



Focus

Major Air Pollutants

Nitrogen Oxides

Background

Nitrogen oxides are gases composed of nitrogen and oxygen. These gases include nitrogen dioxide (NO₂) and nitrogen oxide (NO). Nitrogen dioxide is a suffocating, brownish-colored gas that is a strong oxidizing agent. It reacts easily with water vapor to form acid rain. Nitrogen oxide is more common, but relatively less harmful. However, nitrogen oxide emitted into the air is converted to nitrogen dioxide by photochemical reactions. When combined with other pollutants, it eventually causes ozone and other kinds of smog.

The main sources of nitrogen oxides are motor vehicles, power plants, industry, burning of solid waste, and outdoor burning. Natural sources include volcanoes and forest fires.

Washington's nitrogen oxide problem

The federal Environmental Protection Agency declares areas “nonattainment” when levels of certain air pollutants do not meet federal health-based standards. Washington does not exceed federal health-based standards for nitrogen oxides. However, nitrogen oxides are a major contributor to ozone pollution. Until 1996, south Clark County and the Puget Sound area were nonattainment areas for ozone. Because both of these areas now meet the ozone standard, they are listed as “maintenance” areas. Ozone remains a concern in these regions due to population growth and increased motor vehicle use.

Health effects of nitrogen oxides

Although nitrogen oxide is not very toxic, it is rapidly converted to nitrogen dioxide, which is toxic. At high concentrations, nitrogen dioxide can cause disturbances in the central nervous system, circulatory system, and enzyme system. Because it does not dissolve easily in water and remains in a gas form, it can penetrate to the most remote portions of the respiratory tract. At high concentrations it can be fatal. At lower concentrations it can irritate the lungs and lower the body's resistance to respiratory infections such as influenza, pneumonia, and bronchitis.

As mentioned above, nitrogen oxides that combine with hydrocarbons and other volatile organic compounds form ozone. Ozone can pose serious health problems. It can inflame and irritate breathing passages, reduce resistance to illnesses, and cause coughing and wheezing. (See Focus sheet FA-91-128).

Other effects of nitrogen oxides

In addition to their effects on human health, nitrogen oxides can damage other organisms and materials through their role in producing ozone. Ozone can reduce the size of plants and cause leaf spotting. It can change the color of clothing dyes, cause fabrics to lose strength, and corrode some metals.

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Nitrogen oxides also produce a brown haze that impairs visibility. Ecology evaluates the potential of new sources to harm visibility and applies stringent emission limits to protect our state's scenic resources. Some federal lands (national parks and wilderness areas) have visibility standards that Ecology helps enforce.

In addition, nitrogen oxides are one of the ingredients of acid rain. Acid rain changes the chemistry of lakes and streams, which destroys aquatic life. It makes soil more acid, damages building materials, cloth, and metals, and can potentially contaminate drinking water.

Controlling nitrogen oxides

The Washington Clean Air Act adopted in 1991 includes measures for reducing the amount of nitrogen oxides and ozone in the air. These include:

- Reductions in traffic and the use of single-occupant vehicles;
- Reductions in slash and agricultural burning;
- A permit program for industrial facilities; and
- Research into and use of alternative fuels.

For more information

Focus sheets on other major pollutants, as well as on air quality programs, are available from the Washington State Department of Ecology, P.O. Box 47600, Olympia, WA 98504-7600; or by calling:

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If you have special accommodation needs or require this document in alternative format, please call Tami Dahlgren at (360) 407-6830 (voice); or (360) 407-6006 (TDD only).