
ENVIRONMENTAL Fact Sheet



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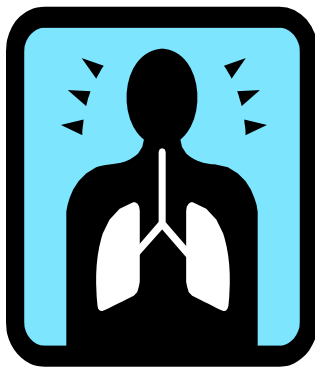
Wood Stoves and Air Pollution *Clean Burning Wood Stoves Minimize Health Risks*

Many New England households use wood as a primary heating fuel, while other households use wood stoves and fireplaces as supplementary heating sources. The New Hampshire Office of Energy and Planning estimates that up to 25 percent of New Hampshire homes heat with a wood stove. For many people, the sight and smell of wood smoke curling out of a chimney brings back fond memories of hearth and home. Wood is a renewable resource, unlike fossil fuels such as oil, coal and gas, which are non-renewable. In fact, if firewood is harvested in a sustainable way, woodlots can provide an abundant source of fuel for years to come.



Unfortunately, smoke from wood burning stoves and fireplaces can be a significant source of air pollution, negatively impacting public health and the environment. People can reduce the amount of smoke from their wood stoves by choosing low-emission certified stoves, operating them properly, and using good quality firewood. This will improve combustion efficiency, reduce emissions, help protect public health and the environment, and save fuel costs.

The Problem: Smoke from Wood Stoves is a Public Health Risk



The smoke produced from woodstoves and fireplaces contains over 100 different chemical compounds, many of which are harmful and potentially carcinogenic. Wood smoke pollutants include fine particulates, nitrogen oxides, sulfur oxides, carbon monoxide, volatile organic compounds, dioxins, and furans. 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.

Fine particulate matter, the very small particles that make up smoke and soot, may be the most insidious component of wood smoke pollution. The most harmful particles are those ten microns or less in diameter (a human hair is approximately 70 microns in diameter). These particles 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. The

particles are also often composed of harmful substances, such as sulfate, which is acidic, and toxic trace metals like lead and cadmium. Inhalation of fine particulate matter can increase cardiovascular problems, irritate lungs and eyes, trigger headaches and allergic reactions, and worsen respiratory diseases such as asthma, emphysema, and bronchitis, resulting in premature deaths.



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.

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. This has become a serious issue in many areas of New Hampshire over the past few years.

The air quality on cold, calm nights in low-lying valleys of New Hampshire is periodically very poor. This poor air quality is a serious concern for scientists and state officials; computer models have connected 80 percent of the particulate matter in the air in some areas of the state to wood stoves. Although the source has been identified as wood stoves, in order to meet federal and state regulations for ambient air quality, the local industries will likely have very stringent emission standards imposed on them. These emissions standards will be costly to meet and could drive local industries out of business. Therefore, to keep local businesses operating, it is important to realize the consequences of wood stove emissions and do something about it.

The Solution: Increasing Wood Stove Efficiency to Reduce Smoke

Smoke from wood stoves is generated primarily by incomplete combustion, which can be caused by a number of different factors related to the wood stove's efficiency. Improving a wood stove's efficiency will improve the combustion process, and thus reduce the amount of smoke and harmful air pollutants released into the air. A wood stove's efficiency is affected by both the design features of the stove and how it is operated and maintained. Here are some ways to improve wood stove efficiency, resulting in less smoke and money savings on wood fuel costs.

Select a clean-burning stove and make sure it is the proper size

When buying a new wood stove, make sure you are purchasing a certified clean burning, more efficient model with design features that promote complete combustion. Wood stove design technologies that are desirable include advanced combustion stoves, catalytic stoves, and wood pellet stoves. Advanced combustion stoves are designed to create the conditions necessary to burn the combustion gases as they go up the chimney. Catalytic stoves contain a catalytic combustor that ignites smoke gases and particles at a lower temperature, resulting in a more complete burn of harmful substances. Wood pellet stoves burn small pellets of compressed wood by-products instead of cordwood. The pellets are fed into the stove through a hopper at a controlled rate, producing a clean optimum burn with low emissions.

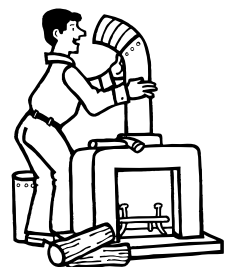
The U.S. Environmental Protection Agency set standards for wood stoves in 1990. Stoves cannot be sold to consumers in the US unless they meet certain emission standards for particulate matter and carry the EPA Emission Certification label. Certified stoves reduce smoke emissions by as much as 90 percent, compared with conventional stoves, and are much more efficient. EPA-certified stoves often include design features that promote secondary combustion aimed at burning off dangerous chemicals and toxic substances before they leave the firebox.

Be sure the wood stove you are using is EPA-certified, and if your wood stove is old, consider replacing it with a cleaner, more efficient model. A 30 percent tax credit is available through January 2010 through the American Recovery and Reinvestment Act for the purchase of a new efficient stove to defray the cost and encourage this investment. Properly used, a new stove will pay for itself over time by saving fuel and have a lifetime of 30-40 years.

EPA offers advice to consumers for purchasing woodstoves, ranging from considerations relating to installation, operation and maintenance, to determining the best size stove for your heating needs. A wood stove should be the proper size for the area being heated. A stove that is too large or too small will create more pollution.

Make sure your wood stove is properly installed

All wood stoves should be properly installed to ensure tightness, safety, proper draft and efficiency. This is important both for efficiency and for maintaining good indoor air quality. Improper installation could result in more air pollution, chimney fires, or house fires. Follow the manufacturer's instructions and recommendations for flue size, clearances and connections, and consider having your wood stove installed by a certified installer. Before installation, be sure to check with your local authorities regarding building codes and permits, and notify your fire insurance company.



Choose the proper fuel

The best wood to use in wood burning stoves is air-dried hardwood (oak, beech, maple, elm, ash – **not** pine), seasoned for six to eight months prior to burning and stored under cover for protection from the weather. Wet or freshly cut (“green”) wood is not energy efficient because the heat produced is used to evaporate water, rather than heat the home. The water content of a tree or freshly-cut firewood can be as high as 50 percent, compared with 15-20 percent in dry, well-seasoned wood. Burning dry wood produces a more even burn and helps prevent the formation of creosote, a highly-flammable crusty deposit that sticks to the inside walls of your chimney.

The use of properly sized wood pieces is equally important. Wood should be split to a maximum thickness of four to six inches, depending on stove size. This size increases the surface area exposed to flame, resulting in higher burn efficiency.

NEVER burn household wastes such as plastics, color newsprint, diapers, magazines, packaging materials, coated or laminated papers, or painted or treated wood in residential stoves or fireplaces. When burned, these products produce smoke, odors, and release toxic fumes, and the remaining ash may be hazardous. Only dry, untreated wood is acceptable to burn.

Use proper burning techniques

Efficient wood burning requires proper starting, an adequate supply of oxygen, and temperatures high enough to ensure that gases coming off the fire are burned. Start a wood stove fire small at first, with dry kindling or small pieces of clean paper and the damper open. Once the flames from the kindling just begin to subside, add several small pieces of wood, being careful not to smother the fire. The key to maintaining a good fire is careful control of the air supply. The fire should be small enough for air to get to it, but large enough to be hot and able to burn for hours without opening the wood stove door. Unwanted emissions can be released in the house whenever the wood stove door is opened.



A fire that is burning brightly without visible smoke is a sign of good combustion. Excessive smoke from a chimney in the middle of a burn means the smoke is not being burned in the firebox, but is going up the chimney. Never allow the fire to smolder. Smoldering fires are the worst polluters because they burn at a temperature too low for efficient combustion. The result is more smoke – unburned wood going up the chimney, wasted. This means more air pollution and creosote deposits that could lead to a chimney fire.

In addition to checking the fire and smoke conditions, keep the wood stove properly maintained and check it frequently for leaks. Leaks in a stove reduce its efficiency and cause indoor air pollution. To enhance chimney safety and maintenance, periodically check and clean the stack pipe and chimney. See your local fire officials for more information on maintenance of wood stoves, stacks and chimneys.

Reduce the amount of firewood burned by making your house more energy-efficient

Before installing a wood stove, consider insulating and weather stripping your home to conserve heat. Also, make sure that all doors and windows are properly caulked. There are tax incentives to help with these costs and these improvements will save money on fuel and raise the resale value of your home.

For more information

For more information on wood stoves and air quality, contact the N.H. Department of Environmental Services Air Resources Division at (603) 271-1370. For information on wood stoves for residential heating, contact the N.H. Office of Energy and Planning at (603) 271-2155 or visit the EPA website at <http://www.epa.gov/woodstoves/>. UNH Cooperative Extension has information at <http://extension.unh.edu/Energy/WoodHeat.html>.

New Hampshire – Doing Our Share for Clean Air!