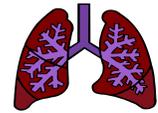




# USACHPPM Guide to Health Effects from Ground Level Ozone



**Over 40% of major Army installations are located in an area that fails to meet National Ambient Air Quality Standards (NAAQS) for ground level ozone.** Ozone pollution is a concern during summer, and other months (1 May – 30 September) when the weather conditions necessary to form it – lots of sunlight and high temperatures – normally occur. Personnel should be aware of local ozone levels, steps they can take to protect themselves, and actions they can take to curtail the formation of ground level ozone.

**Exposure to ozone has been linked to numerous respiratory disorders.** Both short and long term exposures to ozone have been shown to inflame and damage lung tissue, aggravate chronic lung disease (such as asthma or bronchitis), and lower resistance to other respiratory disease (such as pneumonia). In addition, ozone can cause coughing, throat irritation, breathing discomfort and limit the ability to take a deep breath.

**Many populations are at risk from exposure to ozone.** Children, senior citizens and people with pre-existing lung problems (such as asthma) are most sensitive to the health effects of ozone. However, even healthy adults involved in moderate or strenuous outdoor activity have been shown to suffer degraded lung function after exposure to ozone.

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## What is ozone ?

Ozone is a colorless gas that is found in the air we breathe. It occurs naturally in the Earth's upper atmosphere (the stratosphere) where it shields the Earth from the sun's ultraviolet rays. Stratospheric ozone is beneficial and does not cause the negative health effects that can result from exposure to ground level ozone. Ground level ozone is formed mostly during the summer months in a chemical reaction involving air pollutants, warm temperatures and sunlight.

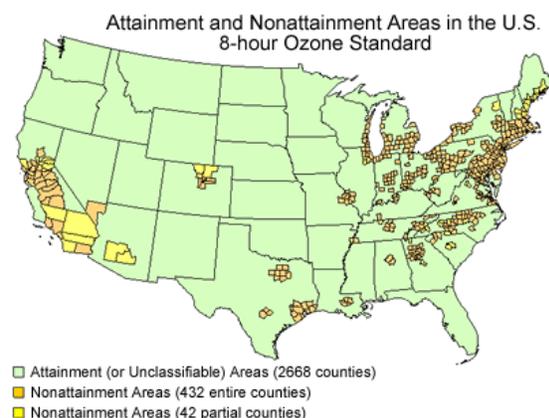
## Where does ground level ozone come from ?

Ground level ozone is formed in a chemical reaction involving volatile organic compounds (VOCs), and oxides of nitrogen (NO<sub>x</sub>) in the presence of sunlight. Sources of VOCs and NO<sub>x</sub> include:

- engine exhaust from cars, trucks, aircraft, motor boats, or lawn & garden equipment
- any combustion activity such as waste incineration, burning of coal, oil or natural gas for heat and energy production at power plants
- gasoline filling stations, drycleaners, print shops, and landfills
- consumer items such as paints, solvents, lubricants, adhesives, aerosols, and lighter fluid

## How does ozone affect human health ?

Even at low levels, ozone can cause inflammation and irritation of the respiratory tract, particularly during physical activity. Resulting symptoms can include breathing difficulty, coughing and throat irritation. Breathing ozone can worsen asthma attacks, and increase susceptibility of lungs to infection, allergens and other air pollutants. Scientists liken the lung tissue damage resulting from ozone exposure to a sunburn on the inside of your lungs. Animal studies suggest that if ozone inflammation occurs over longer periods (months or years), lung tissue may become permanently scarred resulting in permanent loss of lung function.





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## How to tell when ozone levels are a health concern:

Check the local **Air Quality Index (AQI)**. Between May and September newspapers, radio and television stations publish a localized AQI for ozone. The AQI is a numeric and color-coded indicator of the severity of ozone levels. It is derived from measured and forecast levels of ozone in the region of interest. **Green** and **Yellow** indicate that ozone levels are low, and no mitigating action is necessary. **Orange**, **Red**, **Purple** and **Maroon** indicate that air quality is poor, ozone levels are high, and people should take protective measures to avoid exposure to ozone. The current and next-day AQI for various regions around the United States may be found at the following website: [www.epa.gov/airnow](http://www.epa.gov/airnow)

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	...air quality conditions are:	...as symbolized by this 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 to do when ozone levels are expected to be high:

Determine the AQI color-of-the-day. If the AQI forecasts an **Orange**, **Red**, **Purple** or **Maroon** day, plan on restricting all outdoor activities, and observe local health warnings. To minimize personal exposure:

- Conduct physical training either early in the morning or late in the evening (when ozone levels are lowest)
- Avoid midday or afternoon exercise, avoid strenuous outdoor work in the late afternoon and early evening when ozone levels are typically highest (3–6 pm)
- Avoid congested streets and rush hour traffic; pollution levels can be high up to 50 feet from the roadway

### The Importance of Clean Air & Exercise

Lungs are the body's primary point of contact with the outside world. Adults breathe about 15,000 liters of air/day (6–10 liters/minute). Oxygen is necessary for muscles to function. The purpose of exercise training is to improve the body's ability to deliver oxygen. As a result, when we exercise, we may increase our intake of air by as much as ten times our level at rest.

Mouth breathing during exercise bypasses the nasal passages, the body's natural air filter. This means that when we exercise in polluted air, we increase our contact with pollutants, and our vulnerability to health damage.

## To prevent the formation of ground level ozone:

- Conserve energy. Set the thermostat a little higher in the summer. Participate in local utilities' load-sharing and energy conservation programs.
- Reduce air pollution from cars, trucks, gas-powered lawn and garden equipment, boats and other engines by keeping equipment properly tuned and maintained.
- Carpool, use public transit, walk, or bicycle to reduce engine exhaust that contributes to ozone pollution.
- Avoid engine idling in long drive-through lines. Turn off your car and go in.
- Fill gas tank during cooler morning or evening hours to cut down on evaporation. Avoid spilling gas and don't "top off" the tank.
- Shop by phone, mail or Internet.
- Telecommute when possible.

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