

United States
Environmental Protection Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA-452/F-99-002
September 1999



Regional Haze and Visibility Protection

*Clearing the Air and
Improving the View*

Air Pollution Affects Visibility

Have you ever noticed that the scenic views in many of our national parks are not as clear as they used to be and, on some days, are not visible at all? Or have you noticed that the skies in our cities are sometimes very hazy? Visibility impairment, or haze, is one of the most obvious effects caused by air pollution. Visibility is a measure of how far and how well we can see into the distance. The same pollutants (primarily very small particles) that cause haze also cause or contribute to significant health and environmental problems across the United States.

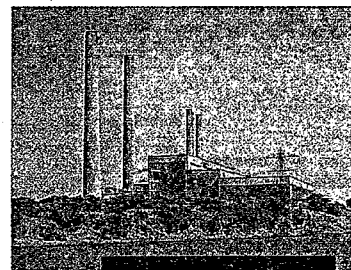
Haze and Its Causes

Haze obscures the clarity, color, texture and form of what we see. Haze is caused when light encounters tiny pollution particles (sulfates, nitrates, organic carbon, soot, and soil dust) and some gases (nitrogen dioxide) in the air. Some light is absorbed by the particles and gases and other light is scattered away before it reaches an observer. More pollutants mean more absorption and scattering of light, resulting in more haze. Humidity (especially prevalent in the East) magnifies the haze problem, because some particles, such as sulfates, attract water and grow in size, scattering light better than other particles.



Pollution in the air scatters and absorbs light so the view is not as clear or as far as it should be.

Some haze-causing pollutants are formed when gases emitted to the air form particles as they are carried many miles from the source of the pollutants. Particles that are formed from gases include sulfates, nitrates, and some organic carbon particles.



Sulfate particles formed from sulfur dioxide gas, emitted from utility boilers and other combustion sources, are a major cause of regional haze.

Other haze-causing pollutants (mostly small particles) are directly emitted to the atmosphere from sources such as electric utilities and industrial fuel burning, manufacturing processes, and vehicle emissions. Natural sources such as forest fires and windblown dust also contribute to haze.

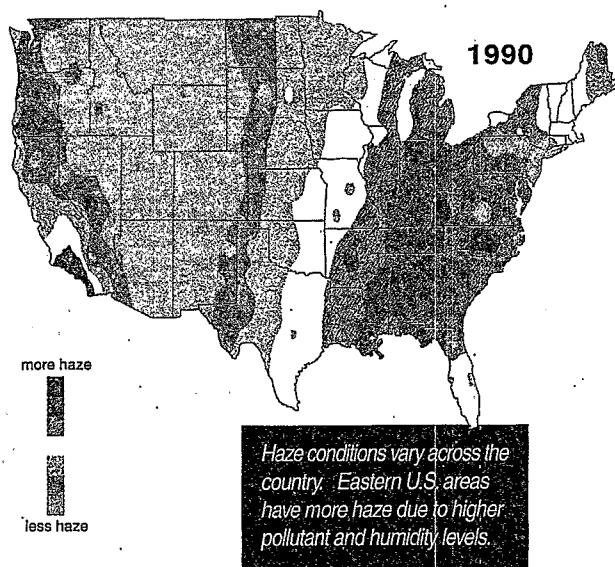
Transport of Pollutants that Cause Regional Haze

Particles in the air can travel hundreds or thousands of miles, contributing to the haze that causes visibility impairment over broad regions of the United States. This makes it important for states to work together in solving the problem of regional haze.

Differences in Eastern and Western United States

Visibility is generally worse in the East than in the West. In the eastern United States, reduced visibility is primarily caused by sulfates from power plants and other large, industrial sources. Emissions from these same types of large, industrial sources also account for much of the visibility impairment in the West. However, other sources (such as woodsmoke from burning or nitrates from auto emissions) play a more

significant role in the West than in the East. Visibility varies with the season and is generally worse during the humid summer months. In our nation's scenic areas, the visual range has been substantially reduced. In eastern parks, average visual range has decreased from 90 miles to 15-25 miles. In the West, visual range has decreased from 140 miles to 35-90 miles.



What are the Health and Environmental Concerns?

Efforts to improve visibility also provide other health and environmental benefits. Some of the same



particles that contribute to regional haze are also linked to serious health and environmental effects.

- Exposure to very small particles has been linked to increased respiratory illness, damage to lung tissue, and premature death.
- Sulfates and nitrates contribute to the formation of acid rain, which damages forests, erodes building materials and monuments, and causes lakes and streams to become acidic, making them unsuitable for many fish.
- Other pollutants that contribute to haze also help form ground-level ozone (smog) which can trigger serious respiratory problems, and cause significant damage to forests and ecosystems.
- Nitrogen oxide gases from electric utilities and cars are a major contributor to increased nitrogen loading in water bodies, particularly estuaries, which upsets the chemical balance of nutrients used by aquatic plants and animals.



*Acadia National Park
on a clear day and
on a hazy day*

Every year there are over 280 million visitors to our nation's most treasured parks and wilderness areas. Unfortunately, many visitors aren't able to see the spectacular vistas they expect.

*Yosemite National Park
on a clear day and
on a hazy day*

EPA and Regional Offices

U.S. EPA

Office of Air Quality Planning & Standards
MD-15
Research Triangle Park, NC 27711
(919) 541-5551

Region 1

(Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont)
John F. Kennedy Federal Building
One Congress Street
Boston, MA 02203
(617) 565-3476

Region 2

(New Jersey, New York, Puerto Rico, Virgin Islands)
290 Broadway
New York, NY 10007-3198
(212) 637-3725

Region 3

(Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia)
1650 Arch Street
Philadelphia, PA 19103-2029
(215) 814-2100

Region 4

(Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee)
61 Forsyth Street
Atlanta, GA 30303
(404) 562-9077

Region 5

(Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)
77 West Jackson Boulevard
Chicago, IL 60604-3507
(312) 353-2212

Region 6

(Arkansas, Louisiana, New Mexico, Oklahoma, Texas)
Fountain Place, 12th Floor, Suite 1200
1445 Ross Avenue
Dallas, TX 75202-2733
(214) 665-7200

Region 7

(Iowa, Kansas, Missouri, Nebraska)
901 North Fifth Street
Kansas City, KS 66101
(913) 551-7020

Region 8

(Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming)
999 18th Street, Suite 500
Denver, CO 80202-2466
(303) 312-6041

Region 9

(Arizona, California, Hawaii, Nevada, Guam, American Samoa)
75 Hawthorne Street
San Francisco, CA 94105
(415) 744-1219

Region 10

(Alaska, Idaho, Oregon, Washington)
1200 Sixth Avenue
Seattle, WA 98101
(206) 553-4273

Other Federal Offices

National Park Service

Air Resources Division
P.O. Box 25287
Lakewood, CO 80225
(303) 969-2074

U.S. Fish and Wildlife Service

Air Quality Branch
P.O. Box 25287
Lakewood, CO 80225
(303) 969-2617

U.S. Forest Service

201 14th Street, SW
at Independence Avenue, SW
Washington, DC 20024
(202) 205-1473

U.S. EPA

401 M Street, SW
Washington, DC 20460
(202) 564-7400

Homepage: <http://www.epa.gov/air>

EPA's Efforts to Improve and Protect Visibility

The U.S. Environmental Protection Agency (EPA), states, local governments, and other federal agencies are working to reduce the pollution that causes regional haze. Protecting and improving visibility is a crucial component of EPA's strategy for cleaner air.

Regional haze affects some of our nation's most treasured areas, including the Grand Canyon, Yellowstone, Acadia, and Shenandoah. To improve visibility in national parks and wilderness areas, EPA has issued regulations to reduce emissions that cause haze. These regional haze regulations address a variety of pollution sources that cause visibility impairment across broad geographic areas. EPA's earlier regulations focused on specific pollution sources that contributed to local visibility problems. The regional haze regulations call for states to establish goals for improving visibility and to develop long-term strategies aimed at returning visibility to natural conditions.

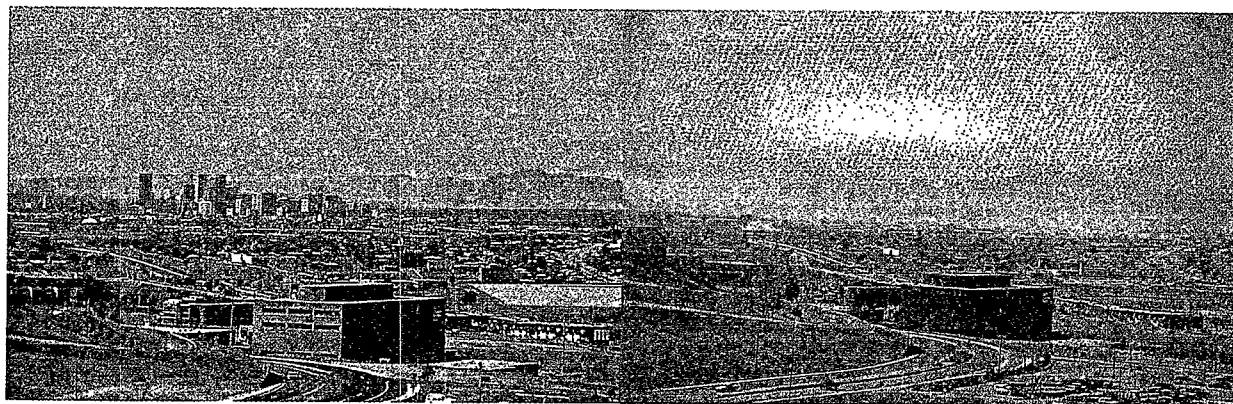
The regional haze regulations also call for coordinated efforts between the states to meet particulate matter health standards. The program applies to all states, based on evidence that very small particles can be carried by the wind hundreds of miles. Each state is

to address its contribution to visibility problems in national parks and wilderness areas both within and outside its borders. EPA encourages states to work in regional groups to develop and implement their air quality plans.

Other Air Pollution Programs

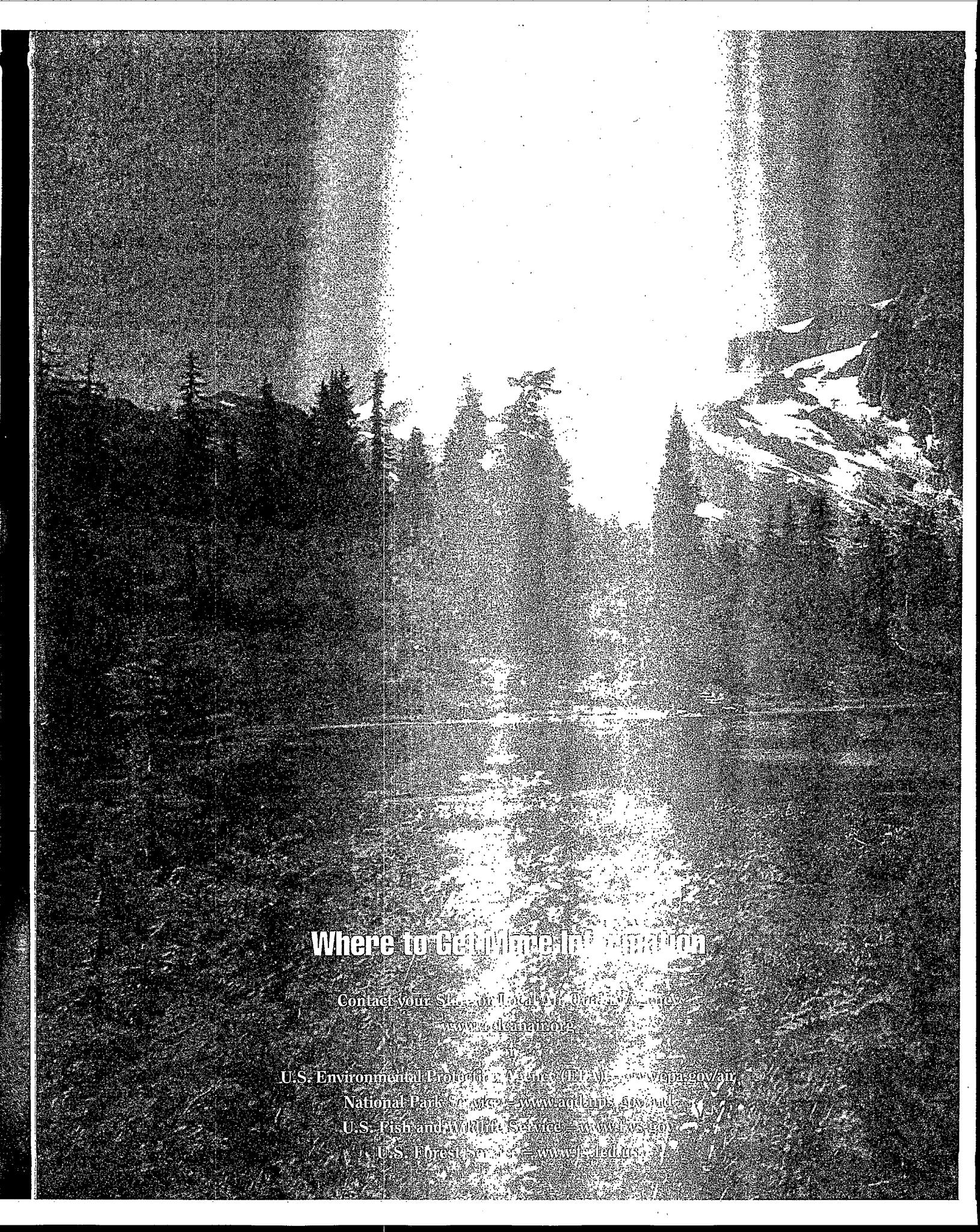
Other air pollution reduction programs also contribute to visibility protection. In developing strategies for regional haze, states can take credit for emission reductions realized through other programs, such as:

- Acid Rain Program – To help reduce acid rain, this national program targets reductions in sulfur dioxide and nitrogen oxides from coal-fired power plants.
- National Ambient Air Quality Standards for Ozone and Particulate Matter – To meet national health-protection standards, state and local agencies are implementing emission reduction programs.
- Regional Transport of Nitrogen Oxides – This program targets reductions in emissions of nitrogen oxides in 22 eastern states. Nitrogen oxides can be transported long distances and contribute to ground-level ozone formation.
- Tailpipe Emissions and Cleaner Fuels – Tighter tailpipe emission standards for gasoline and diesel-powered vehicles, along with programs for cleaner-burning fuels, will further reduce air pollution.
- Air Toxics Program – Reductions in air toxics emissions from industrial sources such as paper mills, steel mills and incinerators can reduce haze-forming particles.



Denver on a clear day.

Denver on a hazy day.



Where to Get More Information

Contact your State or Local Air Quality Agency
www.epa.gov/air

U.S. Environmental Protection Agency (EPA) — www.epa.gov/air

National Park Service — www.nps.gov

U.S. Fish and Wildlife Service — www.fws.gov

U.S. Forest Service — www.fs.fed.us