Ozone: The Facts

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Sound science and targeted regulations have greatly reduced ozone concentrations in Texas cities and across the nation.

The Texas Commission on Environmental Quality uses scientific research to develop effective strategies to reduce ozone concentrations. Texas has devoted millions of dollars to air quality research during the past decade, including two major field studies—the Texas Air Quality Study 2000 and the Texas Air Quality Study II—and numerous smaller scale studies throughout the state.

Ozone-reduction strategies, developed from knowledge gained through research, have decreased ozone statewide—by 29 percent from 2000 to 2014. By comparison, the rest of the nation averaged only a 16 percent decrease over the same period.

The TCEQ's goal is sensible regulation, based on sound science, that addresses real environmental risks while complying with state and federal statutes.

What is ozone?

Ozone, sometimes referred to as smog, is a gas that is formed in the atmosphere when three atoms of oxygen combine. The chemical structure of ozone is the same wherever it is found; however, there are two categories of ozone.

Stratospheric ozone is found naturally in the Earth's upper atmosphere—6 to 30 miles above the Earth's surface—where it forms a protective layer that shields us from the sun's harmful ultraviolet rays.

Ground-Level ozone is found at ground level (it is also called tropospheric ozone). It is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOCs. In addition, biogenic sources (living organisms or biological processes) release VOCs that can contribute to ground-level ozone.

What are the health effects of elevated ground-level ozone concentrations?

Ground-level ozone is of particular importance because it is a respiratory toxic agent that can cause acute respiratory health effects when people breathe high concentrations of it over several hours. These effects include decreased lung function and pain with deep breaths, and aggravated asthma symptoms.

What conditions lead to elevated ground-level ozone concentrations?

Summer days in Texas can be conducive for ozone formation as high-pressure systems dominate our local weather patterns, giving us clear skies and stagnant winds. Ozone mainly forms in the highest concentrations on warm, sunny days with light wind speeds, which allows more of the pollutant to form and accumulate.

What about indoor air quality?

The United States Environmental Protection Agency (EPA) has identified and characterized significant risks to public health from indoor environmental contaminants that are commonly found in homes, schools, offices, and other buildings where, on average, Texans are spending about 90 percent or more of their time. It is possible for indoor levels of air pollutants to reach up to two to five times higher, and occasionally even 1,000 times higher, than outdoor levels—according to the Texas Department of State Health Services (DSHS).

Common indoor air contaminants include radon, tobacco smoke, cleaning products, chemicals in upholstery foam, mold, combustion by-products, and VOCs. Ozone is not typically an indoor air contaminant. However, ozone generators, which are sometimes used in homes as air purifiers, may cause harmful levels of ozone.

Building systems, such as heating, ventilating, and air conditioning, also have a direct influence on the type and amount of exposure occupants may experience from indoor environmental contaminants.

For more information on indoor air quality visit:

- EPA, Indoor Air Quality: <epa.gov/iaq/>
- DSHS: <dshs.state.tx.us/iaq/>

Should I limit exercise and stay indoors when ozone concentrations are elevated?

The World Health Organization ranks physical inactivity as a major risk factor for heart disease, breast cancer, colon cancer, and diabetes. The Centers for Disease Control and Prevention found that 27.2 percent of adults and 16.6 percent of youth in Texas were inactive in 2014. For children, the risks of obesity are well-documented.

Many people engage in physical exercise to prevent disease and obesity. Individuals must consider those benefits when making choices about whether to follow the EPA's recommendation to limit exercise outdoors and stay indoors when concentrations of ozone in ambient air are elevated.

A personal decision to limit outdoor activities should consider more than ozone levels because there are other conditions that can increase health risks, such as high heat and humidity.

For more information on obesity risks, visit:

- Childhood Obesity Facts: <cdc.gov/obesity/data/childhood.html>
- Physical Activity for a Healthy Weight: <cdc.gov/healthyweight/physical_activity/index.html>
- State Indicator Report on Physical Activity: <cdc.gov/nutrition/data-statistics/state-action-guides.html>

What is background ozone and why is it important?

Background ozone is the amount of ozone due to distant sources. It can come from natural processes such as movement from the stratosphere or wildfires. Also, it can be transported from international pollution sources. It is important to study the locations in which background ozone is formed and where that ozone is transported. This information is used to develop successful reduction strategies.

What is the Air Quality Index?

The Air Quality Index (AQI) is a numerical scale accompanied by corresponding colors created by the EPA for rating air quality. The AQI scale is based on the National Ambient Air Quality Standards (NAAQS) and is used to report current conditions, forecast future conditions, and notify the public about local air quality; including recommended steps people can take to avoid exposure to air pollutants.

Each NAAQS pollutant, such as ozone, has a separate AQI scale. For a given locality, a pollutant other than ozone could be in the good range while the ozone level is unhealthy. Colors indicate the amount of threat to health posed by of the concentration of a pollutant. For example, an AQI for a locality anywhere from 101 to 150 due to ozone is coded Level Orange, which means "unhealthy for sensitive groups."

For more information on the AQI visit the EPA Web page on AQI Basics at <airnow.gov>.

Air Quality Index

Air Quality Index Values	Level of Health Concern	Color
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

What is an Ozone Action Day?

Ozone Action Day (OAD) forecasts are made daily by TCEQ meteorologists during the OAD forecast season for each of nine metropolitan areas in Texas (see table below).

METROPOLITAN AREA	OZONE FORECAST SEASON BEGINS	OZONE FORECAST SEASON ENDS
Austin	April 1	Oct. 31
Beaumont–Port Arthur	May 1	Oct. 31
Corpus Christi	April 1	Oct. 31
Dallas–Fort Worth	March 1	Oct. 31
El Paso	May 1	Oct. 31
Houston	March 1	Nov. 30
San Antonio	April 1	Oct. 31
Tyler-Longview	May 1	Sept. 30
Victoria	May 1	Sept. 30

The Ozone Action Day forecast seasons are based on when each region is likely to experience elevated ozone concentrations. Each forecast predicts whether ozone levels for the following day in an area are expected to reach or exceed the EPA's AQI Level Orange—an eight-hour average of 71 parts per billion or a one-hour average of 125 ppb.

TCEQ meteorologists use a set of criteria from historic meteorological data, ozone measurements, and ozone prediction models to make these predictions. When they forecast an Ozone Action Day, TCEQ meteorologists contact the National Weather Service, which then broadcasts the information across its "weather wire." The TCEQ also contacts officials in affected areas so that local community clean air coalitions can notify media, government, business, and industry. Ozone Action Days are issued, in most cases, by 2 p.m. local time and are valid for the next day.

What can I do to limit ozone formation?

- Limit driving and idling; instead, carpool, combine errands, use public transportation, bike, or walk.
- Refuel your vehicle in the late afternoon or evening and don't top off the tank.
- Keep your vehicle maintained, including proper tire pressure.
- Maintain your yard equipment, including changing the oil and replacing air filters regularly. Also consider using tools without motors. Hand tools such as shears, edgers, and push reel mowers are lightweight, quiet, and easy to use, and do not generate emissions.
- Don't burn yard waste.
- Use paint and cleaning products with less or zero VOCs.

How can I sign up to receive e-mail and text alerts?

You can subscribe for e-mail and text alerts about the TCEQ's Air Quality Forecast and other topics at <tceq.texas.gov/airquality/monops/ozone_email.html>.

You can also sign up to receive e-mail alerts through the EPA's EnviroFlash website at <enviroflash.info/>.

Related Web Pages

- Take Care of Texas encourages all Texans to help keep our air and water clean, conserve water and energy, and reduce waste: <TakeCareOfTexas.org>.
- Sign up for *Take Care of Texas News You Can Use*—a free monthly e-newsletter—at <TakeCareOfTexas.org/newsletter>
- Learn more about air quality at the TCEQ webpage <tceq.texas.gov/airquality/monops>.

For More Information

TakeCareOfTexas.org

Take Care of Texas, MC 104
Texas Commission on Environmental Quality
PO Box 13087
Austin TX 78711

512-239-3929 | educate@tceq.texas.gov

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