

ENVIRONMENTAL Fact Sheet



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Smoke and Smog (Particle Pollution and Ozone) *Challenges for Protecting New Hampshire's Air Quality*

Smoke and Smog are Two of New Hampshire's Larger Air Quality Problems

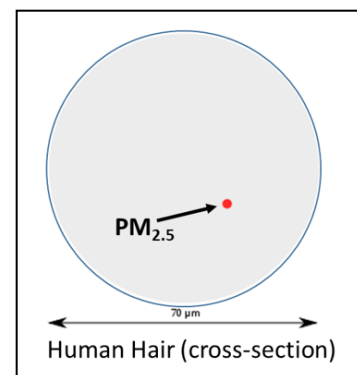
NHDES issues Air Quality Action Days (AQADs) through social media, the NHDES website, and local media outlets, on days when outdoor exertion may need to be reduced because of potentially harmful air quality. Unhealthy levels of particle pollution and ozone are the cause of AQAD alerts.

Particle pollution is commonly found in wood smoke. Wood **smoke** in some New Hampshire valley communities and locations near some high emitting residential sources increases exposure to particle pollution, including particles smaller than 2.5 micrometers in diameter ($PM_{2.5}$). $PM_{2.5}$ is an air pollutant that can penetrate deep into the lungs and cause a number of health symptoms. The New Hampshire Department of Environmental Services (NHDES) has studied wood smoke concentrations in the state and strongly encourages use of EPA certified wood stoves and pellet stoves when wood is burned. When outdoor wood boilers (hydronic heaters) are installed, they must be installed and operated according to manufacturer specification and set-back distances to minimize wood smoke exposure for owners and neighbors. Burn only dry wood fuels according to stove manufacturer recommendations.

Smog is a term that refers to a combination of smoke and fog, but in modern times, smog refers mostly to "ground-level ozone" (O_3). Ozone is not a pollutant that is emitted directly; it is formed when a chemical reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) occurs in the presence of strong sunlight. Unlike naturally occurring (stratospheric) ozone in the upper atmosphere is beneficial because of its protective qualities, ozone at Earth's surface is a man-made air pollutant that can have harmful effects on both humans and the environment. In New Hampshire, ozone concentrations can exceed health advisory levels anywhere in the state due to local and transported pollution arriving with the prevailing winds.

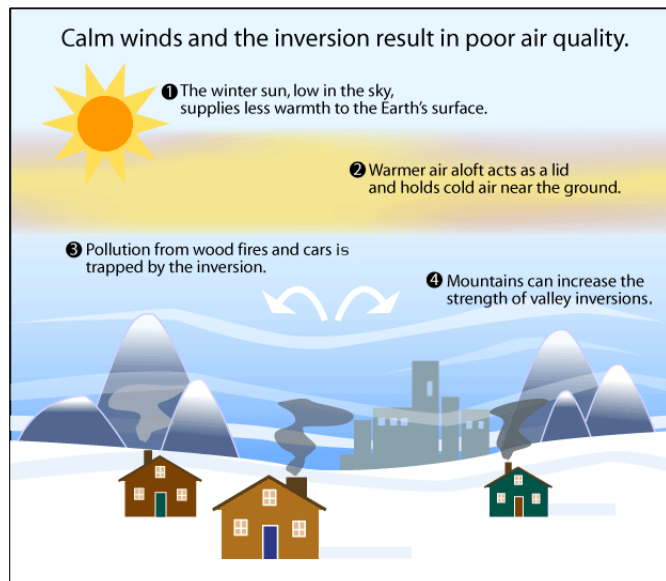
More about Wood Smoke and Particle Pollution ($PM_{2.5}$)

The smoke produced from wood stoves and fireplaces contains over 100 different chemical compounds, many of which are harmful and potentially carcinogenic. Wood smoke pollutants include $PM_{2.5}$, NO_x , sulfur oxides, carbon monoxide, VOCs, dioxins, and furans. $PM_{2.5}$ particles are 2.5 microns or less in diameter (a human hair is approximately 70 microns in diameter). These air pollutants can cause irritation of the lungs and eyes and cause new, or exacerbate a number of existing health issues.



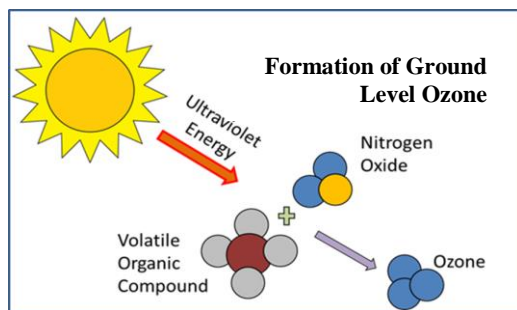
PM_{2.5} pollution from wood stoves is a particular concern in the winter when cold, stagnant air and temperature inversions limit air movement. Communities located in valleys are more strongly affected. As wood burning increases on cold, clear, calm nights, smoke is unable to rise and disperse. Pollutants are trapped and concentrated near the ground, and the small size of the particles allows them to seep into houses through closed doors and windows. We see the result of this particle pollution when it deposits as soot outside on our cars and inside on our furniture.

In addition to its potential health impacts, wood smoke contributes to the unpleasant brown haze we often experience on winter mornings. Regional haze reduces visibility and obscures our enjoyment of scenic vistas.

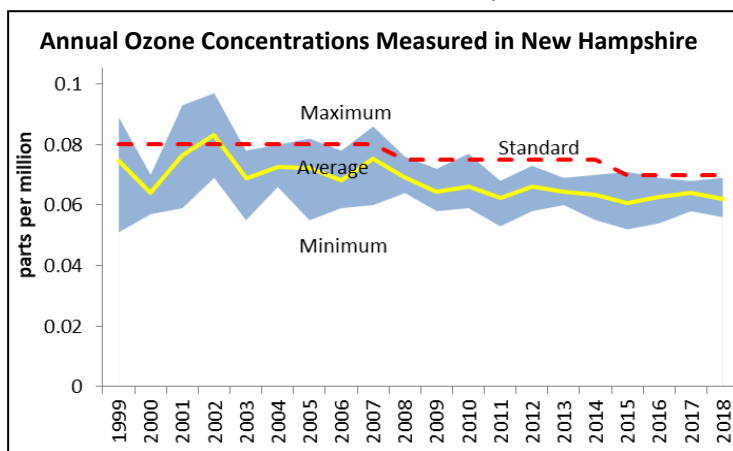


More about Ground-Level Ozone (Smog)

Since ozone is not directly emitted, emissions of its precursor air pollutants need to be reduced in order to lower ozone concentrations. NO_x and VOC emission sources are very common and widespread, including cars, trucks, fuels, industrial boilers, power plants, paints, solvents, and other commercial and consumer products. About half of all manmade NO_x and VOC emissions in New Hampshire come from cars and trucks! Ozone and its precursors can also be released in upwind states and transport to New Hampshire with the wind. Hot and humid days with bright sunshine and light winds coming from upwind high emission areas are ideal for creating high ozone in New Hampshire.



Ground-level ozone is a serious air pollution problem in the Northeast and Mid-Atlantic States. As shown in the chart below, ozone levels in New Hampshire have been above and near the health standard for decades, but declined significantly since efforts to reduce ozone began in the 1990s. The efforts included state, regional and national pollution reduction measures to address both local and upwind emissions so that downwind states, such as New Hampshire, can achieve and maintain compliance with the federal air quality standards for ozone. The chart to the right shows the yearly average, maximum and minimum ground-level ozone concentrations measured at monitoring locations throughout the state. The dashed line indicates the level of the EPA standard.



New Hampshire was designated as failing to attain the 1990 ozone standard, and while conditions improved, portions of the state still failed to meet the revised 1997 version of the ozone standard. The ozone standard

was further revised in 2008, and for the first time the entire state met the ozone standard. The portions of the state that failed to attain the 1997 ozone standard were redesignated to attainment in 2013. A

third revision to the ozone standard was made in 2015 and all of New Hampshire continues to meet this standard.

Health and Environmental Effects of Smoke and Smog

Breathing air containing wood smoke can cause a number of serious respiratory and cardiovascular health problems. Those at greatest health risk from wood smoke include infants, children, pregnant women, the elderly, and those suffering from allergies, asthma, bronchitis, emphysema, pneumonia, or any other heart or lung disease. PM_{2.5} can easily be inhaled deep into the lungs, collecting in the tiny air sacs (called alveoli) where oxygen enters the blood, causing breathing difficulties and sometimes permanent lung damage. Inhalation of fine particle pollution can increase cardiovascular problems, irritate lungs and eyes, trigger headaches and allergic reactions, and worsen respiratory diseases such as asthma, emphysema, and bronchitis, which could result in premature deaths.

Ozone at ground-level poses health problems by irritating the nose, throat and lungs and causing chest pain, coughing and nausea. Long-term exposure may result in permanent damage to the lungs. Ozone aggravates respiratory conditions such as allergies, asthma and emphysema and can have pronounced effects, even on healthy individuals who work or play outdoors during hot, sunny summer months when levels of smog are usually at their highest. In addition to its effects on people, ozone is believed to harm forests and agricultural crops and may accelerate the deterioration of rubber tires, paints and dyes in fabrics.

The Challenge: Reducing Smoke and Smog

The federal Clean Air Act Amendments of 1990 require New Hampshire to take direct action to remedy unhealthy air quality, including ozone and PM_{2.5}. NHDES has been active in promoting clean wood burning practices and the use of EPA certified residential heating units to reduce PM_{2.5} concentrations caused by wood burning. As part of this effort, NHDES and others have conducted wood stove change out programs to encourage residents in targeted areas to replace their older, dirtier burning stoves with newer, more efficient units. To date, communities involved in this program have seen declining PM_{2.5} concentrations.

To reduce your wood smoke and PM_{2.5} emissions:

- Use an EPA certified wood stove or pellet stove;
- Burn only dry, seasoned hardwood;
- Don't let your stove smolder. Keep the combustion hot;
- Have your unit cleaned and tuned annually; and
- Be aware of your smoke and where it goes. It's not fair if your smoke blows into the neighbor's house. If it does, it's time to consider changing your burning practices.

New Hampshire has significantly reduced levels of NO_x and VOCs in order to reduce concentrations of Smog (O₃). However, since ozone still reaches unhealthy concentrations for sensitive people, NHDES will continue to seek opportunities to reduce emissions in the state and in upwind areas. You can help make a difference with your everyday behavior:

- Reduce vehicle use when possible by car-pooling, consolidating trips, riding a bike, walking, or using public transportation;
- Keep your automobile tuned and maintained, making sure your tires are properly inflated, your wheels aligned and your air filter clean;
- Purchase cars with the highest fuel economy and lowest emission ratings possible;
- Use spill-proof fuel containers and be careful not to spill gasoline when filling up your car, gas-powered lawn or garden equipment, boat or recreational vehicle;
- Reduce energy use – turn off unneeded lights and appliances; unplug phone chargers, coffee pots, microwaves and other devices that have a “phantom plug load”; change to energy efficient appliances and light bulbs etc.;
- Participate in your local utility's energy conservation programs;

- Use water-based or solvent-free paints whenever possible, and buy products that say “low VOC”; and
- Seal containers of household cleaners, solvents, and workshop or garden chemicals to prevent VOCs from evaporating into the air.

For more information, contact the NHDES Air Resources Division at (603) 271-1370 or visit www.airquality.nh.gov