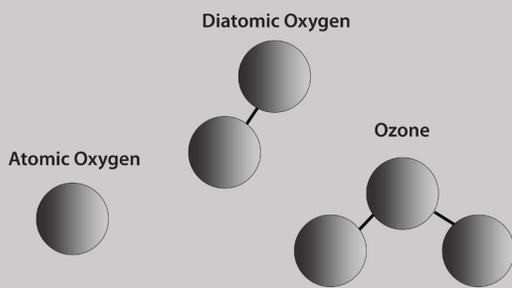




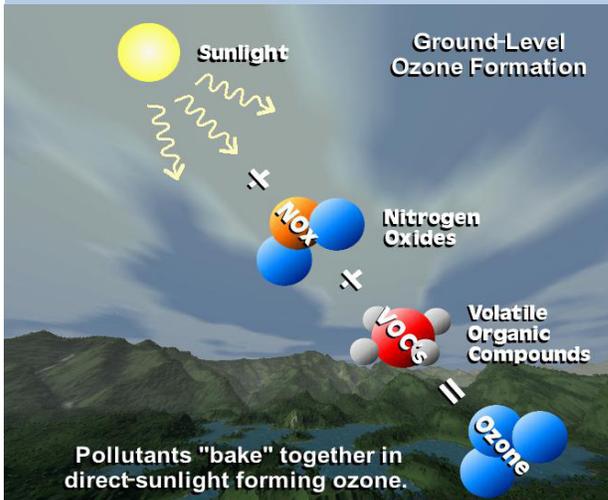
# OZONE

## A simple molecule with a big reputation

Who hasn't heard about ozone? It's only one form of oxygen. But it can cause big headaches, depending on where it is found.



The ozone molecule itself is a simple one – three oxygen atoms together, or  $O_3$ . The type of oxygen we breathe is a molecule made up of two oxygen atoms, or  $O_2$ . One oxygen atom is rare, because it's unstable by itself and tends to connect with other atoms to form molecules.



Ozone that forms close to the ground is bad news, because it is one of the main ingredients in smog. Ozone air pollution is harmful to people and crops and can even break down common materials, like rubber. The threat to human health, especially for people who already have breathing problems, is a big concern with "bad" ground-level ozone.

Dangerous levels of ground-level ozone are most often measured in summertime and in urban areas. This is mainly because certain chemicals from automobiles and industry help form ozone, and in the summer, these interact with the Sun's more intense rays. Summertime ozone also can be worsened by weather patterns in some areas that produce stagnant air so that the pollution doesn't dissipate.

### "Ozone: good up high, bad nearby"

'Good' ozone is found high in the upper atmosphere, far from plants and people. It's the same molecule, but in the stratosphere, ozone absorbs ultraviolet (UV) radiation from the Sun. UV radiation damages living things, so the thin ozone layer up high prevents excessive amounts of UV from reaching the Earth's surface. Scientists continue to monitor the ozone layer and the "ozone hole" that develops over Antarctica. Their work has led governments worldwide to ban chemicals that deplete upper-level ozone.

Because of its harmful impacts on human health and the environment, excessive ground-level ozone is a big concern to

scientists. This is why the state of Utah, the National Oceanic and Atmospheric Administration (NOAA) and others are conducting an **ozone study in the Uintah Basin**. Scientists are monitoring ozone levels and investigating how ozone is forming in rural areas, how winter weather is affecting ozone formation, and how long ozone persists in the region. This information will be used by decision-makers in Utah and elsewhere to reduce ground-level ozone and its impacts.

## ... about you and 'ground-level' ozone pollution

### Why are NOAA and its partners studying ozone in the Uintah Basin in Eastern Utah?

In the winter of 2010, ground-level ozone levels in the Uintah Basin reached values as high as 139 parts per billion (ppb), levels nearly twice as high as the federal health standard, during weather conditions that trap cold air near the ground — an inversion. At this point, it is not clear what factors contribute to or cause these elevated levels. Under investigation are regional oil and gas development, nearby plant emissions, even local traffic.

However, this air quality problem is not confined to the Uintah Basin. Episodes of high ozone have also occurred in northwestern Wyoming. NOAA researchers discovered there that ozone was rapidly produced when three factors converge: 1) emission of ozone-forming chemicals from the natural gas field, 2) occurrence of a strong temperature inversion that trapped the chemicals close to the ground, 3) occurrence of frigid temperatures and extensive snow cover, which reflected high amounts of Sunlight that could have caused the needed chemical reactions.

A main ingredient of urban smog, ozone can cause severe respiratory effects, especially in children, the elderly, and asthmatics. It also damages crops, trees, and other vegetation. The Environmental Protection Agency sets health-based air-quality standards for ground-level ozone pollution in the United States through the Clean Air Act.

### Who is involved in this study?

The following agencies are working together to characterize the impact of oil and gas development and other factors on air quality:

- National Oceanic and Atmospheric Administration (NOAA)
- Cooperative Institute for Research in Environmental Sciences (CIRES)
- Utah Division of Air Quality (UDAQ)
- Bureau of Land Management (BLM)
- Energy Companies
- Energy Development Lab/Utah State University (EDL/USU)
- Energy Industry Organizations
- Environmental Protection Agency (EPA)
- State and local governments
- State and local health departments
- Tribal government
- United States Forest Service (USFS)
- Western Energy Alliance

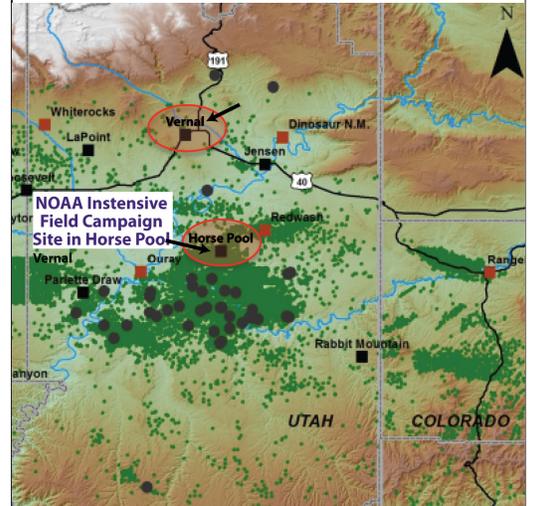
### What can be done about air quality in the Uintah Basin?

At the end of the study, NOAA scientists and their partners hope to give decision makers a list of possible contributors to air quality problems in the Basin so that they can develop strategies to protect the health and welfare of the citizens of Utah.

For more information on the study go to:  
<http://esrl.noaa.gov/csd/tropchem/2012ubwos/>



For the Uintah Basin study, researchers launch balloons like this equipped with instrument packages that record data about ozone.



Green dots represent oil and gas exploration drilling sites.

### What is NOAA?

The National Oceanic and Atmospheric Administration (NOAA), an agency within the U.S. Department of Commerce, conducts research aimed at understanding and predicting changes in the Earth's environment, from the depths of the ocean to the surface of the Sun, and conserves and manages our coastal and marine resources.

