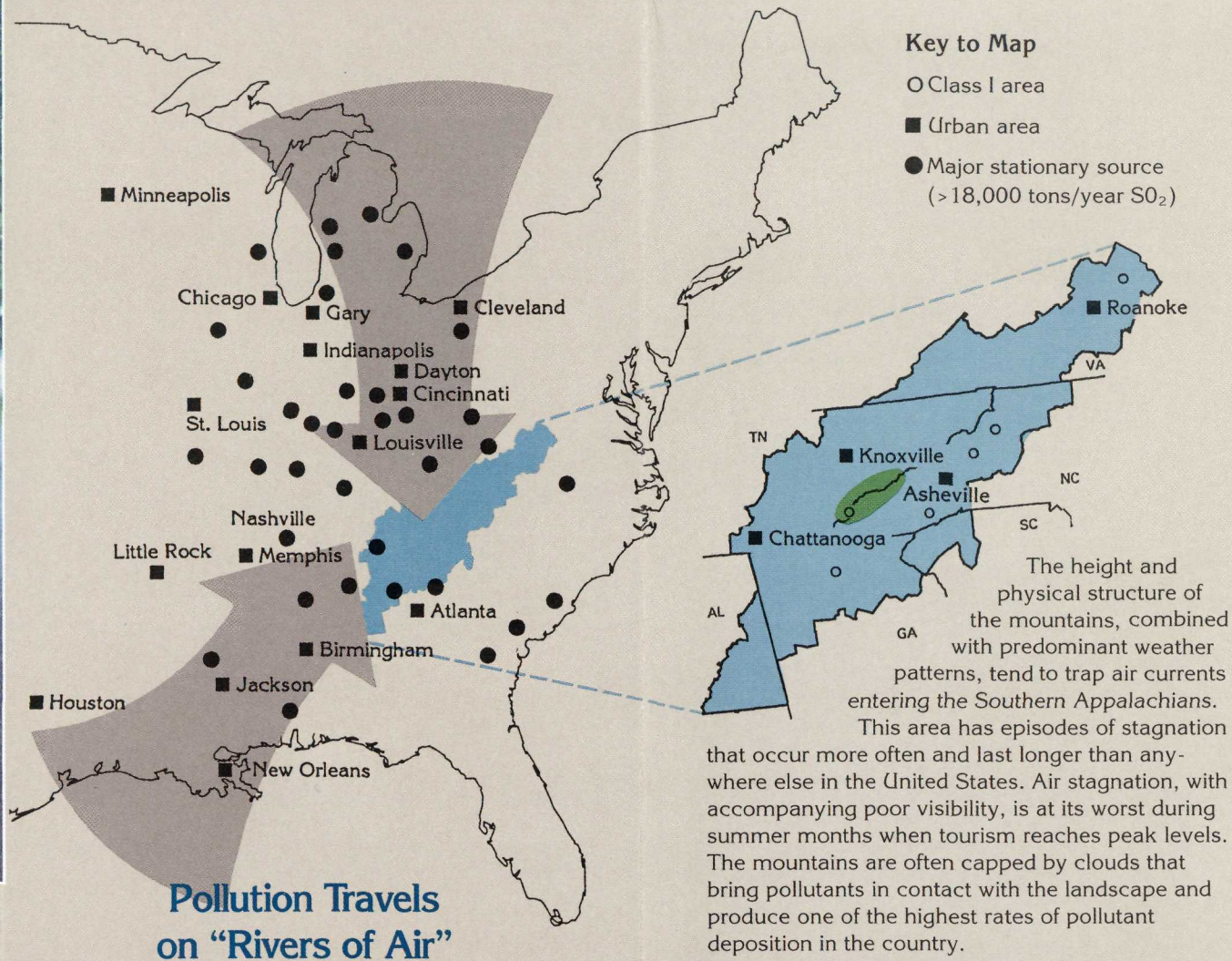
USDA Forest Service • (704) 257-4815

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Understanding Air Pollution in the Southern Appalachians





A report of SAMAB, the Southern Appalachian Man and the Biosphere Program — SAMAB is a cooperative of public and private organizations dedicated to solving natural resource problems that require a balance between a sound economy and a healthy environment.

The air that surrounds us affects all the elements of the natural world, including our forests, streams, and soils. To protect these valuable resources, Congress has amended the Clean Air Act of 1970, adding provisions to establish and protect Class I areas in which the highest standards for air quality apply. In the SAMAB region, six Class I areas cover more than 600,000 acres of Federal land managed by the National Park Service and the Forest Service.

Pollution Travels on "Rivers of Air"

Air currents coming into the Southern Appalachians carry emissions from as far away as the Ohio and Mississippi Valleys, the industrial cities of the Southeast, and the Gulf Coast. Hundreds of nearer sources each year produce more than a million tons of sulfates, nitrates, carbon monoxide, and volatile organic compounds (VOCs). Added to these are pollutants from many poorly quantified industrial and commercial sources. And finally there are natural gases produced by forests; and significant quantities of nitrogen oxides from trucks, cars, and other mobile sources—mainly produced by the millions of tourists who enjoy the mountains each summer.

Once they reach the Southern Appalachians, pollutants are carried to forests by rain, clouds, and snow, and are even deposited during dry periods. When scientists compared monitoring results of all the national parks, they found that the Great Smoky Mountains had the highest rate of nitrate deposition; the highest concentrations of ammonium sulfate, organics, and aerosol acidity; the second highest rate of sulfate loading; and chronic, sustained ozone exposures.

Some scientists suspect that, in addition to causing direct damage to forests, these pollutants may increase susceptibility to insect infestations and diseases.

The Pollution Picture . . .



Wet deposition collector on platform.



Red spruce shows symptoms of decline, possibly linked to acid deposition. Ozone causes stippling, chlorosis, and premature senescence in leaves.

Acid in the Air

The burning of fossil fuels—coal, oil, and natural gas—by electric power plants and other industrial sources produces sulfur dioxide and nitrogen oxides. Nitrogen oxides also come from motor vehicles and, to a smaller extent, from natural sources such as lightning and soil emissions. Sulfur dioxide and nitrogen oxides can transform into weak acids in the atmosphere and return to earth as acid deposition (commonly called acid rain).

Rainfall in the Southern Appalachians is more than five times as acidic as normal, and cloud water acidity is even more severe. In the 1980's, Forest Service research discovered a possible link between acid deposition and a growth decline of red spruce trees in New England. Later studies in the Great Smoky Mountains showed similar declines in the number of needles and the health of red spruce crowns. Red spruce is one of the two species that populate the highest elevations of the Southern Appalachians. The other species, the Fraser fir, has already been devastated by an infestation of an insect called the balsam woolly adelgid.

Acid deposition can also affect streams, lakes, and other aquatic resources. In Southern Appalachian watersheds, the low buffering capacity of underlying geological formations causes streams to be extremely sensitive to acid inputs. Studies have linked acid deposition to changes in the species composition of insect and fish populations in sensitive streams. Additional acidic inputs will aggravate any problems that already exist.

Ozone – A Special Problem

Ozone is a clear gas. In the earth's upper atmosphere, ozone is natural and beneficial; it serves as an important filter, absorbing some of the sun's ultraviolet rays. Ground-level ozone is formed by a reaction between nitrogen oxides and volatile organic compounds (VOCs) in the presence of sunlight, and is considered a serious health threat

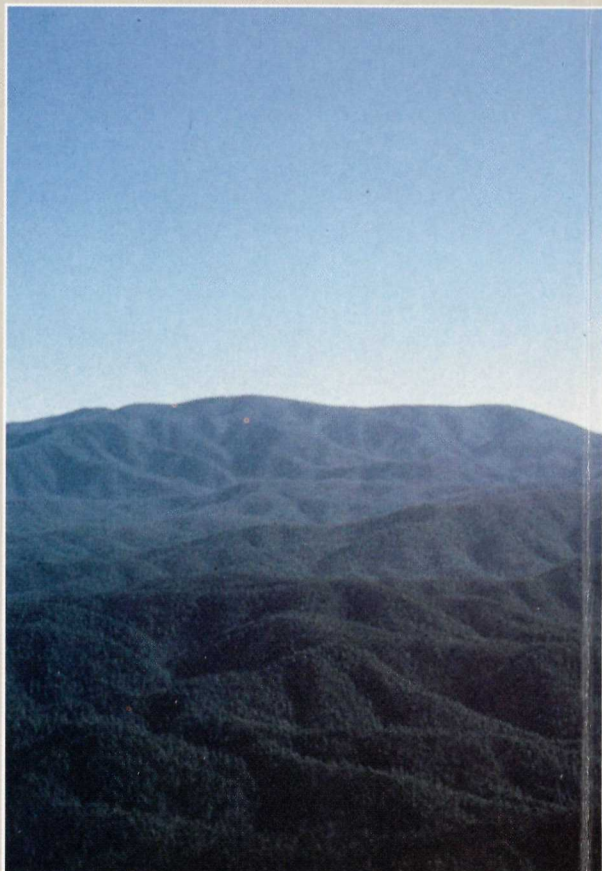


Exposure chambers for testing responses to acid deposition and ozone.

to people and plants. The sources of VOCs range from manufacturing processes to the natural "breathing" of trees and other plants.

Contrary to popular beliefs, ground-level ozone is not limited to cities; it also affects rural areas of the South. Black cherry, tulip-poplar, blackberry, and milkweed plants are very sensitive to ozone. Ozone enters plants through their leaves and damages internal cells that contain chlorophyll, slowing photosynthesis and growth. Visible symptoms include a splotchy brown, purple, or yellow discoloration on the top surface and inter-veinal portions of leaves. Because ozone has the potential to damage dozens of plant species, many scientists believe it is the pollutant of greatest concern to forest health and productivity in the Southern Appalachians.

Many Sources, Effects Unclear



Going, Going, Gone? Gregory Bald from Look Rock air quality station in the Great Smoky Mountains.

Haze Also a Factor

Haze reduces visibility by scattering and absorbing light. In the Southern Appalachians, a certain amount of blue haze is normal and characteristic enough to influence the naming of major landforms, such as the Great Smoky and the Blue Ridge Mountains.

Today however, scenic vistas are being obscured by more frequent and more severe episodes of haze, 90 percent of which are caused by pollution. Since 1948, visual range has decreased by a year-round average of 60 percent in the Southeast,

ranging from 40 percent in winter to 80 percent in summer. Visual range is the distance it is possible to see; it has degenerated from an ideal of 93 miles to a current average of 12 to 19 miles.

This new kind of haze differs from natural haze. It consists of aerosols, made up of sulfate solutions and organic compounds that change back into a liquid state and reflect light. Sulfates, which come from burning coal and oil, account for most of the haze in the Southern Appalachians.

