UNIVERSITY OF MARYLAND EXTENSION
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October, 2010

Heating with Wood

Wood is a plentiful and accessible fuel for many Marylander's. Wood burns relatively clean and comes from a renewable resource — the rural or urban forest. Wood can be used as cut and split firewood, known as fuelwood, which can be purchased from a firewood seller or cut yourself. Wood can also be consumed as pellets which are made from compressed sawdust, purchased by the bag and burned in specially-made pellet stoves.

Coal and oil supplies are limited, are not renewable, and the cost of these fuels continue to increase. Heating costs consume a significant percentage of earnings of low- to moderate-income families. Heating with fuelwood can greatly reduce utility bills for these households.

Many people think that burning wood produces dirty smoke that will cause problems and pollution. However, new EPA-approved stoves built after 1988 have minimized these problems. Burning dry wood with efficient combustion results in clean burning with few particulates. If you are considering burning wood for heat, look into replacing old, inefficient stoves.

Stoves are also available that burn wood pellets and corn as well. Some stoves will burn both pellets and corn. Some towns, such as Takoma Park and Mt. Rainer, have corn heat co-ops to reduce the price for consumers.

The heating value of properly prepared fuel wood compares favorably with other fuels. When you purchase wood from a firewood dealer or cut it yourself, you are using a renewable fuel. If you own a woodlot and apply timber stand improvement practices, the residual wood can be cut for firewood. On a good growing site, your trees should grow at the rate of about 1/3 cord per year per acre. Even a three acre woodlot can provide about a cord of wood per year. During power failures or national emergencies, wood heat provides a guaranteed source of heat that requires no electricity.

Wood, however, does have disadvantages for industrial or home heating that have contributed to a decline in its use. These include:

- Storage problems because wood creates greater bulk per unit of heat content
- Wood must be air dried for best performance, so keeping it covered is important.
- Possible chimney fire hazard because low pipe or flue temperatures cause residues to condense.
- Inefficiency of many older heating units and methods of fuel wood preparation.

New EPA approved wood stoves are typically more than 70% efficient and greatly reduce the problem with chimney fires. Combined with good fuel preparation systems, burning firewood can be safe, efficient, and save significantly on heating costs. These factors have resulted in a comeback in the use of fuelwood.

How wood burns

When wood burns, three things happen:

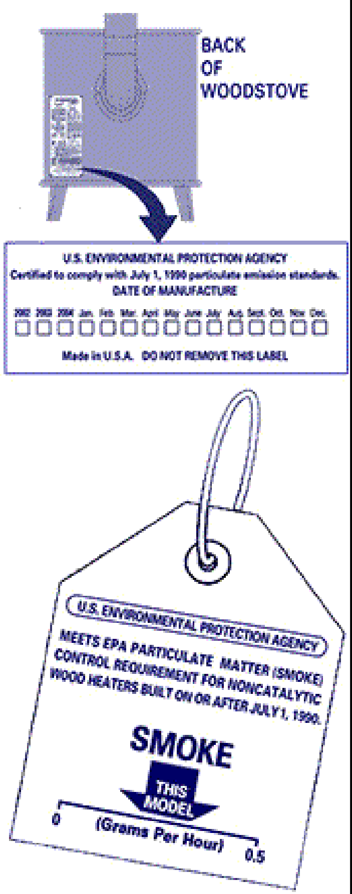
- Water is removed by evaporation
- Chemically, the wood breaks down into charcoal, gas and volatile liquids, with carbon dioxide and water being the chief end products
- The charcoal burns, forming carbon dioxide either directly or with an intermediate conversion to carbon monoxide.

One pound of very dry (zero moisture content) wood of any species has a calorific value of approximately 8,600 Btu (British thermal unit, which equals the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit). Any moisture in the wood reduces the recoverable heat by carrying heat up the chimney during vaporization. Each pound of water vaporized uses about 1,200 Btu.

Additional Btu are lost through the formation of volatile liquids and gases during combustion, but these vary by the type of heating unit. Combustion should be considered part of the efficiency factor of the heating unit.

Most Btu calculations for wood are based on a pound of wood with a 20 percent moisture content, which is air-dried and covered. This pound of wood contains 0.17 pound of water and 0.83 pound of completely dry w0ood and has a heat value of about 7,000 Btu. **This is the base figure used in the heating comparisons made throughout this publication.**

Figure 2



Improving wood-fuel efficiency & emissions

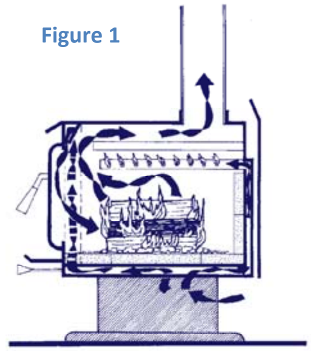
Many types of heaters, furnaces and fireplaces exist, but their efficiency varies because of design and construction.

Fireplaces – Franklin Stoves

Most fireplaces, including Franklin-type stoves, are inefficient because their open front allows lots of heat to escape up the chimney. Installing glass fire screens with proper draft controls, or "heatilators," often increases fireplace efficiency. Properly designed fireplaces can also decrease heat loss. Modern fireplaces may have metal side walls and backs with space for air to circulate between the walls and the fireplace setting. Inlets near the floor and outlets near the mantel provide convection-air heating and circulation in addition to the radiant heat from the fireplace.

Downdraft Wood Stoves

Figure 1



The old technique of admitting room air under the fire and letting it flow up through the fuel bed and then into the chimney flue is inefficient. To heat efficiently, combustible gases released during the burning process must be mixed with ample oxygen at a minimum temperature of 1,100 degrees.

For complete combustion of the wood gases, supply about 80 percent of the air needed over and around the fuel. The desirability of having air supplied over the fire bed has led to the design of "down-draft" combustion heating units (Figure 1). Such units force combustible elements to pass along a circuitous route where they are mixed with a current of hot air and nearly all burned. In less-efficient units, these elements escape up the chimney or are deposited in the flue in the form of soot and creosote.

The internal design of wood stoves has changed entirely since the EPA issued standards of performance for new wood stoves in 1988. EPA's mandatory smoke emission limit for wood stoves is 7.5 grams of smoke per hour (g/h) for non-catalytic stoves and 4.1 g/h for catalytic stoves. (Wood stoves offered for sale in the state of Washington must meet a limit of 4.5 g/h for non-catalytic stoves and 2.5 g/h for catalytic stoves.)

Stove manufacturers have improved their combustion technologies over the years, and now some newer stoves have certified emissions in the 1 to 4 g/h range. When comparing models, look for the EPA white label on the stove (Figure 2). A lower g/h rating means a cleaner, more efficient wood stove.

Outside Wood Boilers

A wood boiler is a furnace, boiler, or stove designed to burn wood for heating and hot water needs. These units vary in size from 115,000 to 3.2 million British thermal units (Btu) per hour. They are most often located outside or in a separate, self-contained shed with a smoke stack. This shed protects a firebox surrounded by a water jacket in which water is heated then pumped through underground pipes to homes, shops, swimming pools, spas, or any application that requires heat or hot water.

While the fundamental design of a wood boiler maximizes the transfer of heat to the water, older wood boilers do not have emission controls and may contribute to a significant source of air pollution and other environmental and health problems. These include: 1) particulate matter and toxic compound emissions; and, 2) foul, heavy smoke that creates a nuisance in local communities.

As of April 1, 2009, all outside wood boilers sold, installed, distributed, or manufactured in Maryland must meet new stringent emission requirements and have a particulate matter emission of 0.6 pounds per million BTU input, and a particulate matter emission standard of 0.32 pounds per million BTU heat output by April 1, 2010.

A person owning or operating a small wood boiler that was purchased before April 1, 2009 can still operate their stove but there are some restrictions on the types of fuel that must be used. They can use clean wood and wood pellets, but there is a list of unacceptable fuels such as garbage, tires, lawn clippings, yard waste, plastic, rubber, etc. The willingness of Maryland Department of Environment (MDE) to allow existing stoves to operate was based on input from manufacturers. These manufacturers found there was no type of add-on they could provide to reduce the emissions. Additionally, the MDE felt disallowing operation of existing stoves would cause an economic hardship to many people who have them in use.

Maryland counties have the ability to impose additional regulations on small wood-fired boilers, as they do with all state regulations.

While not stated specifically in the regulation, the operation of an existing wood boiler could be effected if it was a nuisance or created a public health problem. It is possible that a dispute between neighbors can arise and a neighbor could file a nuisance or public health complaint against another for retribution. These types of complaints are commonly handled by county and/or MDE personnel depending on the county. Usually the parties are brought together and reasonable solutions are found.

There is a major effort to use incentives such as tax credits to encourage replacement of older, inefficient wood stoves and outside boilers with EPA-approved equipment. While many incentives exist for renewable energy sources such as solar, wind and geothermal, incentives for wood have been slow in coming. Check the websites for the Maryland Energy Administration (www.energy.state.md.us) and the MDE (www.mde.state.md.edu).

Effect of Wood Stove Efficiency on Fuel Cost

The following two examples (Figure 3) compare heating efficiency between two methods of burning wood.

(Note: each sample assumes a standard cord of air-dried red oak with a purchase price of $150. Available heat units equal 25.3 million Btu).

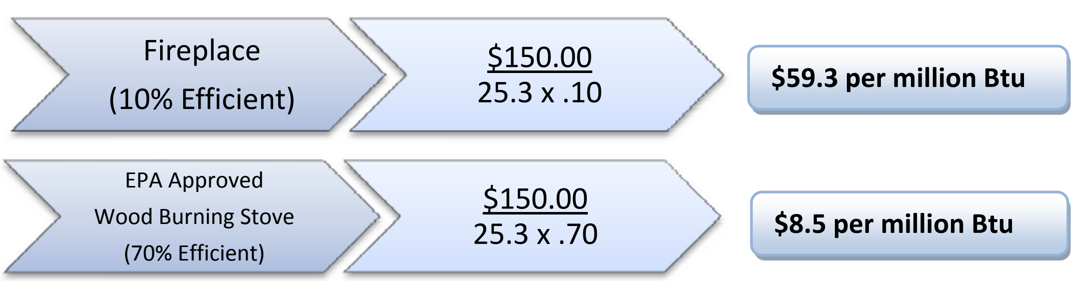


Figure 3

Table 1: Best woods for burning

Approximate weight per standard cord (80 cubic feet of solid wood content) of various woods (green and air-dried to 20-percent moisture content) and potential heat of air-dried wood.

	Pounds green[1]	Pounds air-dried[2]	Million Btu available[3]
Ash	3,940	3,370	23.6
Basswood	3,360	2,100	14.7
Box elder	3,500	2,500	17.5
Cottonwood	3,920	2,304	16.1
Elm (American)	4,293	2,868	20.1
Elm (red)	4,480	3,056	21.4
Hackberry	4,000	3,080	21.6
Hickory (shagbark)	4,980	4,160	29.1
Locust (black)	4,640	4,010	28.1
Maple (silver)	3,783	2,970	20.8
Maple (sugar)	4,386	3,577	25.0
Oak (red)	4,988	3,609	25.3
Oak (white)	4,942	3,863	27.0
Osage orange	5,480	4,380	30.7
Pine (shortleaf)	4,120	2,713	19.0
Red cedar	3,260	2,700	18.9
Sycamore	4,160	2,956	20.7
Walnut (black)	4,640	3,120	21.8

[1]Approximate weight of standard cord (occupying 128 cubic feet of space and containing 80 cubic feet of solid wood), for the first two columns of figures.
[2]To 20 percent moisture content.
[3]Potential available heat from standard cord with 100 percent unit efficiency. Heat at 20 percent moisture content.

The fuel value of wood varies by the type of wood and depends on its density and moisture content. Any wood will burn, but the denser (heavier) woods, if properly dried, will deliver more Btu per cord. The advantages of drying wood to at least a 20-percent moisture level are indicated by Table 1. The average moisture content of green wood varies considerably by wood species. By looking at Table 1, you can see that if you bought a cord of green red oak and burned it without proper seasoning (to 20-percent moisture content) you would, for all practical purposes, reduce the amount of available Btu by the number it takes to vaporize 1,379 pounds of water.

Some counties, such as Prince Georges, require that homeowners store firewood in a neat stack at a minimum of 18" above the ground or 6" above an approved weed-free surface. http://www.co.pg.md.us/Government/AgencyIndex/DER/community-services.asp

Comparing wood to other fuel

The amount of Btu's it takes to heat a home depends on many factors, but climate zone and square footage are two basic factors that can provide a general estimate. Most of Maryland, except for Garrett County and part of the Eastern Shore are located in climate zone 3, with a heating need of 40-45 Btu's per square foot of house for a well-insulated home. You can calculate your winter heating requirement by multiplying the Btu's per square foot (40-45) by your total square footage. For example, if you heat 2000 square feet, your winter heating requirement would range from 80,000 to 90,000 Btu's. This could vary widely depending on how warm you keep your home, insulation, and other factors. One advantage of wood heating over conventional house heating is that you only have to heat the square footage of the area you use.

The Department of Energy maintains a website at www.eia.doe.gov/neic/experts/heatcalc.xl that compares the costs of different fuels at today's prices, allowing you to calculate the potential cost savings of using wood fuel. This website can also be found by searching the phrase, ""Heating fuel comparison calculator" using your internet browser. It will allow you to open a Microsoft Excel spreadsheet that can be opened by most computer spreadsheet programs. You can type in the values for fuel oil, electricity, gas, propane, wood, wood pellets, and coal and the cost per million Btu's is provided. You can then select the type of heating appliance you have and the efficiency rating of the heating unit, which provides the actual fuel cost per million Btu's. Table 2 takes the information from the spreadsheet to calculate the fuel cost per heating season, which is based on an average of 80 million Btu's.

Table 2: Fuel cost for heating season

Fuel cost for the heating season based on the fuel cost for each type of fuel and the efficiency of the furnace used. Prices used are from summer 2010.

Type of Fuel	Fuel Cost per unit	Fuel Price $/mBtu	Efficiency (%)	Fuel Cost $/mBtu	Fuel Cost Heating Season 80 mBtu
Firewood stove	$150 cord	$6.82	68%	$9.74	$779
Pellet stove	$250 ton	$15.15	68%	$21.65	$1732
Electric heat pump	$0.14kwh	$15.22	9.2%	$15.22	$1218
Oil furnace	$2.82 gallon	$20.55	85%	$24.18	$1934
Nat Gas furnace	$0.92 therm	$9.20	85%	$10.82	$866
Propane furnace	$3.23 gallon	$35.36	85%	$41.61	$3329
Coal furnace	$250 ton	$10	85%	$14.71	$1177

Firewood provides the lowest fuel cost for the season at $779, assuming wood is purchased at $150 per cord. If you cut your own wood firewood it becomes very inexpensive. However, the cost of a chainsaw, gear, trailer or truck, logsplitter, as well as your time needs to be considered. Still firewood can be quite inexpensive.

Table 3 compares the basic heating value of firewood with averages of other common fuels when figured at 100-percent burning efficiency. Because no heating unit performs at that efficiency, you need to know or estimate the relative efficiencies of the heating units you are considering or currently using.

From Table 3 you find that a cord of air-dried red oak will provide a potential heat value of 25.3 million Btu. It would take 180.7 gallons of number 2 fuel oil to provide the same number of Btu. The amount of other fuels displaced by using wood depends on the type of wood. You can see comparisons for a range of species and other fuels.

Table 3: Heat source comparison

Equivalent heat of other fuels compared to a cord of air-dried wood (80 cubic feet of solid wood content at 20-percent moisture) based on a heating-unit efficiency of 100 percent. To get more accurate comparison you would need to multiply the efficiency of the heating unit used for each type of fuel.

Wood[1]	Available heat per cord in million Btu	Number 2 Fuel oil[2]	Anthracite[3] coal	Natural[4] gas	LP[5] gas	Electric[6] heat
		Gallons needed to equal cord	**Tons needed to equal cord**	**100 cubic feet needed to equal cord**	**Gallons needed to equal cord**	**Kilowatt hours needed to equal cord**
Ash	23.6	168.6	0.98	236	259.3	6,941
Basswood	14.7	105.0	0.61	147	161.5	4,324
Box elder	17.5	125.0	0.73	175	192.3	5,147
Cottonwood	16.1	115.0	0.67	161	176.9	4,735
Elm	20.1	143.6	0.84	201	220.9	5,912
Elm (red)	21.4	152.9	0.89	214	235.2	6,294
Hackberry	21.6	154.3	0.90	216	237.4	6,353
Hickory (shagbark)	29.1	207.9	1.21	291	319.8	8,559
Locust (black)	28.1	200.7	1.17	281	308.8	8,265
Maple (silver	20.8	148.6	0.87	208	228.6	6,118
Maple (sugar)	25.0	178.6	1.04	250	274.7	7,353
Oak (red)	25.3	180.7	1.05	253	278.0	7,441
Oak (white)	27.0	192.9	1.13	270	296.7	7,941
Osage orange	30.7	219.3	1.28	307	337.4	9,029
Pine (shortleaf)	19.0	135.7	0.79	190	208.8	5,588
Red cedar	18.9	135.0	0.79	189	207.7	5,559
Sycamore	20.7	147.9	0.86	207	227.5	6,088
Walnut (black)	21.8	155.7	0.91	218	239.6	6,412

[1]*Wood available heat at 20 percent moisture 7,000 Btu per pound (128 cubic feet with 80 cubic feet wood volume).*
[2]*Number 2 fuel oil available heat 140,000 Btu per gallon.*
[3]*Anthracite coal available heat 12,000 Btu per pound.*
[4]*Natural gas available heat 1,000 Btu per cubic foot.*
[5]*LP gas available heat 91,000 Btu per gallon.*
[6]*Electricity available heat 3,400 Btu per kilowatt hour.*

Seasoning wood

To get the most heat value, allow wood to dry following cutting and splitting. This usually requires several months. Most dense hardwoods require at least one year to fully season.

The more wood surface exposed to air, the faster it dries. Stack the wood in loose piles off the ground. The best place is a storage area exposed to sunlight. Covered storage, open on the sides, helps prevent rewetting from rain or snow.

Burn wood safely

You can use wood safely in home heating units. But each year, because of disregard for safety, many costly and tragic fires occur. Most local governments have specifications for wood burning stove installations and many require a permit, which will help to assure a safe installation. You also need to check with your insurance company to let them know you are installing a wood burning stove. Both of these steps will prevent most problems. Common sense precautions that are part of any safe installation or use of the stove include:

- Construct the chimney properly, and keep it in good repair and clean of tars and creosote.
- The heating unit must be well-designed and constructed so burning coals, sparks and smoke cannot escape. All EPA approved stoves will meet these requirements.
- Set the unit on an inflammable base large enough so coals or sparks cannot spill on a flammable floor surface.
- Protect flammable walls or ceilings by keeping the stove or pipes an adequate distance away or use a heat shield, as per manufacturer specifications.
- Don't place wood, clothing or other flammable materials where the heat from the unit could ignite them.
- Don't place or store oils, gases or volatile liquids where open flames can ignite fumes.
- Don't fully load a heating unit, set the draft and immediately leave because the fuel may flare up and overheat.
- Provide adequate ventilation so oxygen consumed by combustion can be replaced.
- Never use volatile liquids to start a fire.
- Be careful when removing ashes; live coals are often present, which might fall or otherwise contact flammable materials.
- Do not use your stove to burn cardboard, paper, plastics or other trash.

When wood is harvested and seasoned properly and burned in an efficient and safe heating unit, it is a safe, efficient, economical and desirable fuel from a renewable resource. See Table 3 for information about which firewood will work best for you.

Table 4: Value of selected woods for fuel (dry wood)

Whether buying or cutting wood, these ratings may help you decide on the right kind of wood for your wood-burning stove.

Species	Relative heat value per cord*	Ease of splitting	Ease of starting	Sparks	Coaling quality**
Beech	High	Hard	Poor	Few	**Excellent**
Black locust	High	Hard	Poor	Moderate	**Excellent**
Hickory	High	Medium	Fair	Moderate	**Excellent**
Hophornbeam	High	Hard	Poor	Few	**Excellent**
Oak	High	Medium	Poor	Few	**Excellent**
Sugar maple	High	Medium	Poor	Few	**Excellent**
Southern yellow pine	High	Easy	Good	Few	**Good**
Apple	Average	Hard	Poor	Few	**Excellent**
Ash	Average	Easy	Fair	Few	**Good**
Birch	Average	Medium	Good	Moderate	**Good**
Black cherry	Average	Medium	Good	Few	**Excellent**
Black walnut	Average	Medium	Fair	Few	**Good**
Elm	Average	Hard	Fair	Very few	**Good**
Black gum	Average	Hard	Good	Few	**Good**
Larch	Average	Easy	Excellent	Moderate	**Good**
Red maple	Average	Medium	Fair	Few	**Good**
Aspen	Low	Easy	Good	Moderate	**Poor**
Basswood	Low	Easy	Poor	Few	**Poor**
Cedar	Low	Easy	Easy	Many	**Poor**
Hemlock	Low	Easy	Excellent	Many	**Poor**
Pine	Low	Easy	Excellent	Many	**Poor**
Tree-of-heaven***	Low	Easy	Good	Few	**Poor**
Yellow poplar	**Low**	**Easy**	**Good**	**Moderate**	**Poor**

** Based on BTUs per cord of air-dried wood.*
*** Coaling quality*
*** Tree-of-heaven is invasive and when it is cut, more will grow.*

Sources: C. Hunt and R. Ramath. 1973. Enjoy Your Fireplace, Especially During the Energy Crisis. *USDA Forest Service, Upper Darby, PA; Beattie, M., C. Thompson, and L. Levine. 1993.* Working with Your Woodland: A Landowner's Guide. *University Press of New England, Hanover, NH, p. 39; Fazio, J.R. 1994. The Woodland Steward. The Woodland Press, Moscow, ID.*

How to buy firewood

Most wood is purchased by the cord although nationally, there is a trend toward selling firewood by weight and by the small bundle. However, a cord is the standard unit of measure typically encountered. Maryland law states that firewood must be sold by a cord or a fraction of a cord. This is enforced by the Maryland Department of Agriculture's - Weights and Measures section.

When you purchase firewood, always inspect the load before it gets dumped in your yard to make sure it's seasoned, if advertised as such. Also, the seller is required to leave a receipt with his name and address, price and his forest product operator's license number.

A standard cord is 128 cubic feet (Figure 4). This may be 4 feet by 4 feet by 8 feet or 4 feet by 2 feet by 16 feet or any other combination yielding 128 cubic feet. A measure of one-third or one-half cord commonly has been called a "rick," although a rick is really only a pile of wood.

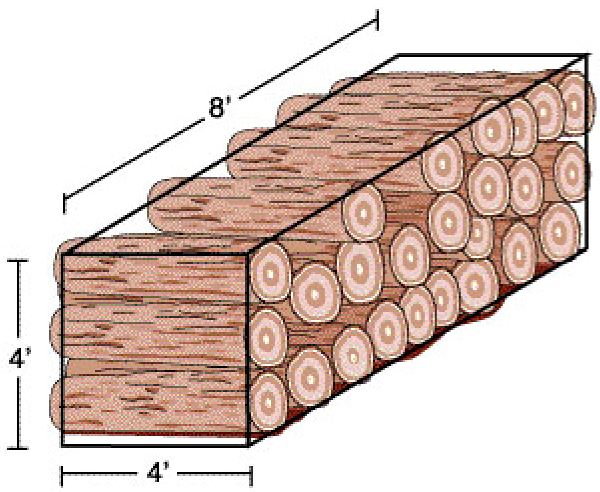


Figure 4: A Cord of Wood

Actual volume of solid wood in a cord varies from 65 cubic feet for small, crooked sticks, increasing with the size and straightness of the sticks up to about 90 cubic feet.

Average for this region is about 80 cubic feet. The shrinkage in volume between a cord of green wood and a cord of seasoned wood is about 8 percent.

Another common measure used in selling firewood is the "face cord" (4 feet by 8 feet by 24 inches - Figure 5).

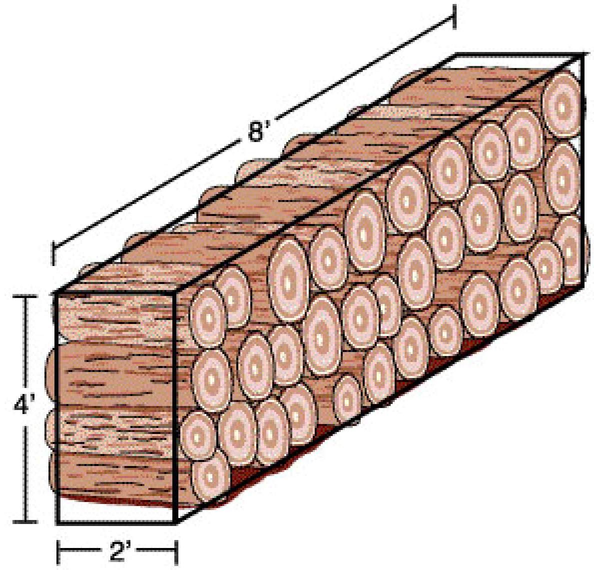


Figure 5: A Face Cord

The length may vary from 18 inches to 24 inches. "Rank" and "fireplace cord" also are used to describe the amount of wood in a face cord. In Maryland this would have to be expressed as a fraction of a cord.

Another element of the wood business is the firewood bundle, often seen at supermarkets. Seasoned oak or other dried hardwood weighs about 3,600 pounds per cord. Bundles, weighing about 36 pounds, represent about 1/100 cord. Another measuring method may be by bundle size. For example, a bundle 1 foot by 1 foot by 2 feet would be 2 cubic feet or 1/64 cord (Figure 6). Typically, the volume of wood in bundles is expressed in terms of cubic feet instead of cords.

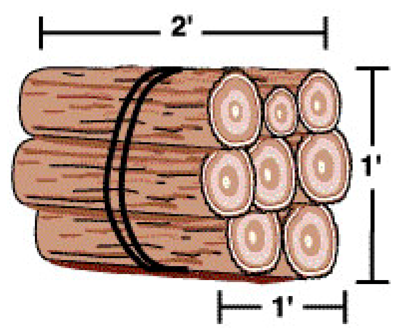


Figure 6: Fireplace Bundle (fraction of cord) *Example: 1/64 cord is 1 foot by 1 foot by 2 feet. Many bundles sold in convenience stores are smaller, usually about 0.75 cuft. Check the label.*

Table 5: The price of firewood in Maryland

(Cord of oak or hardwood, cut, split and delivered)

The University of Maryland Extension does an informal firewood price survey every few years to give firewood users an idea of current market prices. The values are based on prices found on the internet and regional publications for a cord of oak or hardwood, cut, split and delivered. In general, the highest firewood prices are found in the central Maryland area with lower prices in western Maryland and the Eastern Shore.

	2010		
	Average Price	Number of Prices Obtained	Range
Western MD			
Allegany/Garrett	$193	3	$180 - $200
Washington	$200	3	$175 - $225
Frederick	$178	6	$130 - $250
Carroll	$185	4	$170 - $199
Central MD			
Baltimore	$188	4	$165 - $210
Harford	$196	7	$180 - $245
Mont/Howard/PG	$236	7	$175 - $275
Southern MD			
Charles	$158	3	$150 - $165
Anne Arundel	$208	6	$175 - $275
St. Mary's	$168	4	$150 - $185
Eastern Shore			
Cecil	$201	5	$150 - $255
Kent, Dorchester, Queen Anne's	$205	5	$150 - $275
Worchester, Talbot, Caroline	$173	3	$125 - $180

Which Trees to Cut

If you cut wood wisely, the remaining woodland will be more productive. Owners frequently cut the straight, well-pruned trees for firewood because they split easier than crooked trees with many limbs. This practice, coupled with leaving low-quality trees, reduces woodlots to a collection of poor quality trees with poor genetic stock.

Cut only those trees that, when removed, will give more room for growth to the most desirable trees in the woodlot. Removing inferior trees for firewood can solve one of the most difficult problems in building up forest resources (Figure 7). It can provide an income to the timber owner during the period when the best trees are making their most valuable growth. Also the better trees grow faster without excessive competition from inferior trees.

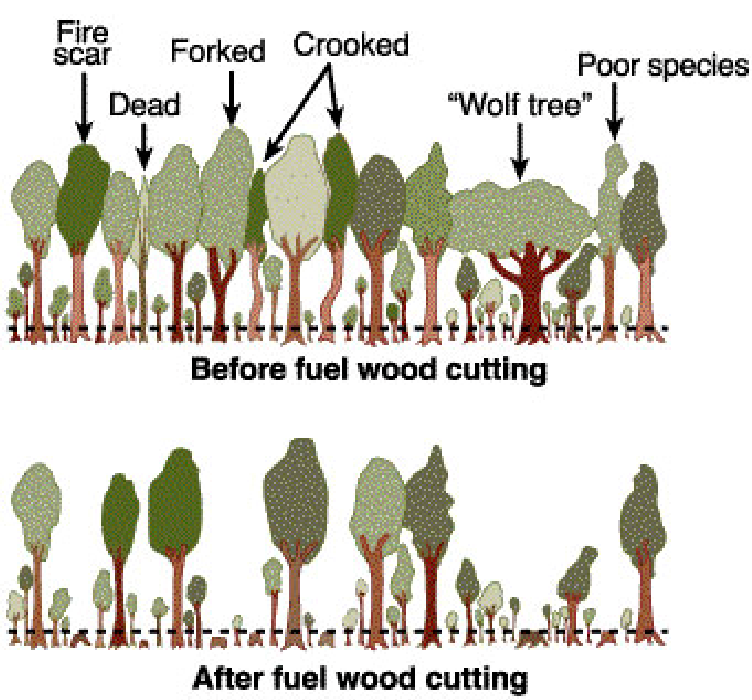
Dead trees (both standing and down) are commonly selected for firewood since they can be burned in a short period of compared to live trees. However, standing dead trees provide habitat for woodpeckers and other animals and down trees provide a diverse habitat for ground-nesting wildlife. Remember to leave some standing and down dead trees for wildlife. If you are interested in improving the growth of the remaining forest, it is best to cut live trees that are interfering with the growth of your better trees. These trees will require more time to air dry for use in your stove.

Consider the following principles for identifying fuelwood:

- Sound dead trees and logging wastes, such as tops and large limbs. Remember to leave some dead trees and logging waste for wildlife.
- Diseased or insect-infested trees (if the wood can be burned in a short period of time to prevent pest spreading).
- Brushy, crooked or broken hardwoods.
- Trees that could fall and damage property or cause human injury.
- Trees that have been seriously overtopped and stunted by others.
- "Wolf" trees (those with unusually large spreading tops occupying excessive space). Sometimes these trees provide valuable habitat for wildlife.
- Undesirable species which are invasive and exotic.

Before felling, mark trees to be cut with a ribbon or paint. Professional foresters can mark the trees to be cut for a fee. The Maryland Forest Service has foresters in most counties that may be able to help. University of Maryland Extension (UME) has workshops and publications that can help guide your marking decisions and provide help in tree identification, forest and wildlife management, invasive species management, and much more. The publication, The Woods in Your Backyard: Enhancing and Creating Natural Areas Around Your Home, is a great resource available from UME. A full set of resources and a calendar of events are available at: www.naturalresources.umd.edu.

Figure 7: Which Trees to Cut: If you cut low-quality trees and crooked trees with many limbs for your firewood, you'll help woodland development.



References

This publication adapted material from the following publication:

Wood Fuel for Heating by J.P. Slusher. MU Guide G5450. University of Missouri Extension. Published March 1995, all rights reserved. Available online at: http://extension.missouri.edu/publications/DisplayPub.aspx?P=G5450 .

Figures:

Wood burning stove diagram – EPA- Certified Woodburning. Fact Sheet. Hearth, Patio, & Barbecue Association, Arlington, VA. http://basineducation.uwex.edu/centralwis/pdfs/EPACertWoodburning.pdf

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