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Burning wood better

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Lloyd Walker<sup>1</sup>



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**Quick Facts**

- Inefficient burning of wood causes an air pollution problem as well as a less efficient use of wood fuel.
- The operator of a woodburning device needs to maintain a hot fire with an adequate supply of air to burn the volatile gases as they are released from the wood.
- Buying a stove that is too large produces a temptation to burn wood slowly.
- Heat output always should be controlled primarily by fuel load size rather than by air control only.
- Only dry and properly seasoned wood should be burned in a stove; never burn trash, coal, railroad ties, plastics or wrapping paper.
- Under even the best conditions, very little heat can be gained from most fireplaces; they are primarily aesthetic devices.

Unfortunately, this rediscovery of our oldest heating fuel is causing an increase in air pollution, which is especially apparent in large metropolitan areas and towns located in high mountain valleys. The reduced visibility and pungent odors created by the inefficient burning of wood represent an air pollution problem as well as a less effective use of wood fuel.

Regardless of the reason you burn wood, this fact sheet has specific tips to help you get the most from your wood while limiting your contribution to the pollution problem.

**The Culprits of Pollution & Wood Waste**

Some of the causes of wood smoke pollution include:

- Colorado's topography and weather conditions in high valleys and natural basins contribute greatly to the problem. Pollutants released during frequent temperature inversions are concentrated near the ground.
- Colorado's large number of woodburning devices (fireplaces, fireplace inserts and stoves), concentrated in certain areas, is another factor.
- Improper operation (slow burning) of woodburning devices is a third element. Slow burning causes incomplete combustion that results in increased production of particulates, carbon monoxide and other harmful pollutants. These pollutants reduce visibility and produce odors that are objectionable to many people. Researchers are investigating possible health effects.

**Author's Note:** This fact sheet is not a comprehensive document about the operation of any specific woodburning device. Consult your owner's manual or your local stove and fireplace dealer for specific instructions.

A flickering flame, crisp snapping logs and earthy aroma provide an ambience that is enjoyed more and more in the western states. In fact, over 80% of the timber harvested in Colorado is burned in fireplaces and wood stoves, according to one estimate.

Colorado homeowners are rediscovering wood, and many are finding that it can be a satisfying alternative to more conventional forms of home heating. Efficient woodburning devices abound, and thousands of Coloradans are making "the move to wood heat" every year. Also, some people burn wood just for the effect.

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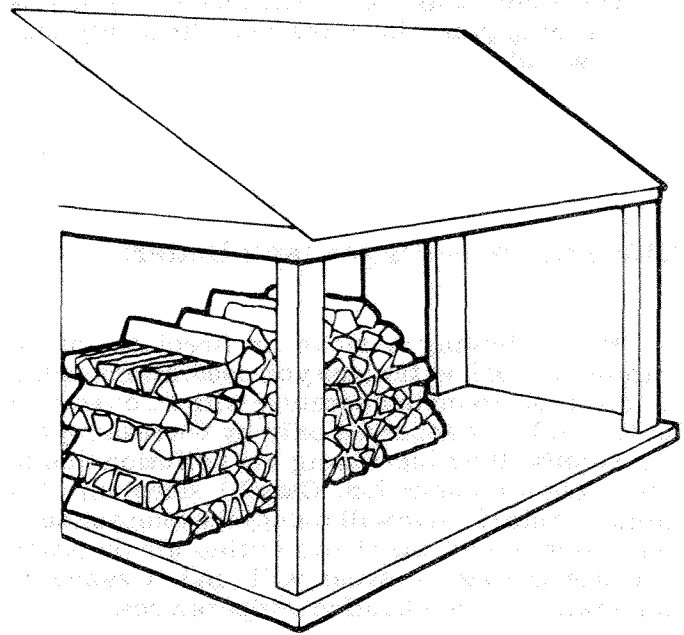
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To simplify technical terminology, trade names of products and equipment occasionally will be used. No endorsement of products named is intended nor is criticism implied of products not mentioned.

Woodburners cannot change the topography or weather conditions but they can significantly improve their operating methods. This will increase the effectiveness of the woodburning device, resulting in cleaner air, increased heat output and greater safety by reducing creosote deposits inside the chimney. (Creosote is a highly flammable substance produced by the incomplete combustion of wood.) Proper operation also results in more economical use of wood, minimizing the woodburner's investment of time and money.

Be aware of community air conditions! It is best not to burn wood at all when your local air quality is poor.

In order to understand the effective operation of a woodburning device we need to grasp a few easily understood principles. Volatile gases are released from wood as it burns. Fifty percent of wood's heat value is contained in these gases and, if not completely burned, they contribute to air pollution. The gases are released from the wood at relatively low temperatures but will not burn until they reach much higher temperatures and are mixed with a proper amount of air. **The operator of a woodburning device needs to maintain a hot fire with an adequate supply of air to burn the volatile gases as they are released from the wood.**



### Getting the Best from Your Stove

A better way to control heat output from a stove is to limit the amount of fuel burned at a given time. **Always maintain a hot fire.** Do this by adding modest amounts of fuel. When warming requirements are small you should maintain a *small hot fire*. Greater heating requirements will simply call for a *larger hot fire*. **Always control heat output primarily by fuel load size rather than by air control only.** (Nighttime heating requirements can be met best by building a large brick or stone mass around your stove. The hot stove will transfer heat to the thermal mass and the mass will radiate heat to the room for several hours after the fire goes out.)

When adding wood to a stove, open the draft controls to a maximum setting for 10 to 30 minutes to bring the combustion temperature up quickly. Then partially close the draft controls to obtain a moderate burn rate. However, the stove's performance should be monitored to assure that adequate temperatures are maintained for more complete combustion. A simple way to monitor the stove's operation is to observe the smoke coming from the chimney, since efficient combustion occurs when the chimney shows little or no visible smoke.

For cleaner air and better fuel economy burn wood that is dry and properly seasoned. Green or wet wood will lower the burning temperature, causing incomplete combustion. Wood should be split and loosely stacked in a dry place (preferably for one full summer) before use.

### Getting the Worst from Your Stove

Controlled draft stoves and fireplace inserts generate excessive air pollutants if operated improperly. A common, but highly improper operating procedure involves fully loading the stove or insert with wood and restricting the air flow through the unit by almost closing the draft controls. This creates a cooler, slower burning fire that produces a great deal of smoke. This smoke not only represents lower combustion efficiency and increased creosote deposits on chimney walls, but also adds to the air pollution problem.

Buying a stove that is too large produces a temptation to burn wood slowly. Some stoves have a very large heating capacity. When homeowners purchase units that have too much capacity, and when those stoves are filled with wood, they tend to produce more heat than is needed to be comfortable. Since the units are "airtight," the homeowner can reduce the heat output simply by restricting the air flow to the fire. This results in a comfortable heat output, but also in the slow burning of wood in an air-starved condition. Polluted air and dirty chimneys are the inevitable results.

**Don't burn trash, coal, railroad ties, plastics or wrapping paper in your stove! Burn only seasoned wood!**

## **Stove Sizing—Bigger Isn't Better!**

Before buying a stove or fireplace insert, carefully consider the size you need. Maintaining comfortable room temperature with an oversized unit usually is achieved only by decreasing the air supply, thus increasing air pollution due to incomplete combustion. Careful selection of a properly sized stove will reduce the temptation to burn slowly and assist in limiting air pollution because the stove owner will find it easier to maintain high combustion temperatures.

Consult carefully with your stove dealer on this important aspect of stove selection. Remember: "Bigger isn't necessarily better!"

## **Minimizing Heat Loss and Pollution**

It does little good to use your fireplace for heating purposes. (Typical fireplace efficiencies are from *minus* 10 percent to plus 15 percent, compared with wood stoves that can be as efficient as 70 percent or better.) Under even the best conditions very little heat can be gained from most fireplaces. They are primarily aesthetic devices.

However, a few techniques can be helpful in minimizing heat loss and limiting pollution from a fireplace:

- Do not use your fireplace at all when the outside temperature is below 20 degrees F. The infiltration of cold air into your home more than offsets any heat gained.

- Build a very hot fire. What little heat comes from a fireplace comes as a result of heating the fireplace masonry. Radiant energy from the hot masonry warms whatever is directly in front of the fireplace. The best way to obtain a hot fire is to use a relatively large fuel load. Stack the wood so that the logs are close enough (1 to 2 inches) to keep each other hot, yet far enough apart to allow the free flow of air between them. Use enough logs and arrange them in such a way as to concentrate the heat in the central part of the fire.

- Use fireplace doors wisely. Glass doors on fireplaces help reduce the escape of heated air from the house and up the chimney, especially at night when a fire is burning out. Close the doors and damper when the fireplace is not in use. Open the glass doors when using the fireplace. This allows some radiant heat from the hot masonry to enter the room. Be sure to have the spark screen in place.

## **Improved Technology**

Dramatic strides are being made in wood-burning technology. New combustion-controlled fireplaces, which achieve efficiencies comparable to most wood stoves, are now available. Catalytic converters, which allow smoke to burn at lower temperatures, are being found on some wood stoves. Advanced combustion systems, which do not require catalysts but produce similar efficiencies, are now being introduced. And add-on catalytic devices that can be used to improve the efficiency of some existing stoves also are available.

These devices, when designed, installed and operated properly, will reduce woodburning pollution and increase stove efficiencies. Those who are shopping for new or replacement equipment should evaluate the new cleaner-burning units. One word of warning: not all "state-of-the-art" devices have been proved effective. Your best assurance that a product will perform according to its maker's claims is an independent laboratory efficiency report.

Wood can be a serious source of pollution, and it should be burned wisely for maximum benefit and improved air quality. Everyone can contribute to burning it better.