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Clean Air Act – Taking Toxics Out of the Air

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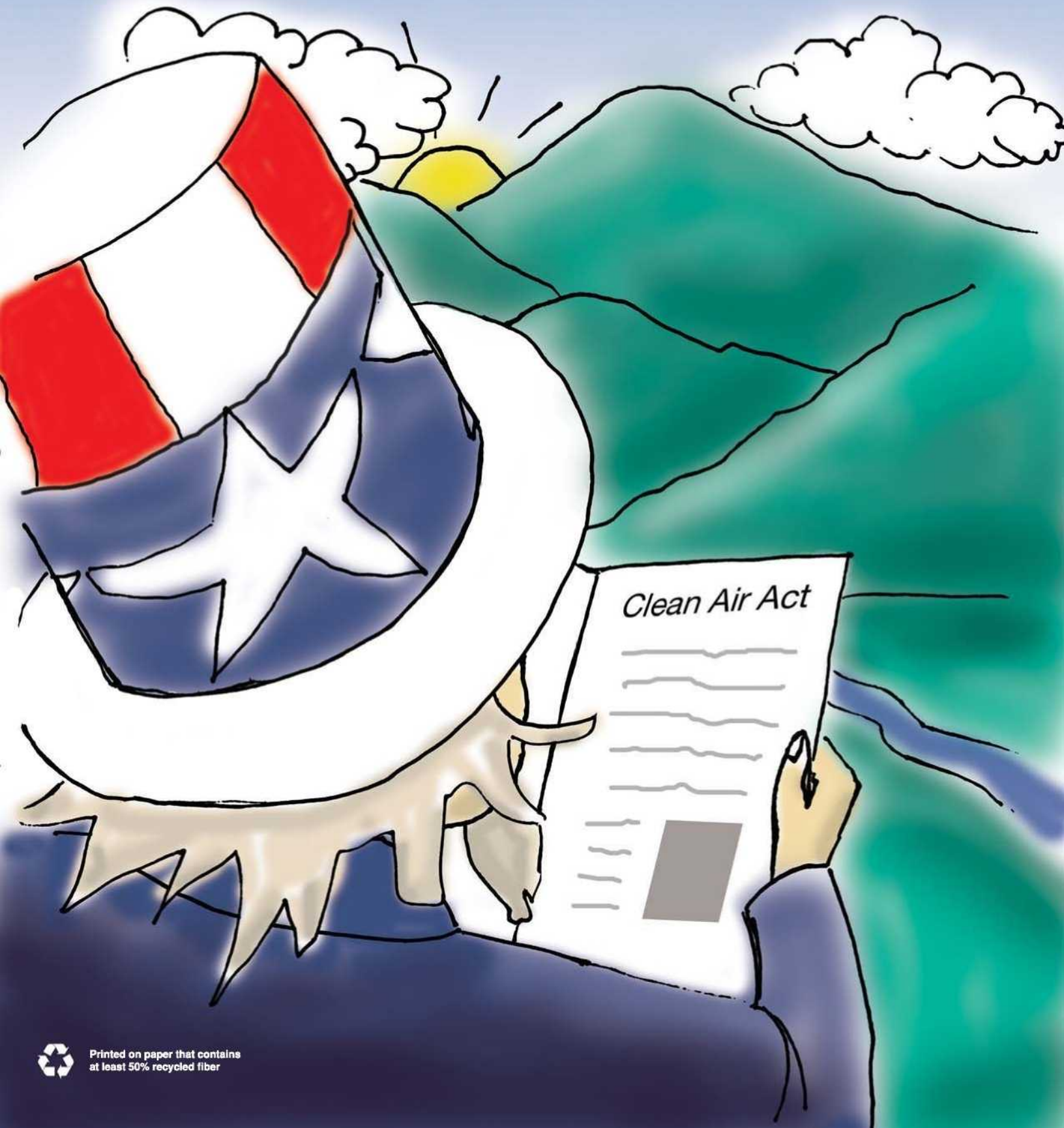
The Plain English Guide To The Clean Air Act



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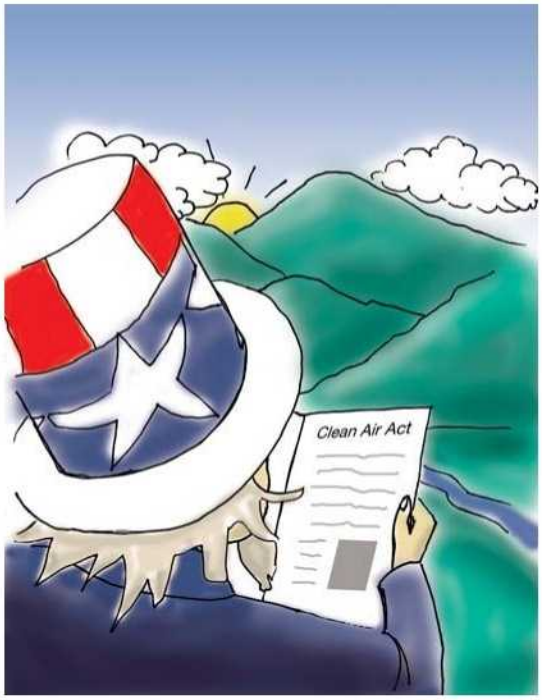
The Plain English Guide to the Clean Air Act



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Why Should You Be
Concerned About Air Pollution?

You could go days without food and hours without water, but you would last only a few minutes without air. On average, each of us breathes over 3,000 gallons of air each day. You must have air to live. However, did you know that breathing polluted air can make you sick?

Air pollution can damage trees, crops, other plants, lakes, and animals. In addition to damaging the natural environment, air pollution also damages buildings, monuments, and statues. It not only reduces how far you can see in national parks and cities, it even interferes with aviation.

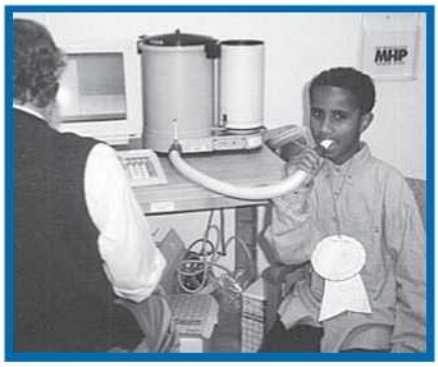
In 1970, Congress created the Environmental Protection Agency (EPA) and passed the Clean Air Act, giving the federal government authority to clean up air pollution in this country. Since then, EPA and states, tribes, local governments, industry, and environmental groups have worked to establish a variety of programs to reduce air pollution levels across America.

The Clean Air Act has helped change the way many of us work or do business. In some cases, it has even changed the way we live. This guide provides a brief introduction to the programs, philosophies, and policies in the Clean Air Act.

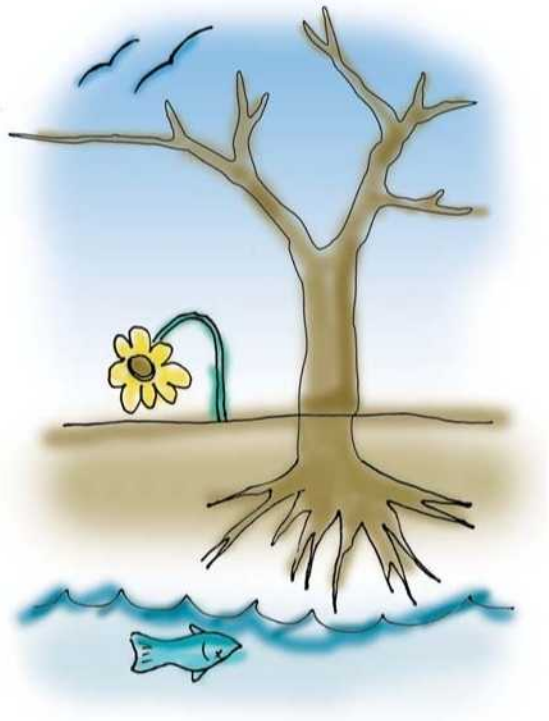
Air Pollution and Your Health

Breathing polluted air can make your eyes and nose burn. It can irritate your throat and make breathing difficult. In fact, pollutants like tiny airborne particles and ground-level ozone can trigger respiratory problems, especially for people with asthma. Today, nearly 30 million adults and children in the United States have been diagnosed with asthma. Asthma sufferers can be severely affected by air pollution. Air pollution can also aggravate health problems for the elderly and others with heart or respiratory diseases.

Testing for asthma in Minneapolis, Minnesota. Air pollution can trigger and aggravate asthma in children.



Ian Greaves, M.D., University of Minnesota School of Public Health, Minneapolis, MN



Some toxic chemicals released in the air such as benzene or vinyl chloride are highly toxic and can cause cancer, birth defects, long term injury to the lungs, as well as brain and nerve damage. And in some cases, breathing these chemicals can even cause death.

Other pollutants make their way up into the upper atmosphere, causing a thinning of the protective ozone layer. This has led to changes in the environment and dramatic increases in skin cancers and cataracts (eye damage).

Air Pollution and the Environment

Air pollution isn't just a threat to our health, it also damages our environment. Toxic air pollutants and the chemicals that form acid rain and ground-level ozone can damage trees, crops, wildlife, lakes and other bodies of water. Those pollutants can also harm fish and other aquatic life.

Air Pollution and the Economy

The health, environmental, and economic impacts of air pollution are significant. Each day, air pollution causes thousands of illnesses leading to lost days at work and school. Air pollution also reduces agricultural crop and commercial forest yields by billions of dollars each year.

By reducing air pollution, the Clean Air Act has led to significant improvements in human health and the environment in the United States.

Since 1970,

- the six commonly found air pollutants have decreased by more than 50 percent,
- air toxics from large industrial sources, such as chemical plants, petroleum refineries, and paper mills have been reduced by nearly 70 percent,
- new cars are more than 90 percent cleaner and will be even cleaner in the future, and
- production of most ozone-depleting chemicals has ceased.

At the same time,

- the U.S. gross domestic product, or GDP, has tripled,
- energy consumption has increased by 50 percent, and
- vehicle use has increased by almost 200 percent.

Understanding
the Clean Air Act

Brief History of the Clean Air Act

In October 1948, a thick cloud of air pollution formed above the industrial town of Donora, Pennsylvania. The cloud which lingered for five days, killed 20 people and caused sickness in 6,000 of the town's 14,000 people. In 1952, over 3,000 people died in what became known as London's "Killer Fog." The smog was so thick that buses could not run without guides walking ahead of them carrying lanterns.

Events like these alerted us to the dangers that air pollution poses to public health. Several federal and state laws were passed, including the original Clean Air Act of 1963, which established funding for the study and the cleanup of air pollution. But there was no comprehensive federal response to address air pollution until Congress passed a much stronger Clean Air Act in 1970. That same year Congress created the EPA and gave it the primary role in carrying out the law. Since 1970, EPA has been responsible for a variety of Clean Air Act programs to reduce air pollution nationwide.

In 1990, Congress dramatically revised and expanded the Clean Air Act, providing EPA even broader authority to implement and enforce regulations reducing air pollutant emissions. The 1990 Amendments also placed an increased emphasis on more cost-effective approaches to reduce air pollution.

Clean Air Act Roles and Responsibilities

The Clean Air Act is a federal law covering the entire country. However, states, tribes and local governments do a lot of the work to meet the Act's requirements. For example, representatives from these agencies work with companies to reduce air pollution. They also review and approve permit applications for industries or chemical processes.

EPA's Role

Under the Clean Air Act, EPA sets limits on certain air pollutants, including setting limits on how much can be in the air anywhere in the United States. This helps to ensure basic health and environmental protection from air pollution for all Americans. The Clean Air Act also gives EPA the authority to limit emissions of air pollutants coming from sources like chemical plants, utilities, and steel mills. Individual states or tribes may have stronger air pollution laws, but they may not have weaker pollution limits than those set by EPA.

EPA must approve state, tribal, and local agency plans for reducing air pollution. If a plan does not meet the necessary requirements, EPA can issue sanctions against the state and, if necessary, take over enforcing the Clean Air Act in that area.

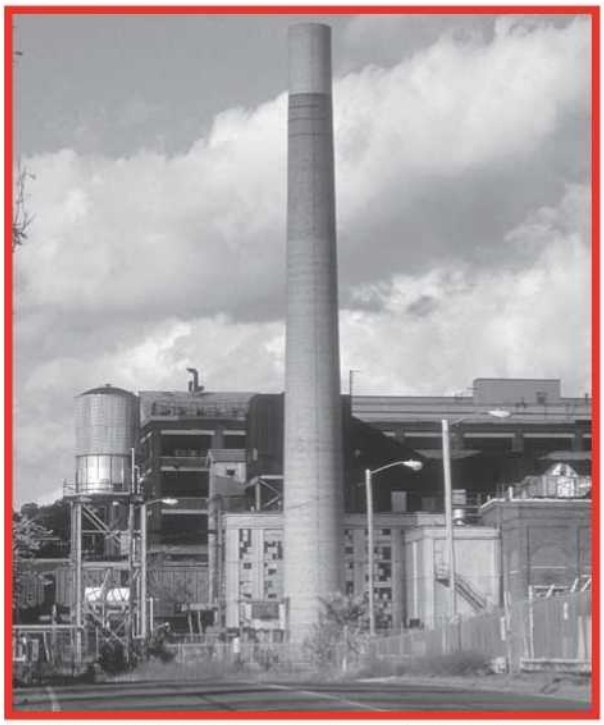
EPA assists state, tribal, and local agencies by providing research, expert studies, engineering designs, and funding to support clean air progress. Since 1970, Congress and the EPA have provided several billion dollars to the states, local agencies, and tribal nations to accomplish this.

State and Local Governments' Role

It makes sense for state and local air pollution agencies to take the lead in carrying out the Clean Air Act. They are able to develop solutions for pollution problems that require special understanding of local industries, geography, housing, and travel patterns, as well as other factors.

State, local, and tribal governments also monitor air quality, inspect facilities under their jurisdictions and enforce Clean Air Act regulations.

States have to develop State Implementation Plans (SIPs) that outline how each state will control air pollution under the Clean Air Act. A SIP is a collection of the regulations, programs and policies that a state will use to clean up polluted areas. The states must involve the public and industries through hearings and opportunities to comment on the development of each state plan.



The Clean Air Act includes a variety of approaches for dealing with pollution released by large industrial sources.

Tribal Nations' Role

In its 1990 revision of the Clean Air Act, Congress recognized that Indian Tribes have the authority to implement air pollution control programs.

EPA's Tribal Authority Rule gives Tribes the ability to develop air quality management programs, write rules to reduce air pollution and implement and enforce their rules in Indian Country. While state and local agencies are responsible for all Clean Air Act requirements, Tribes may develop and implement only those parts of the Clean Air Act that are appropriate for their lands.

Key Elements
of the Clean Air Act

EPA's mission is to protect human health and the environment. To achieve this mission, EPA implements a variety of programs under the Clean Air Act that focus on:

- reducing outdoor, or ambient, concentrations of air pollutants that cause smog, haze, acid rain, and other problems;
- reducing emissions of toxic air pollutants that are known to, or are suspected of, causing cancer or other serious health effects; and
- phasing out production and use of chemicals that destroy stratospheric ozone.

These pollutants come from stationary sources (like chemical plants, gas stations, and powerplants) and mobile sources (like cars, trucks, and planes).

Cleaning Up Commonly Found Air Pollutants

Six common air pollutants (also known as "criteria pollutants") are found all over the United States. They are particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants can harm your health and the environment, and cause property damage. Of the six pollutants, particle pollution and ground-level ozone are the most widespread health threats. Details about these two pollutants are discussed below. For information about the other common pollutants, visit EPA's website at www.epa.gov/air/urbanair/.

EPA calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels. The set of limits based on human health is called primary standards. Another set of limits intended to prevent environmental and property damage is called secondary standards. A geographic area with air quality that is cleaner than the primary standard is called an "attainment" area; areas that do not meet the primary standard are called "nonattainment" areas.

How Smog Is Formed

Many pollution sources, including cars, manufacturing and chemical plants, and products used in homes, release smog-forming pollutants. Winds blow the pollutants away from their sources and the heat of the summer sun causes chemical reactions that form ground-level ozone—a principal component of smog.

Hours after the smog-forming pollutants are released from their sources, smog pollutes the air, often many miles away from where the pollutants were released.

EPA has been developing programs to cut emissions of these commonly found air pollutants since the Clean Air Act was passed in 1970. It's a big job, and although a great deal of progress has been made, it will take time to make the air healthy throughout the country. For the latest information on air quality trends in the U.S., visit www.epa.gov/airtrends. There are still several areas of the country, including many large cities, that are classified as nonattainment for at least one of the six common pollutants. Despite continued improvements in air quality, millions of people live in areas with monitoring data measuring unhealthy levels of pollution.

To see whether your area is attainment or nonattainment, contact your local air pollution control agency or visit EPA's website at: www.epa.gov/air/urbanair.

Particle Pollution

Particle pollution, also known as particulate matter (PM), includes the very fine dust, soot, smoke, and droplets that are formed from chemical reactions, and produced when fuels such as coal, wood, or oil are burned. For example, sulfur dioxide and nitrogen oxide gases from motor vehicles, electric power generation, and industrial facilities react with sunlight and water vapor to form particles. Particles may also come from fireplaces, wood stoves, unpaved roads, crushing and grinding operations, and may be blown into the air by the wind.

EPA scientists and other health experts are concerned about particle pollution because very small or "fine" particles can get deep into the lungs. These fine particles, by themselves, or in combination with other air pollutants, can cause increased emergency room visits and hospital admissions for respiratory illnesses, and tens of thousands of deaths each year. They can aggravate asthma, cause acute respiratory symptoms such as coughing, reduce lung function resulting in shortness of breath, and cause chronic bronchitis.

The elderly, children, and asthmatics are particularly susceptible to health problems caused by breathing fine particles. Individuals with pre-existing heart or lung disease are also at an increased risk of health problems due to particle pollution.

Particles also cause haze reducing visibility in places like national parks and wilderness areas that are known for their scenic vistas. These are places where we expect to see clearly for long distances. In many parts of the United States, pollution has reduced the distance and clarity of what we see by 70 percent.

Fine particles can remain suspended in the air and travel long distances with the wind. For example, over 20 percent of the particles that form haze in the Rocky Mountains National Park have been estimated to come from hundreds of miles away.

Particles also make buildings, statues and other outdoor structures dirty. Trinity Church in downtown New York City was black until a few years ago, when cleaning off almost 200 years worth of soot brought the church's stone walls back to their original light pink color.

Before the 1990 Clean Air Act went into effect, EPA set limits on airborne particles smaller than 10 micrometers in diameter called PM_{10}. These are tiny particles (seven of these particles lined up next to each other would cover a distance no wider than a human hair). Research has shown that even smaller particles (1/4 the size of a PM_{10} particle) are more likely to harm our health. So in 1997, EPA published limits for fine particles, called $PM_{2.5}$. To reduce particle levels, additional controls are being required on a variety of sources including power plants and diesel trucks.

Protecting the Public from Particle Pollution

EPA is tackling particle pollution in several different ways.

- EPA's health-based standards include limits for smaller-sized or "fine" particles. States are taking actions to meet these standards. To learn more, visit www.epa.gov/particles.
- EPA's rule for Clean Diesel Trucks and Buses will result in a fleet of heavy-duty trucks and buses that will be 95 percent cleaner than today's trucks and buses. To learn more, visit www.epa.gov/otaq/diesel.
- Visibility protection regulations are designed to reduce emissions that cause haze in our national parks and wilderness areas. States are working together on strategies to improve visibility in these natural areas. To learn more, visit www.epa.gov/visibility.
- EPA created the Air Quality Index (AQI) to provide simple information on local air quality, the health concerns for different levels of air pollution, and how people can protect their health when pollutants reach unhealthy levels. To learn more, visit www.airnow.gov.

Pollution Prevention in Consumer Products

Hair sprays, interior and exterior paints, foam plastic products (such as disposable foam cups), charcoal fire starter — all are consumer products whose production, use, or disposal can contribute to air pollution.

Volatile organic compounds (VOC) emitted from the use of consumer products can cause or contribute to ozone levels that violate the air quality standards EPA set for ground-level ozone.

In 1998, EPA issued a rule limiting VOC emissions from consumer products. It requires many United States manufacturers, importers, and distributors to limit the VOC content of their products. EPA also issued a rule limiting emissions from architectural coatings (exterior and interior house paints, wood and roof coatings).

Ground-level Ozone

Ground-level ozone is a primary component of smog. Ground-level ozone can cause human health problems and damage forests and agricultural crops. Repeated exposure to ozone can make people more susceptible to respiratory infections and lung inflammation. It also can aggravate pre-existing respiratory diseases, such as asthma. Children are at risk from ozone pollution because they are outside, playing and exercising, during the summer days when ozone levels are at their highest. They also can be more susceptible because their lungs are still developing. People with asthma and even active healthy adults, such as construction workers, can experience a reduction in lung function and an increase in respiratory symptoms (chest pain and coughing) when exposed to low levels of ozone during periods of moderate exertion.

The two types of chemicals that are the main ingredients in forming ground-level ozone are called volatile organic compounds (VOCs) and nitrogen oxides (NO_x). VOCs are released by cars burning gasoline, petroleum refineries, chemical manufacturing plants, and other industrial facilities. The solvents used in paints and other consumer and business products contain VOCs. The 1990 Clean Air Act has resulted in changes in product formulas to reduce the VOC content of those products. Nitrogen oxides (NO_x) are produced when cars and other sources like power plants and industrial boilers burn fuels such as gasoline, coal, or oil. The reddish-brown color you sometimes see when it is smoggy comes from the nitrogen oxides.

But I Thought the Ozone Layer Was a Good Thing?!

It is! In the upper atmosphere, called the stratosphere, ozone naturally occurs and forms a protective layer that shields the Earth from some of the sun's ultraviolet (UV) light. Exposure to some forms of UV light has been linked to cataracts (eye damage), skin cancer, and plant damage. This high-altitude ozone, therefore, protects human health and the environment.

Ground-level ozone, on the other hand, is harmful. It can cause serious health problems and damage forests and crops. Ground-level ozone affects the respiratory system, aggravating asthma and causing lung inflammation.

So, whether ozone is "good" or "bad" depends on its location – at ground level, it is "bad," in the upper atmosphere, it is "good."

The pollutants that react to form ground-level ozone literally cook in the sky during the hot summertime season. It takes time for smog to form—several hours from the time pollutants get into the air until the ground-level ozone reaches unhealthy levels. For more information on days when air quality is expected to be unhealthy, visit EPA's website at www.airnow.gov.

Weather and the lay of the land (for example, hills around a valley, high mountains between a big industrial city and suburban or rural areas) help determine where ground-level ozone goes and how bad it gets. When temperature inversions occur (warm air stays trapped near the ground by a layer of cooler air) and winds are calm, high concentrations of ground-level ozone may persist for days at a time. As traffic and other sources add more ozone-forming pollutants to the air, the ground-level ozone gets worse.

How the Clean Air Act Reduces Air Pollution Such as Particle Pollution and Ground-level Ozone

First, EPA works with state governors and tribal government leaders to identify "nonattainment" areas where the air does not meet allowable limits for a common air pollutant. States and tribes usually do much of the planning for cleaning up common air pollutants. They develop plans, called State/Tribal Implementation Plans, to reduce air pollutants to allowable levels. Then they use a permit system as part of their plan to make sure power plants, factories, and other pollution sources meet their goals to clean up the air.

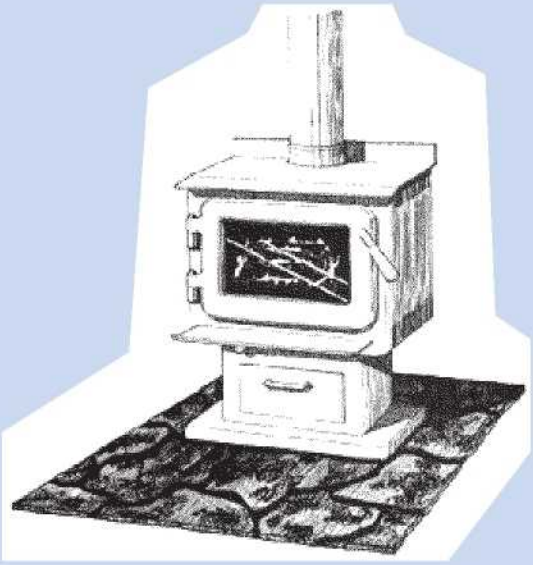
The Clean Air Act requirements are comprehensive and cover many different pollution sources and a variety of clean-up methods to reduce common air pollutants. Many of the clean-up requirements for particle pollution and ground-level ozone involve large industrial sources (power plants, chemical producers, and petroleum refineries), as well as motor vehicles (cars, trucks, and buses). Also, in nonattainment areas, controls are generally required for smaller pollution sources, such as gasoline stations and paint shops.

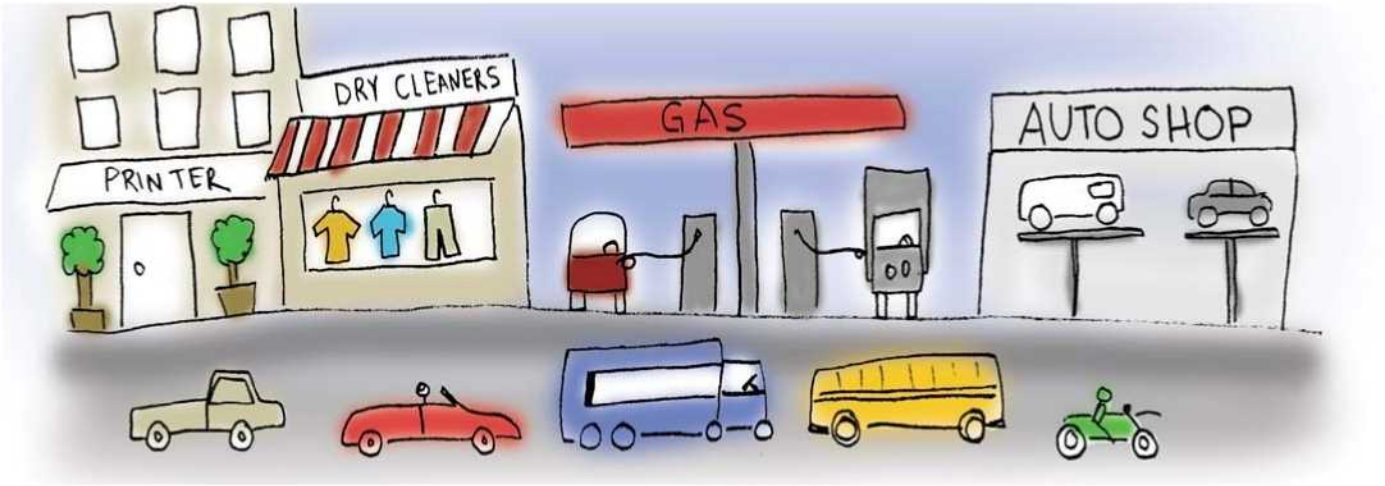
Wood Stoves and Fireplaces

Residential wood smoke (from wood stoves, fireplaces, and outdoor wood-fired hydronic heaters) contributes 6 percent (420,000 tons) of the total amount of fine particle pollution ($PM_{2.5}$) directly emitted in the United States each year. That contribution can be significantly higher in some areas with increased wood burning. EPA and state and local agencies are working on a number of fronts to help reduce residential wood smoke pollution. To learn more, visit www.epa.gov/woodstoves.

If you use wood:

- **replace your old wood stove or fireplace with an EPA-certified model, and get more heat and less pollution while burning less wood;**
- **burn only clean, dry, "seasoned" wood;**
- **regularly remove ashes from your wood stove and store outside away from wood.**





Cars, Trucks, Buses, and "Nonroad" Equipment

Today, motor vehicles are responsible for nearly one-half of smog-forming volatile organic compounds (VOCs), more than half of the nitrogen oxide (NOx) emissions, and about half of the toxic air pollutant emissions in the United States. Motor vehicles, including nonroad vehicles, now account for 75 percent of carbon monoxide emissions nationwide.

The total vehicle miles people travel in the United States increased 178 percent between 1970 and 2005 and continues to increase at a rate of two to three percent each year. In the United States, there are more than 210 million cars and light-duty trucks on the road. In addition, the types of cars people drive have changed greatly since 1970. Beginning in the late 1980s, Americans began driving more vans, sport utility vehicles (SUVs), and pickup trucks as personal vehicles. By the year 2000, these "light-duty trucks" accounted for about half of the new passenger car sales. These bigger vehicles typically consume more gasoline per mile and many of them pollute three to five times more than cars.

The Clean Air Act takes a comprehensive approach to reducing pollution from these sources by requiring manufacturers to build cleaner engines; refiners to produce cleaner fuels; and certain areas with air pollution problems to adopt and run passenger vehicle inspection and maintenance programs. EPA has issued a series of regulations affecting passenger cars, diesel trucks and buses, and so-called "nonroad" equipment (recreational vehicles, lawn and garden equipment, etc.) that will dramatically reduce emissions as people buy new vehicles and equipment.

Cleaner Cars

The Clean Air Act required EPA to issue a series of rules to reduce pollution from vehicle exhaust, refueling emissions and evaporating gasoline. As a result, emissions from a new car purchased today are well over 90 percent cleaner than a new vehicle purchased in 1970. This applies to SUVs and pickup trucks, as well. Beginning in 2004, all new passenger vehicles – including SUVs, minivans, vans and pick-up trucks – must meet more stringent tailpipe emission standards. This marks the first time that light-duty trucks, including SUVs, pickups, and minivans are subject to the same national pollution standards as cars. As more of these cleaner vehicles enter the national fleet, harmful emissions will drop dramatically.

These reductions would not be possible without cleaner, very low sulfur gasoline and diesel fuel. In addition to their direct emissions benefits, cleaner fuels enable sophisticated emission control devices to effectively control pollution. Congress recognized the importance of cleaner fuels to reducing motor vehicle emissions and gave EPA authority to regulate fuels in the Clean Air Act.

Lead and Other Toxic Pollutants

One of EPA's earliest accomplishments was the elimination of lead from gasoline. Elevated levels of lead can damage organs and the brain and nervous system, and affect the heart and blood. Adverse health effects range from behavior disorders and anemia to mental retardation and permanent nerve damage. Children are especially susceptible to lead's toxic effects on the nervous system, which can result in learning deficits and lowered IQ. In the mid-1970s, EPA began its lead phase-out effort by proposing to limit the amount of lead that could be used in gasoline. By the summer of 1974, unleaded gasoline was widely

available around the country, improving public health and providing protection for the catalytic converters that manufacturers began to install on all new vehicles. This effort was followed by even stronger restrictions on the use of lead in gasoline in the 1980s. In 1996, leaded gasoline was finally banned as a result of the Clean Air Act.

Under the Clean Air Act, EPA has also put into place standards to reduce toxic air emissions from mobile sources. These standards will cut toxic emissions from gasoline, vehicles, and even gas containers.

Reformulated Gasoline

The Clean Air Act requires certain metropolitan areas with the worst ground-level ozone pollution to use gasoline that has been reformulated to reduce air pollution. Other areas, including the District of Columbia and 17 states, with ground-level ozone levels exceeding the public health standards, have voluntarily chosen to use reformulated gasoline. Reformulated gasoline reduces emissions of toxic air pollutants, such as benzene, as well as pollutants that contribute to smog.

Low Sulfur Fuels

Beginning in 2006, refiners have been supplying gasoline with sulfur levels much lower than in the past, reducing the sulfur levels in gasoline by 90 percent. Sulfur in gasoline inhibits a vehicle's catalytic converter from effectively cleaning up the exhaust. The advanced vehicle emission control systems in passenger cars and light trucks are even more sensitive to sulfur, so reducing the sulfur content of gasoline will ensure that vehicle emission control devices are effective in reducing pollution. In addition to cutting emissions from new vehicles, lower sulfur fuel will result in lower emissions from vehicles currently on the road.

Since 2006, refiners have begun supplying diesel fuel with very low sulfur levels for highway diesel vehicles. As with gasoline vehicles, efficient new emission controls on diesel engines require this "Ultra-Low Sulfur Diesel" (ULSD) fuel to function properly. Highway diesel fuel sulfur levels are 97 percent cleaner than diesel prior to 2006. In 2007, refiners began reducing sulfur in diesel fuel used for nonroad diesel engines, such as construction equipment.

The Clean Air Act requires the installation of vapor recovery nozzles at gas stations in certain areas. These gas pump nozzles reduce the release of gasoline vapor into the air when people put gas in their cars.

Alternative Fuels

The Clean Air Act encourages development and sale of alternative fuels. Alternative fuels are transportation fuels other than gasoline and diesel, including natural gas, propane, methanol, ethanol, electricity, and biodiesel. These fuels can be cleaner than gasoline or diesel and can reduce emissions of harmful pollutants. Renewable alternative fuels are made from biomass materials like wood, waste paper, grasses, vegetable oils, and corn. They are biodegradable and reduce carbon dioxide emissions. In addition, most alternative fuels are produced domestically, which is better for our economy, energy security and helps offset the cost of imported oil.

The Clean Air Act also requires EPA to establish a national renewable fuel (RF) program. This program is designed to significantly increase the volume of renewable fuel that is blended into gasoline and diesel.

Cleaner Trucks, Buses and "Nonroad" Equipment

Diesel engines are more durable and are more fuel efficient than gasoline engines, but can pollute significantly more. Heavy-duty trucks and buses account for about one-third of nitrogen oxides emissions and one-quarter of particle pollution emissions from transportation sources. In some large cities, the contribution is even greater. Similarly, nonroad diesel engines such as construction and agricultural equipment emit large quantities of harmful particle pollution and nitrogen oxides, which contribute to ground-level ozone and other pervasive air quality problems.

Photo - Steve Delaney

In the past, buses released large quantities of pollutants. Cleaner, less-polluting buses resulted from the 1990 Clean Air Act Amendments.

EPA has issued rules to cut emissions from onroad and nonroad vehicles by more than 90 percent by combining stringent emissions standards for diesel engines and clean, ultra-low sulfur diesel fuel. Under the Clean Air Act, EPA is also addressing pollution from a range of nonroad sources, including locomotives and marine vessels, recreational vehicles, and lawn and garden equipment. Together these sources comprise a significant portion of emissions from the transportation sector.

Transportation Policies

Congress required "conformity" in the Clean Air Act Amendments of 1990. In other words, transportation projects such as construction of highways and transit rail lines cannot be federally funded or approved unless they are consistent with state air quality goals. In addition, transportation projects must not cause or contribute to new violations of the air quality standards, worsen existing violations, or delay attainment of air quality standards.

The conformity provisions require areas that have poor air quality now, or had it in the past, to examine the long-term air quality impacts of their transportation system and ensure that it is compatible with the area's clean air goals. In doing so, those areas must assess the impacts of growth on air pollution and decide how to manage growth. State and local agencies must work together to either change the transportation plan and/or the state air plan to achieve the necessary emission reductions.

Inspection and Maintenance Programs

Proper maintenance of a car's engine and pollution control equipment is critical to reduce excessive air pollution. To help ensure that such maintenance occurs, the Clean Air Act requires certain areas with air pollution problems to run inspection and maintenance (I/M) programs. The 1990 Act also established the requirement that passenger vehicles be equipped with on board diagnostics. The diagnostics system is designed to trigger a dashboard "check engine" light alerting the driver of a possible pollution control device malfunction. To help ensure that motorists respond to the "check engine" light in a timely manner, the Act requires that I/M programs include an inspection of the on board diagnostic system.

Interstate and International Air Pollution

Air pollution does not recognize state or international boundaries. Pollutants can be carried long distances by the wind. Dirty air even turns up in places where you least expect it, like national parks or wilderness areas in remote parts of the United States.

Taller smokestacks can lift pollutants high above a local community but help pollutants get into

More cars driving more miles! This is why air pollution from cars has not improved as much as we had hoped, even though individual cars produce less pollution than they used to.

wind currents that can carry them hundreds, even thousands, of miles. For example, emissions from power plants and industrial boilers can travel hundreds of miles and contribute to smog, haze, and air pollution in downwind states. One family of pollutants, nitrogen oxides, also reacts with other chemicals, sunlight and heat to form ground-level ozone. The nitrogen oxides and the ozone itself can be transported with the weather to help cause unhealthy air in cities and towns far downwind.

States and tribes seeking to clean up air pollution are sometimes unable to meet EPA's national standards because of pollution blowing in from other areas. The Clean Air Act has a number of programs designed to reduce long-range transport of pollution from one area to another. The Act has provisions designed to ensure that emissions from one state are not contributing to public health problems in downwind states. It does this, in part, by requiring that each state's implementation plan contain provisions to prevent the emissions from the facilities or sources within its borders from contributing significantly to air pollution problems "downwind" – specifically in those areas that fail to meet EPA's national air quality standards. If a state or tribe has not developed the necessary plan to address this downwind pollution, EPA can require the state to do so. If the state still does not take the necessary action, EPA can implement a federal plan to achieve the necessary emission reductions.

Also, the Act gives any state or tribe the authority to ask EPA to set emission limits for specific sources of pollution in other (upwind) areas that significantly contribute to its air quality problems. States and tribes can petition EPA to require the upwind areas to reduce air pollution.

The Act provides for interstate commissions to develop regional strategies for cleaning up air pollution. For instance, state and tribal governments from Maine to Virginia, the government of the District of Columbia, and EPA are working together through the Ozone Transport Commission (OTC) to reduce ground-level ozone along the east coast.

The Clean Air Act also requires EPA to work with states to reduce the regional haze that affects visibility in 156 national parks and wilderness areas, including the Grand Canyon, Yosemite, the Great Smokies, and Shenandoah National Parks. During much of the year in these areas, a veil of white or brown haze hangs in the air blurring the view. Most of this haze is not natural. It is air pollution, carried by the wind often many hundreds of miles from where it originated. Under the regional haze provisions of the Clean Air Act, the states and tribes, in coordination with the EPA, the National Park Service, U.S. Fish and Wildlife Service, the U.S. Forest Service, and others, develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. EPA has worked with states and tribes across the country to form Regional Planning Organizations to develop plans to reduce pollutants that cause haze.

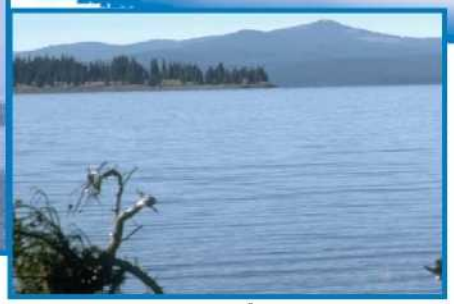
Air Pollution Travels Long Distances

- **Toxaphene, a pesticide used in the U. S. corn belt has been found in fatty tissues of polar bears and other Arctic animals – thousands of miles from any possible source.**
- **Nitrogen oxides deposited from the air have contributed to fish kills by increasing the growth of oxygen-depleting algae in the Chesapeake Bay. Over a quarter of the nitrogen in the Bay and its tidal rivers and streams is estimated to come from air pollution carried by the wind from power plants and industrial sources far away.**
- **Emissions of sulfur oxides from power plants in the Midwest contribute to acid rain, haze and particle pollution problems in the eastern United States hundreds of miles away.**

Clearing the Air in Our National Parks

Yellowstone

poor



good

Rocky Mountains

poor

good

Big Bend

poor

good

You might not expect air pollution in our national parks, especially since many are far from big cities and polluting industries. However, air pollution carried far from its sources has caused major reduction in visibility in some of our best-loved national parks. The Clean Air Act has provisions for reducing "regional haze," air pollution that reduces visibility in the national parks. To learn more, visit www.epa.gov/visibility.

These photos show how good and bad the visibility can be at national parks from coast to coast. You can see real-time pictures of visibility at several national parks by visiting the National Park Service Website, www.nps.gov. Air resource specialists at the national parks—rangers who specialize in air pollution—present visitor programs, participate in air pollution monitoring and research, and provide information to visitors interested in air quality.

Photos - National Park Service and Colorado State University

Acadia

poor

good

Shenandoah

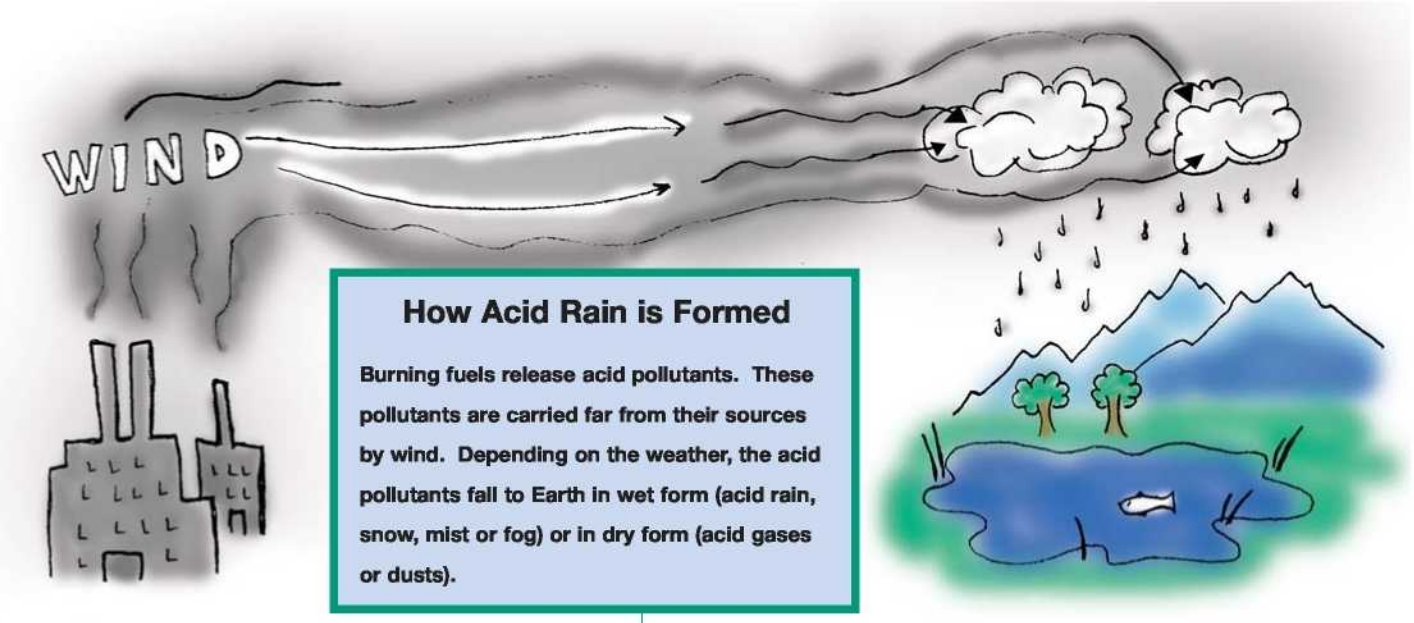
poor

good

Great Smoky Mountains

poor

good



How Acid Rain is Formed

Burning fuels release acid pollutants. These pollutants are carried far from their sources by wind. Depending on the weather, the acid pollutants fall to Earth in wet form (acid rain, snow, mist or fog) or in dry form (acid gases or dusts).

Reducing Acid Rain

You have probably heard of "acid rain." But you may not have heard of other forms of acid precipitation such as acid snow, acid fog or mist, or dry forms of acidic pollution such as acid gas and acid dust. All of these can be formed in the atmosphere and fall to Earth causing human health problems, hazy skies, environmental problems and property damage. Acid precipitation is produced when certain types of air pollutants mix with the moisture in the air to form an acid. These acids then fall to Earth as rain, snow, or fog. Even when the weather is dry, acid pollutants may fall to Earth in gases or particles.

Sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are the principal pollutants that cause acid precipitation. SO_2 and NO_x emissions released to the air react with water vapor and other chemicals to form acids that fall back to Earth. Power plants burning coal and heavy oil produce over two-thirds of the annual SO_2 emissions in the United States. The majority of NO_x (about 50 percent) comes from cars, buses, trucks, and other forms of transportation. About 40 percent of NO_x emissions are from power plants. The rest is emitted from various sources like industrial and commercial boilers.

Heavy rainstorms and melting snow can cause temporary increases in acidity in lakes and streams, primarily in the eastern United States. The temporary increases may last for days or even weeks, causing harm to fish and other aquatic life.

The air pollutants that cause acid rain can do more than damage the environment—they can damage our health. High levels of SO_2 in the air aggravate various lung problems in people with asthma and can cause breathing difficulties in children and the elderly. In some instances, breathing high levels of SO_2 can even damage lung tissue and cause premature death.

Acid Rain's Harmful Effects

Acid lakes and streams have been found all over the country. For instance, lakes in Acadia National Park on Maine's Mt. Desert Island have become acidic due to pollution from the midwest and the east coast. Streams in Maryland and West Virginia, as well as lakes in the Upper Peninsula of Michigan, have been damaged by acid rain. Since the wind can carry pollutants across the country, the effects of acid rain can be seen far from the original source of the acid-forming pollutant.

Acid rain has damaged trees in the mountains of Vermont and other states. Red spruce trees at high altitudes appear to be especially sensitive to acid rain. The pollutants that cause acid rain can make the air hazy or foggy; this occurs in the eastern United States in areas like the Great Smokies and Shenandoah National Park, areas where vacationers go to enjoy the beautiful scenery and awe-inspiring views. In addition to damaging the natural environment, acid rain can damage manmade objects such as stone statues, buildings, and monuments.

The 1990 changes to the Clean Air Act introduced a nationwide approach to reducing acid pollution. The law is designed to reduce acid rain and improve public health by dramatically reducing emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x). Using a market-based cap and trade approach, the program sets a permanent cap on the total amount of SO_2 that may be emitted by electric power plants nationwide. As of 2005, emission reductions were more than 7 million tons from power plants, or 41 percent below 1980 levels.

The initial phase of EPA's Acid Rain Program went into effect in 1995. The law required the highest emitting units at 110 power plants in 21 Midwest, Appalachian, and Northeastern states to reduce emissions of SO_2. The second phase of the program went into effect in 2000, further reducing SO_2 emissions from big coal-burning power plants. Some smaller plants were also included in the second phase of the program. Total SO_2 releases for the nation's power plants are permanently limited to the level set by the 1990 Clean Air Act — about 50 percent of the levels emitted in 1980.

Each allowance is worth one ton of SO_2 emissions released from the plant's smokestack. Plants may only release the amount of SO_2 equal to the allowances they have been issued. If a plant expects to release more SO_2 than it has allowances, it has to purchase more allowances or use technology and other methods to control emissions. A plant can buy allowances from another power plant that has more allowances than it needs to cover its emissions.

There is an allowances market that operates like the stock market, in which brokers or anyone who wants to take part in buying or selling allowances can participate. Allowances are traded and sold nationwide.

EPA's Acid Rain Program has provided bonus allowances to power plants for installing clean coal technology that reduces SO_2 releases, using renewable energy sources (solar, wind, etc.), or encouraging energy conservation by customers so that less power needs to be produced. EPA has also awarded allowances to industrial sources voluntarily entering the Acid Rain Program.

The 1990 Clean Air Act has stiff monetary penalties for plants that release more pollutants than are covered by their allowances. All power plants covered by the Acid Rain Program have to install continuous emission monitoring systems, and instruments that keep track of how much SO_2 and NO_x the plant's individual units are releasing. Power plant operators keep track of this information hourly and report it electronically to EPA four times each year. EPA uses this information to make sure that the plant is not releasing quantities of pollutants exceeding the plant's allowances. A power plant's program for meeting its SO_2 and NO_x limits will appear on the plant's permit, which is filed with the state and EPA and is available for public review.

You can also help to reduce SO_2 and NO_x emissions from power plants by conserving energy and promoting conservation and renewable energy efficiency in your community. Check www.epa.gov/air/actions/at_home.html for energy conservation tips.

Market Approaches and Economic Incentives

Besides the ground-breaking features in the Acid Rain Program, the 1990 Clean Air Act encouraged other innovative approaches that spur technology. These approaches allow businesses greater flexibility in how they comply with the law, and thus clean-up air pollution as efficiently and inexpensively as possible. For example:

- EPA's new cleaner vehicle standards include an averaging system that allows manufacturers to choose how to produce a mix of more- or less-polluting vehicles, as long as the overall fleet average is lower.
- Gasoline refiners can receive credits if they produce cleaner gasoline than required, and they use those credits when their gasoline does not quite meet the clean-up requirements.

Reducing Toxic Air Pollutants

Toxic air pollutants, or air toxics, are known to cause or are suspected of causing cancer, birth defects, reproduction problems, and other serious illnesses. Exposure to certain levels of some toxic air pollutants can cause difficulty in breathing, nausea or other illnesses. Exposure to certain toxic pollutants can even cause death.

Some toxic air pollutants are of concern because they degrade slowly or not at all, as in the case of metals such as mercury or lead. These persistent air toxics can remain in the environment for a long time and can be transported great distances. Toxic air pollutants, like mercury or polychlorinated biphenyls, deposited onto soil or into lakes and streams persist and bioaccumulate in the environment. They can affect living systems and food chains, and eventually affect people when they eat contaminated food. This can be particularly important for American Indians or other communities where cultural practices or subsistence life styles are prevalent.

The majority of air toxics come from manmade sources, such as factory smokestack emissions and motor vehicle exhaust.

Gasoline also contains air toxics. When you put fuel in your car, gases escape and form a vapor. You can smell these vapors when you refuel your vehicle.

When cars and trucks burn gasoline, toxic air pollutants are emitted from the tailpipe. Those air toxics are combustion products—chemicals that are produced when gasoline is burned. EPA is working with industries to develop cleaner-burning fuels and more efficient engines, and is taking steps to make sure that pollution control devices installed in motor vehicles work properly. EPA has issued requirements that are leading to cleaner-burning diesel engines, reducing releases of particle pollution and air toxics.

Air toxics are also released from industrial sources, such as chemical factories, refineries, and incinerators, and even from small industrial and commercial sources, such as dry cleaners and printing shops. Under the 1990 Clean Air Act, EPA has regulated both large and small sources of air toxics, but has mainly focused efforts on larger sources.

Before the 1990 Clean Air Act Amendments, EPA regulated air toxics one chemical at a time. This approach did not work well. Between 1970 and 1990, EPA established regulations for only seven pollutants. The 1990 Clean Air Act Amendments took a completely different approach to reducing toxic air pollutants. The Amendments required EPA to identify categories of industrial sources for 187 listed toxic air pollutants and to take steps to reduce pollution by requiring sources to install controls or change production processes. It makes good sense to regulate by categories of industries rather than one pollutant at a time, since many individual sources release more than one toxic chemical. Developing controls and process changes for industrial source categories can result in major reductions in releases of multiple pollutants at one time.

Persistent Bioaccumulative Toxics (PBTs)

PBTs such as mercury and DDT last for a long time in the environment with little change in their structure or toxic effects. This means that a persistent toxic chemical transported in the wind can be just as toxic 10,000 miles away as it was at the smokestack from which it was released. Some PBTs, such as polychlorinated biphenyls (PCBs), have been found in remote parts of the Arctic, far away from the industrial sources that produce them.

Some of the PBTs that move through the air are deposited into water bodies and are concentrated up through the food chain, harming fish-eating animals and people. Small fish may consume plants that live in water contaminated by PBTs, which are absorbed into plant tissues. Big fish eat smaller fish and as the PBTs pass up the food chain, their levels go up. So a large fish consumed by people may have a much higher concentration of PBTs in its tissues than the simple plant first absorbing the PBTs. PBTs can concentrate in big fish to levels thousands of times the levels found in the contaminated water.

Over 2000 U.S. water bodies are covered by fish consumption advisories, warning people not to eat the fish because of contamination with chemicals, usually PBTs. Those compounds have been linked to illnesses such as cancer, birth defects, and nervous system disorders.

The 1990 Clean Air Act gave EPA the authority to reduce PBT levels by requiring pollution sources to install control devices or change production methods.

EPA has published regulations covering a wide range of industrial categories, including chemical plants, incinerators, dry cleaners, and manufacturers of wood furniture. Harmful air toxics from large industrial sources, such as chemical plants, petroleum refineries, and paper mills, have been reduced by nearly 70 percent. These regulations mostly apply to large, so-called "major" sources and also to some smaller sources known as "area" sources. In most cases, EPA does not prescribe a specific control technology, but sets a performance level based on a technology or other practices already used by the better-controlled and lower emitting sources in an industry. EPA works to develop regulations that give companies as much flexibility as possible in deciding how they reduce their toxic air emissions—as long as the companies meet the levels required in the regulations.

The 1990 Clean Air Act requires EPA to first set regulations using a technology-based or performance-based approach to reduce toxic emissions from industrial sources. After EPA sets the technology-based regulations, the Act requires EPA to evaluate any remaining ("residual") risks, and decide whether it is necessary to control the source further. That assessment of remaining risk was initiated in the year 2000 for some of the industries covered by the technology-based standards.

Chemical Emergencies

The 1984 chemical disaster that resulted in thousands of deaths in Bhopal, India, inspired sections of the 1990 Clean Air Act that require factories and other businesses to develop plans to prevent accidental releases of highly toxic chemicals.

The 1990 Act also established the Chemical Safety Board, an independent agency that investigates and reports on accidental releases of toxic chemicals from industrial facilities. The Board operates much like the National Transportation Safety Board, the agency that investigates airplane and train crashes. The Chemical Safety Board assembles the information necessary to determine how and why an accident involving toxic chemicals happened. The goal is to apply understanding of accidents to prevent other accidents involving toxic chemicals.

Air Toxics and Risk

The Clean Air Act requires a number of studies to help EPA better characterize risks to human health and the environment from air toxics. Those studies provide information for rulemaking and support national and local efforts to address risks through pollution prevention and other voluntary programs. Among these risk reduction initiatives are:

- The Integrated Urban Air Toxics Strategy includes local and community-based initiatives to reduce local toxic air emissions. The primary goal of the strategy is to reduce public health risks from both indoor and outdoor sources of toxic air pollutants. More information can be found at www.epa.gov/ttn/atw.
- The Great Waters Program incorporates activities to investigate and reduce the deposition of toxic air pollutants to the "Great Waters," which include the Chesapeake Bay, Lake Champlain, the Great Lakes, National Estuary Program areas, and National Estuarine Research Reserves. To learn more, visit www.epa.gov/glnpo.
- Initiatives targeting emission reductions of persistent bioaccumulative toxics (PBTs) like mercury, DDT (a pesticide banned in the United States), and dioxins.

Protecting the Stratospheric Ozone Layer

Ozone can be good or bad depending on where it is located. Close to the Earth's surface, ground-level ozone is a harmful air pollutant. Ozone in the stratosphere, high above the Earth, protects human health and the environment from the sun's harmful ultraviolet radiation. This natural shield has been gradually depleted by manmade chemicals. So in 1990, Congress added provisions to the Clean Air Act for protecting the stratospheric ozone layer.

Ozone in the stratosphere, a layer of the atmosphere located 10 to 30 miles above the Earth, serves as a shield, protecting people and the environment from the sun's harmful ultraviolet radiation. The stratospheric ozone layer filters out harmful sun rays, including a type of sunlight called ultraviolet B. Exposure to ultraviolet B (UVB) has been linked to cataracts (eye damage) and skin cancer. Scientists have also linked increased UVB exposures to crop injury and damage to ocean plant life.

In the mid-1970s, scientists became concerned that chlorofluorocarbons (CFCs) could destroy stratospheric ozone. At that time, CFCs were widely used as aerosol propellants in consumer products such as hairsprays and deodorants, and as coolants in refrigerators and air conditioners. In 1978, the U.S. government banned CFCs as propellants in most aerosol uses.

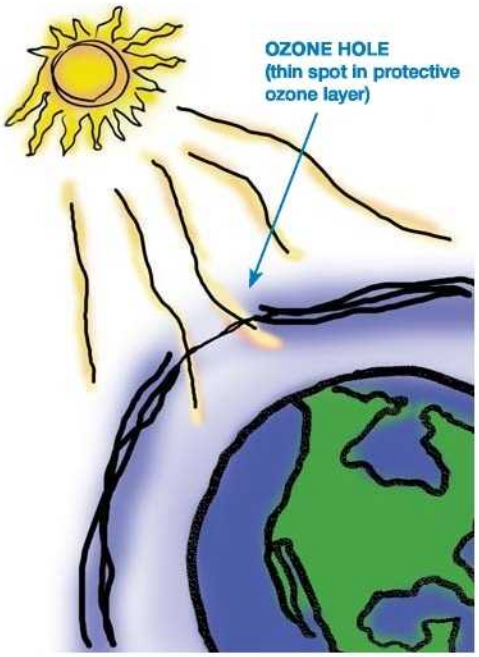
Scientists have been monitoring the stratospheric ozone layer since the 1970s. In the 1980s, scientists began accumulating evidence that the ozone layer was being depleted. The ozone hole in the region of the South Pole, which has appeared each year during the Antarctic winter (our summer), often is bigger than the continental United States. Between 1978 and 1997, scientists have measured a 5 percent loss of stratospheric ozone—a significant amount.

Over 190 countries, including the major industrialized nations such as the United States, have signed the 1987 Montreal Protocol, which calls for elimination of chemicals that destroy stratospheric ozone. Countries that signed the Protocol are committed to limiting the production and use of those chemicals.

The 1990 Clean Air Act required EPA to set up a program for phasing out production and use of ozone-destroying chemicals. In 1996, U.S. production ended for many of the chemicals capable of doing the most serious harm such as CFCs, halons, and methyl chloroform.

Photo - Steve Delaney

Service stations must have special equipment that prevents release of refrigerant chemicals to the air when they are recharging car air conditioning systems.

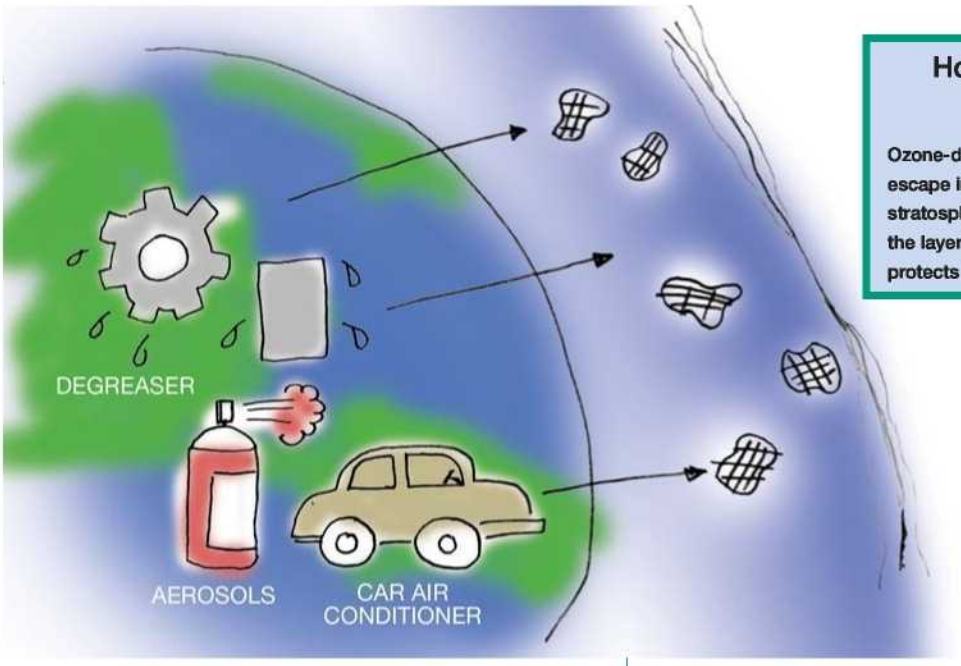


When the protective ozone layer is damaged, there is an increase in harmful rays from the sun reaching the Earth. These rays can harm both health and the environment.

Unfortunately, it will be about 60 years before the stratospheric ozone layer heals. Because of the ozone-destroying chemicals already in the stratosphere and those that will arrive within the next few years, stratospheric ozone destruction will likely continue throughout the decade. September 24, 2006, tied for the largest ozone hole on record at 29 million square kilometers (11.4 million square miles). The year 2006 also saw the second largest sustained ozone hole.

The Clean Air Act includes other steps to protect the ozone layer. The Act encourages the development of "ozone-friendly" substitutes for ozone-destroying chemicals. Many products and processes have been reformulated to be more "ozone-friendly." For instance, refrigerators no longer use CFCs.

Sometimes it isn't easy to phase out an ozone-destroying chemical. For instance, substitutes have not been found for CFCs used in certain medical applications. The limit on the production of methyl bromide, a pesticide, was extended because farmers did not yet have an effective alternative. Despite the inevitable delays because of technical and economic concerns, ozone-destroying chemicals are being phased out, and, with continued work, over time the protective ozone layer will be repaired.



How Ozone Holes Are Formed

Ozone-destroying chemicals escape into the air and reach the stratosphere. Over time they reduce the layer of stratospheric ozone that protects us.

Permits

One of the major initiatives Congress added to the Clean Air Act in 1990 is an operating permit program for larger industrial and commercial sources that release pollutants into the air. Operating permits include information on which pollutants are being released, how much may be released, and what kinds of steps the source's owner or operator is required to take to reduce the pollution. Permits must include plans to measure and report the air pollution emitted. States and tribes issue operating permits. If those governments do not do a satisfactory job of carrying out the Clean Air Act permitting requirements, EPA can take over issuing permits.

Operating permits are especially useful for businesses covered by more than one part of the Clean Air Act and additional state or local requirements, since information about all of a source's air pollution is in one place. The permit program simplifies and clarifies businesses' obligations for cleaning up air pollution and can reduce paperwork. For instance, an electric power plant may be covered by the acid rain, toxic air pollutant, and smog (ground-level ozone) sections of the Clean Air Act. The detailed information required by those separate sections is consolidated into one place in an operating permit.

Thousands of operating permits that have been issued across the United States are available to the public. Contact your state or regional air pollution control agency or EPA for information on access to those documents.

Businesses seeking permits have to pay permit fees, much like car owners paying for car registrations. These fees pay for the air pollution control activities related to operating permits.

Enforcement

The Clean Air Act gives EPA important enforcement powers. In the past, it was difficult for EPA to penalize a company for violating the Clean Air Act–the Agency had to go to court for even minor violations. The 1990 Amendments strengthened EPA's power to enforce the Act, increasing the range of civil and criminal sanctions available. In general, when EPA finds that a violation has occurred, the agency can issue an order requiring the violator to comply, issue an administrative penalty order (use EPA administrative authority to force payment of a penalty), or bring a civil judicial action (sue the violator in court).