

Just the Facts About ...

Ground-Level Ozone

From the Ambient Air Quality Series

Ozone as a Pollutant

Ozone is a colorless gas that can be found in the air we breathe. Each molecule of ozone is composed of three atoms of oxygen, one more than the oxygen molecule we need to breathe. The additional oxygen atom makes ozone extremely reactive. Ozone exists naturally in the Earth's upper atmosphere, known as the stratosphere, where it shields the Earth from the sun's ultraviolet rays. However, ozone is also found close to the Earth's surface. This ground-level ozone is a harmful air pollutant.

Good and Bad Ozone

Whether ozone is good or bad depends on its location. Ozone occurs in two layers of the atmosphere. The layer surrounding the earth's surface is the troposphere. The troposphere extends to a level about 10 miles up, where it meets the stratosphere. Here, ground-level ozone is a noxious air pollutant that damages human health, and vegetation.

The stratospheric or "good ozone" layer occurs naturally in the earth's upper atmosphere. This layer extends from about 10 miles above the earth's surface upward to about 30 miles above the earth's surface and protects life on earth from the sun's UV-b rays.

Creating Bad Ozone

Ground-level or "bad ozone" is created when intense sunlight reacts with nitrogen oxides (NOx) and volatile organic compounds (VOCs). High concentrations of ground-level ozone occur during hot, sunny days, when air flow is limited or stagnant and a mixture of VOCs and NOx is present. The main ozone-causing pollutants, VOCs and NOx, come from

many sources such as the fumes from vehicles, lawnmowers, and boats, or emissions from power plants and industrial facilities.

Ozone Transport

Another source of ozone in Montgomery County comes from the transport of ozone from other areas. Research indicates that during a strong ozone event, ozone concentrations along the upwind boundary reach 80-100 ppbv. Smog has a long formation time (up to 12 hours), with precursor pollutants being transported many miles before developing into smog. Given this, ozone can affect large areas of an airshed and is therefore regarded as a regional problem.

Health Consequences

When ozone forms at ground-level it can be harmful to our health. Ozone inflames and can damage the lining of the lung comparable to sunburn on the skin. Ozone damages the cells that line the air spaces in the lung. Within a few days, the damaged cells are replaced and the old cells are shed-much in the way

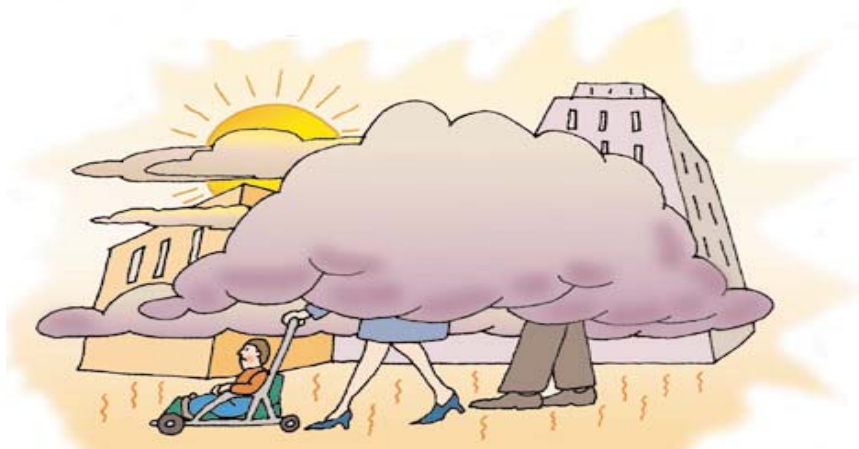
that skin peels after sunburn. Repeated damage may change the lung permanently. Ozone can also worsen bronchitis, heart disease, emphysema and asthma, and reduce lung capacity.

Environmental Consequences

Ground-level ozone also damages plant life and is responsible for 500 million dollars in reduced crop production in the United States each year. It interferes with the ability of plants to produce and store food, making them more susceptible to disease, insects, other pollutants, and harsh weather.

Ozone Sensitive Groups

Children, people who work outdoors or exercise outdoors regularly, the elderly and individuals with pre-existing respiratory problems are most at risk. Physical activity (such as jogging or outdoor work) causes people to breathe faster and more deeply. During activity, ozone penetrates deeper into parts of the lungs that are more vulnerable to injury. Children are more sensitive since they often play outside; their lungs are still



developing and they breathe more rapidly and inhale more air pollution per pound of body weight than adults. The elderly are also more sensitive.

Even healthy adults can experience health problems on high ozone days, especially while exercising. If your local atmosphere is ozone polluted, you may see your lung function reduced by as much as 20 percent.

National Ambient Air Quality Standard

The Environmental Protection Agency (EPA) has set standards known as the National Ambient Air Quality Standards, for six criteria pollutants. A geographic area that meets or does better than the standard is called an attainment area, areas that don't meet the primary standard are called nonattainment areas. Title I of the Clean Air Act classifies areas that exceed the national health-based air quality standards based upon the severity of the problem (marginal, moderate, serious, severe, and extreme). Ground-level ozone is one of the six criteria pollutants and Montgomery County is in a "severe" non-attainment area for the one hour standard of 120 ppb. This one hour standard was revised in July 1997 when the EPA issued a new eight hour average standard of 80ppb which has withstood legal challenge and will be implemented in 2004-5. During recent summers, there have been an average of five days during which the region experienced Code Red conditions (violations of the one-hour standard) and an average of 31 Code Orange condition days (violations of the 8-hour standard).

State Implementation Plan

Since this region has been designated as a "severe" non-attainment area for ozone, the Clean Air Act requires states to develop and implement ozone reduction strategies in the form of a State Implementation Plan (SIP). The SIP is the

region's master plan for attaining the National Ambient Air Quality Standard. Once a SIP is approved by the Administrator of the EPA, it is enforceable as a federal law and the EPA may impose sanctions.

Air Quality Index

The Air Quality Index (AQI) is a scale used to report actual levels of ground level ozone and other criteria pollutants in the air. The higher the AQI value, the greater the health concern. The AQI has been divided into color coded categories that correspond to different levels of health concern. Air Quality is measured by networks of monitors that record the concentration of the major pollutants. These raw measurements are then converted into AQI values using standard formulas. The AQI value is calculated for each of the individual pollutants. Finally, the highest of the AQI values for the individual pollutants becomes the AQI for that day.

What You Can Do

- On Ozone Action Days (Code-Red):
- Brown bag your lunch to avoid mid-day use of your car.
 - Take transit, carpool, bike, telecom-mute, or walk to work.
 - Combine errands and limit driving.
 - Avoid idling your car. (If you expect to idle for more than 30 seconds, you will save gas and reduce pollution by turning off the engine and restarting)
 - Park your car and go into restaurants and banks.
 - Do not mow your lawn.
 - Do not refuel your car. If you must, do so after dark.
 - Substitute water-based paints for oil-based.
 - When air quality is in the unhealthy range, people at risk from breathing ground-level ozone should reduce outdoor activity.

Air Quality Index			Hourly Standards (ppb)	
Index Values	Descriptors	Cautionary Statements for Ozone	One-hour Ozone	8-hour Ozone
0-50	Code Green (Good)	None.	0-79	0-64
51-100	Code Yellow (Moderate)	Unusually sensitive people should consider limiting prolonged outdoor exertion.	80-104	65-84
101-150	Code Orange (Unhealthy for Sensitive Groups)	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.	105-124	85-104
151-200	Code Red (Unhealthy)	Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.	125-204	105-124
201-300	Code Purple (Very Unhealthy)	Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.	>204	>124

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