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G88-881 Heating With Wood I. Species Characteristics and Volumes

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Heating With Wood

I. Species Characteristics and Volumes

Heat content, burning characteristics and overall quality of woods commonly burned in Nebraska, as well as information on buying firewood, are included here.

Mike Kuhns, State Extension Forester
Tom Schmidt, Forester

- Species Characteristics
- Firewood Volume
- Buying Firewood
- For More Information

Wood is a source of heat currently used by many Nebraskans, and more firewood likely will be burned as the cost of other energy sources, such as gas and electricity, rises. In order to use firewood effectively, an understanding of species' characteristics and firewood volumes is needed.

Species Characteristics

Firewood from different species or types of trees varies widely in heat content, burning characteristics and overall quality. Table I below presents several important burning characteristics for most species used in Nebraska.

Green weight is the weight of a cord of freshly cut wood before drying. Dry weight is the weight of a cord after air drying. Green firewood may contain 50 percent or more water by weight. Green wood produces less heat because heat must be used to boil off this water before combustion can occur. Green wood also produces more smoke and creosote than dry wood. Firewood always should be purchased dry or allowed to dry before burning.

Dry wood may cost more than green wood because it produces more heat and is easier to handle.

A wood's dry weight per volume, or density, is important because denser or heavier wood contains more heat per volume. Osage-orange is the densest firewood available in Nebraska. It contains almost twice the heat by volume as cottonwood, one of our lightest woods. It is best to buy or gather dense woods such as oak, ash or mulberry.

Hardwoods, or woods from broadleaved trees, tend to be denser than softwoods, or woods from conifers.
Some firewood dealers sell "mixed hardwood" firewood. This may or may not be desirable, depending on the proportion of low-density hardwoods, such as cottonwood, that are included.

The amount of heat per cord of dry wood is presented in Table I. Heat content is shown as a percent of dry green ash, a common Nebraska firewood. Values above 100 signify a higher heat content than green ash and values below 100 a lower heat content.

Table I also contains information on other characteristics that determine firewood quality. Ease of splitting is important because larger pieces of wood usually must be split for good drying and burning.

Fragrance and tendency to smoke and spark are most important when wood is burned in a fireplace. Woods that spark or pop can throw embers out of an open fireplace and cause a fire danger. Conifers tend to do this more because of their high resin content.

Woods that form coals are good to use in wood stoves because they allow a fire to be carried overnight effectively.

TABLE I. Firewood Facts

<table>
<thead>
<tr>
<th>Species</th>
<th>Weight (lbs./Cord)</th>
<th>Heat/ Cord (1,000,000 BTU'S)</th>
<th>% Green Ash</th>
<th>Ease of Splitting</th>
<th>Smoke</th>
<th>Sparks</th>
<th>Coals</th>
<th>Fragrance</th>
<th>Overall Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>4850 3888</td>
<td>27.0</td>
<td>135</td>
<td>Medium</td>
<td>Low</td>
<td>Few</td>
<td>Good</td>
<td>Excellent</td>
<td>Excellent</td>
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<tr>
<td>Ash, Green</td>
<td>4184 2880</td>
<td>20.0</td>
<td>100</td>
<td>Easy</td>
<td>Low</td>
<td>Few</td>
<td>Good</td>
<td>Slight</td>
<td>Excellent</td>
</tr>
<tr>
<td>Ash, White</td>
<td>3952 3472</td>
<td>24.2</td>
<td>121</td>
<td>Medium</td>
<td>Low</td>
<td>Few</td>
<td>Good</td>
<td>Slight</td>
<td>Excellent</td>
</tr>
<tr>
<td>Basswood (Linden)</td>
<td>4404 1984</td>
<td>13.8</td>
<td>69</td>
<td>Easy</td>
<td>Medium</td>
<td>Few</td>
<td>Poor</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Birch, Paper</td>
<td>4312 2992</td>
<td>20.8</td>
<td>104</td>
<td>Medium</td>
<td>Medium</td>
<td>Few</td>
<td>Good</td>
<td>Slight</td>
<td>Fair</td>
</tr>
<tr>
<td>Box elder</td>
<td>3589 2632</td>
<td>18.3</td>
<td>92</td>
<td>Difficult</td>
<td>Medium</td>
<td>Few</td>
<td>Poor</td>
<td>Slight</td>
<td>Fair</td>
</tr>
<tr>
<td>Buckeye, Ohio</td>
<td>4210 1984</td>
<td>13.8</td>
<td>69</td>
<td>Medium</td>
<td>Low</td>
<td>Few</td>
<td>Poor</td>
<td>Slight</td>
<td>Fair</td>
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<tr>
<td>Catalpa</td>
<td>4560 2360</td>
<td>16.4</td>
<td>82</td>
<td>Difficult</td>
<td>Medium</td>
<td>Few</td>
<td>Good</td>
<td>Bad</td>
<td>Fair</td>
</tr>
<tr>
<td>Cherry, Black</td>
<td>3696 2928</td>
<td>20.4</td>
<td>102</td>
<td>Easy</td>
<td>Low</td>
<td>Few</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Good</td>
</tr>
<tr>
<td>Coffeetree, Kentucky</td>
<td>3872 3112</td>
<td>21.6</td>
<td>108</td>
<td>Medium</td>
<td>Low</td>
<td>Few</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
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<tr>
<td>Cottonwood</td>
<td>4640 2272</td>
<td>15.8</td>
<td>79</td>
<td>Easy</td>
<td>Medium</td>
<td>Few</td>
<td>Good</td>
<td>Slight</td>
<td>Fair</td>
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<tr>
<td>Douglas Fir</td>
<td>3319 2970</td>
<td>20.7</td>
<td>103</td>
<td>Easy</td>
<td>High</td>
<td>Few</td>
<td>Fair</td>
<td>Slight</td>
<td>Good</td>
</tr>
<tr>
<td>Elm, American</td>
<td>4456 2872</td>
<td>20.0</td>
<td>100</td>
<td>Difficult</td>
<td>Medium</td>
<td>Few</td>
<td>Excellent</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Elm, Red</td>
<td>4800 3112</td>
<td>21.6</td>
<td>108</td>
<td>Easy</td>
<td>Medium</td>
<td>Few</td>
<td>Excellent</td>
<td>Good</td>
<td>Good</td>
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<tr>
<td>Elm, Siberian</td>
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<td>20.9</td>
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<td>Medium</td>
<td>Few</td>
<td>Good</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Fir, Concolor</td>
<td>3585 2104</td>
<td>14.6</td>
<td>73</td>
<td>Easy</td>
<td>Medium</td>
<td>Few</td>
<td>Poor</td>
<td>Slight</td>
<td>Fair</td>
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<tr>
<td>Hackberry</td>
<td>3984 3048</td>
<td>21.2</td>
<td>106</td>
<td>Easy</td>
<td>Low</td>
<td>Few</td>
<td>Good</td>
<td>Slight</td>
<td>Good</td>
</tr>
<tr>
<td>Hickory, Bittermuth</td>
<td>5032 3832</td>
<td>26.7</td>
<td>134</td>
<td>Medium</td>
<td>Low</td>
<td>Few</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Hickory, Shagbark</td>
<td>5104 3952</td>
<td>27.5</td>
<td>138</td>
<td>Difficult</td>
<td>Low</td>
<td>Few</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Honeylocust</td>
<td>4640 3832</td>
<td>26.7</td>
<td>133</td>
<td>Easy</td>
<td>Low</td>
<td>Few</td>
<td>Excellent</td>
<td>Slight</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
Firewood Volume

Though firewood dry weight is important for determining heat content, firewood is normally bought and sold by volume.

The most common unit of firewood volume is the cord, also known as a standard or full cord. A cord is an evenly stacked pile containing 128 cubic feet of wood and air space.

Though a cord can be piled in any shape, a standard cord is generally thought of as a stack of wood four feet tall, eight feet long, and four feet deep (Figure 1). To figure the number of cords in another size or shape pile, determine the pile's cubic foot volume and divide by 128. A randomly piled stack of wood generally will contain more air and less wood than one neatly piled.

Some dealers sell wood by the face cord or short cord (Figure 2). A face cord is a stack of wood four feet high, eight feet long, and as deep as the pieces are long. Pieces are commonly 12 to 18 inches long, so a face cord may contain 32 to 48 cubic feet of wood and air.

Another common firewood measure is the pickup load (Figure 3). This is an imprecise but common measure. A full-size pickup with a standard bed
can hold about 1/2 of a full cord, or 64 cubic feet, when loaded even with the
top of the bed. Small pickups hold much less. Random loading will decrease
this amount further.

A randomly piled stack or pickup load of wood will contain more air and
less wood than one neatly stacked. Crooked, small diameter, and knotty or
branchy pieces also reduce the amount of wood in a pile.

Figure 3. PICKUP LOAD,
Approximate Total Volume
= 64 cu. ft.

Buying Firewood

Species, volume, dryness and need for splitting should be considered when buying firewood. This NebGuide
and other publications provide basic information you need to be an informed buyer, but knowing your dealer
is the best way to ensure that you are getting what you are paying for.

For More Information

A number of good publications are available to help you learn more about using firewood for heating. These
include:

- *Burning Wood and Coal* by Susan Mackay, L. Dale Baker, John W. Bartok, Jr., and James P. Lassoie.
  1985. Northeast Regional Agricultural Engineering Service, Riley Robb Hall, Cornell University,
  Ithaca, NY 14853. (607) 256-7654. 90 pp. $4.95.
  Press, Box 333, Waitsfield, VT 05673. 155 pp. $6.95.
  $8.95.

Other publications on heating with wood will be available from the Cooperative Extension Service in the
future. Contact your extension agent for the most recent titles.

A videotape titled "Firewood for Home Heating" also is available for loan or purchase through your extension
agent. This video describes factors to consider when making the decision to heat with wood.

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