



Ozone Formation, Health Effects and Actions to Improve Air Quality

In March 2018 the U.S. Environmental Protection Agency (EPA) classified the Illinois counties in the St. Louis region as meeting the 2008 ozone standard of 75 parts per billion (ppb). The Missouri counties were designated as being in attainment of this standard in September 2018.

EPA strengthened the eight-hour ozone standard to 70 ppb in October 2015. In August 2018, the following were classified by EPA as not meeting the 2015 ozone standard: in Missouri, St. Charles and St. Louis counties, the City of St. Louis and Boles Township in Franklin county; and in Illinois, Madison and St. Clair counties. EPA designated Jefferson and Monroe counties and the majority of Franklin county as in attainment of the 2015 ozone standard.

Ozone exists in both the upper and lower atmosphere. The ozone layer of the upper atmosphere (10-30 miles up) occurs naturally and shields the Earth for harmful ultraviolet radiation. However, ozone in the lower atmosphere (ground-level zone) is man-made and creates a variety of health problems.

Ozone Formation

Ground-Level ozone is formed when hydrocarbons, also known as volatile organic compounds (VOC), and oxides of nitrogen (NO_x) from car exhaust and certain emissions from industrial processes chemically react, or "cook", with oxygen in the lower atmosphere in the presence of strong sunlight and high temperatures. Weather plays an important role in ozone formation. Days when ozone may form are indicated by high pressure weather systems with high temperatures (more than 85° F) and low wind speeds. Temperature inversions during the warm summer months can trap pollutants close to the ground, stopping them from dispersing during the night. These weather systems are common in the St. Louis region during the months of May through early September. Changing weather patterns, especially the number of hot, sunny days and periods of air stagnation, contribute to yearly differences in ozone concentrations.

Sources of VOC	
Point	Large stationary sources (manufacturing sites, power plants)
Area	Sources when viewed separately do not have large enough emissions to warrant individual tracking, but in the aggregate may contribute to emissions (dry cleaners, gas stations, printers, painting)
Mobile On-Road	Vehicles traveling on public roads
Mobile Off-Road	Aircraft, rail, marine vessels, farm and construction equipment, lawn and garden equipment and other such machinery

VOCs are emitted from a variety of sources including cars and trucks, chemical plants, oil refineries, factories, other industrial activities, and consumer and commercial products such as paints and solvents. These emissions occur as the result of incomplete combustion of fossil fuels and vapors escaping from volatile organic compounds.

NOx is primarily produced by the combustion of fossil fuels by motor vehicles and coal-fired power plants and other industrial utility operations.

Ozone Health Effects

In large doses, ozone can cause headaches, fatigue, shortness of breath, coughing, wheezing and eye, nose and respiratory tract irritation. It impairs lung function and limits the ability to exercise, especially in the very young and the very old. Prolonged exposure to ozone can aggravate chronic heart disease, chronic respiratory ailments, decrease resistance to infection and trigger asthma attacks.

People Sensitive to Ozone
• Children at play outdoors
• Adults who work outdoors during the summer months
• People with respiratory disease
• Healthy people who exercise outdoors
• The elderly

When the air quality is poor, people should exercise indoors. If they must exercise outdoors, the early morning and evening hours are best. Those suffering from asthma or other respiratory ailments should stay indoors. At the end of this section is a list of things individuals can do to improve air quality.

Actions Individuals can take to Improve Air Quality

Everyday

- Conserve energy at home, work, everywhere.
- Carpool, use mass transit, or walk or bicycle whenever possible.
- Limit use of oil-based paints and solvents. Limit use of fume-producing household products.
- Keep cars, boats and other gas engines tuned-up according to manufacturer's specifications.
- Be sure tires are properly inflated.
- Be careful not to spill fuel; always tighten gas cap securely; never top off gas tank.

On Days Forecasted to Have High Ozone Values (An Air Quality Index of 101 or Greater)

- Set air conditioner no lower than 78° to conserve energy.
- Share a ride or use mass transit or bicycle or walk
- Avoid using oil- and solvent-based paints, degreasers or lighter fluid.
- Defer use of gasoline-powered lawn and garden equipment (mowers, etc.).
- Refuel cars and trucks after dusk to reduce daytime pollution releases.
- Combine errands and reduce trips.
- Limit vehicle idling when possible.