

**Criteria Pollutants: Ozone (O<sub>3</sub>)**

Office of Air Quality - Air Programs Branch

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**Description:**

- Ozone is a gas composed of three oxygen atoms. The chemical symbol for ozone is O<sub>3</sub>.
- Ozone occurs naturally in the stratosphere, approximately 10 to 30 miles above the Earth's surface, and forms a layer that protects life on Earth from the sun's harmful rays.
- Ozone can also form at ground level when other man-made pollutants react together in heat and sunlight. The man-made pollutants that contribute to the formation of ozone are nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs). Major sources of NO<sub>x</sub> and VOCs include cars, trucks, off-road vehicles, industrial boilers, gasoline vapors, and vapors from chemical solvents.
- Ozone that forms at ground level is harmful to people and the environment.
- Because it is most likely to form on days with long hours of sunlight and warm temperatures, ozone is known as a summertime pollutant. It is most prevalent in Indiana between March 1 and October 31.

**National Ambient Air Quality Standards (NAAQS) for Ozone:**

- The federal Clean Air Act (CAA) requires United States Environmental Protection Agency (U.S. EPA) to set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants that are considered harmful to public health and the environment. These include ground-level ozone, as well as carbon monoxide, lead, nitrogen dioxide, particulate matter, and sulfur dioxide.
- The NAAQS set limits for the criteria pollutants in the ambient air. Limits established to protect human health are referred to as "primary standards." Limits established to prevent environmental damage are referred to as "secondary standards."
- The CAA requires periodic review of the science upon which the NAAQS are based, as well as the standards themselves. NAAQS for photochemical oxidants (pollutants formed by the action of sunlight on pollutants including NO<sub>x</sub> and VOCs) were first established in April 1971, with the same level set for both the primary and secondary standards and a one-hour averaging time. In 1979, the standards were revised to focus on ozone. In 1997, U.S. EPA replaced the one-hour ozone standards with eight-hour standards. The most recent revision was in October 2015, when U.S. EPA lowered the eight-hour ozone standards.
- To attain the 2015 eight-hour ozone NAAQS, the three-year average of the fourth-highest daily maximum eight-hour average concentration from each year cannot exceed 0.070 parts per million parts of air.
- U.S. EPA designates areas that meet the standards as "attainment" and areas that violate the standards as "nonattainment." Nonattainment areas must take steps to attain the standards. U.S. EPA uses three complete, consecutive years of air quality monitoring data to determine whether air quality meets the standards.

**Environmental Impacts:**

- Ground-level ozone can adversely affect both human health and the environment. It is a main ingredient in photochemical smog, which appears as a brown haze on the horizon.
- Breathing ozone can cause respiratory problems for anyone. Sensitive groups, such as the very young, the elderly, or people with asthma or other chronic respiratory problems may be particularly vulnerable to ill health effects. Significant health problems linked to breathing ozone include:
  - Coughing, difficulty breathing, and inflammation to airways.
  - Increased susceptibility to lung infections.
  - Aggravation of diseases such as asthma, emphysema, and chronic bronchitis.
  - Increased frequency of asthma attacks.
- When unhealthy ozone levels are forecast, the Indiana Department of Environmental Management (IDEM) issues Air Quality Action Day (AQAD) advisories with health protective information and simple actions for

reducing ozone-causing emissions. IDEM encourages all Hoosiers to take actions to reduce ozone and help protect sensitive groups on AQADs.

- Ozone damages the leaves of trees and other plants, reduces crop and forest yields, and interferes with the ability of plants to produce and store food, making them more susceptible to disease, harsh weather, insects, and other pollutants.
- Gasoline-powered vehicle emissions and gasoline vapors at the pump can contribute significantly to the formation of ozone in local communities. Pollutants that cause ozone also can be transported by the wind and affect air quality in downwind communities hundreds of miles away.

### **IDEM's Role:**

IDEM is responsible for protecting human health and the environment while providing for safe industrial, agricultural, commercial, and governmental operations vital to a prosperous economy. IDEM works in many ways to improve air quality and protect public health:

- Implements federal, regional, and state control measures and air quality regulations.
- Operates an extensive, statewide air quality monitoring network to gather data on pollutants in the ambient air, identify air quality trends, and provide quality assured data to U.S. EPA for air quality designations.
- Issues daily "SmogWatch" air quality forecasts for ozone, shares data with regional, state, and local forecasting partners, and provides data for U.S. EPA's AirNow website and the national Air Quality Index (AQI), a daily air quality report.
- Issues AQAD advisories when air quality may be unhealthy for ozone, to inform the public about ways to reduce harmful exposure and protect sensitive groups.
- Issues air permits to regulated sources that detail restrictions on emissions that contribute to the formation of ground-level ozone.
- Works with communities in nonattainment areas to implement programs to achieve the standards as quickly as possible.
- Educates citizens and businesses about their roles in reducing harmful emissions.

### **Citizen's Role:**

There are many simple actions every citizen can take to reduce their contribution or exposure to ozone:

- Stay informed by monitoring IDEM's "SmogWatch" website and air quality forecasts from your local news. When AQAD advisories are issued for your area, follow the tips to limit exposure for yourself or others who may be affected.
- Carpool, walk, bike, or use public transportation when possible.
- Avoid idling by turning off the engine while waiting in drive-thru lanes (banks and restaurants) or when picking up children from school. Combine errands when possible and avoid fast-starts.
- In the summer, wait until after 7 p.m. to use gasoline-powered lawn equipment and refuel vehicles.
- Reduce home energy consumption by turning off lights, televisions, and appliances when not in use, to reduce emissions from energy production. Set your thermostat lower in the winter and higher in the summer. Insulate your home as best you can. Use energy efficient lighting and appliances, such as those with the ENERGY STAR® label.
- Recycle to reduce the emissions related to producing paper, plastic, glass bottles, aluminum cans, and cardboard.

### **Additional Information:**

- IDEM's website provides more information concerning air quality including:
  - Daily air quality SmogWatch forecasts: [www.smogwatch.IN.gov](http://www.smogwatch.IN.gov). Sign up for email and text message alerts at: [apps.idem.in.gov/smogwatch/SignUp.aspx](http://apps.idem.in.gov/smogwatch/SignUp.aspx).
  - Overviews for the criteria pollutants including ozone, and state implementation plans for attaining the NAAQS: [www.in.gov/idem/sips/common-criteria-pollutants/](http://www.in.gov/idem/sips/common-criteria-pollutants/).
  - Air quality monitoring data and reports: [www.in.gov/idem/airmonitoring/air-quality-data/](http://www.in.gov/idem/airmonitoring/air-quality-data/).
  - The nonattainment status for Indiana counties or townships: [www.in.gov/idem/sips/nonattainment-status-of-counties/](http://www.in.gov/idem/sips/nonattainment-status-of-counties/).
- U.S. EPA provides information concerning the NAAQS process on its website at: [www.epa.gov/naaqs](http://www.epa.gov/naaqs).
- AirNow and U.S. EPA's AQI are online at: [www.airnow.gov/](http://www.airnow.gov/).
- ENERGY STAR® certified products are listed online at: [www.energystar.gov/](http://www.energystar.gov/).

- For questions and concerns about air quality in Indiana, feel free to call IDEM's Office of Air Quality at 317-233-0178 or 800-451-6027, option 4.