# Air-Drying Lumber

## It takes patience and a watchful eye, but the benefits go far beyond cost savings

BY LEE GRINDINGER

***Cut and dry.*** *Contributor Garrett Hack stacks green lumber near his shop in Thetford Center, Vt.*

Whether you want to save a neighborhood walnut tree from becoming firewood or you're tired of paying $6 a board foot for cherry, there are plenty of reasons to dry your own lumber.

Of course, cost is the great motivator. Hiring a bandsaw mill and drying your own lumber can buy you many projects' worth of furniture-grade wood at less than $1 per board foot. These portable saws mean you don't have to truck your logs to a local sawmill. Also, the cheaper sawblades used by bandsaw mills make it practical to harvest urban and suburban trees, a great source of native and non-native species with the occasional nail lurking inside.

If you live in a wooded region of the country, a local sawmill is a good place to get green stock, sometimes from a single log. Generally, lumber sold directly from mills is not graded and is less than half the price of kiln-dried lumber. Getting and drying lumber from a single log allows you to match boards for furniture and cabinetry (see the photos on the facing page).

And finally, there's the satisfaction of building something from a tree you knew or a stack of lumber you seasoned.

Lumber has been dried without the use of kilns for centuries, in virtually every climate. All it takes is a well-built lumber stack, a watchful eye and patience.



Photos, except where noted: Asa Christiana

If you have called in a sawmill or are buying from one, remember that wood shrinks as it dries. Instruct the sawmill operator to cut the wood ⅛ in. over for each 1 in. of thickness. Be aware that it can take a year per inch of thickness to dry lumber, so thicker stock is truly an investment in the future.

Check also that the thickness is uniform. If it varies more than ⅛ in., the lumber will be difficult to stack, and warping is a very real problem if lumber is not in contact with all of the stickers.

During warm weather get the wood onto stickers within hours of having it sawn. This will prevent staining caused by the bacteria and fungi that invade wet, stacked boards in warm weather.

### End-coat to prevent checking

Wood loses moisture 10 to 15 times faster through the ends as it does through the faces, so if you don't end-coat, you can expect some loss due to checking. Coat the ends of the log as soon as it is felled and cut to length. However, when handled properly, most individual boards won't check more than 4 in. to 8 in. into their ends, so the wood saved by end-coating a lumber stack sometimes isn't worth the time and effort.

The best end coatings, such as Anchorseal, are wax emulsions. Applied with either brush, roller or spray, these coatings must be applied as soon as possible, before any checking begins.

### Choose the right stickers

The best stickers come from dry, straight-grained, clear wood. Hard maple, oak, beech, Douglas fir and hickory are good choices for sticker material. You should avoid cherry and walnut, which contain pigments that can bleed into the lumber. Resinous woods are best avoided as well.

Stickers must be of uniform thickness; ¾ in. is adequate to ensure good airflow. They should be at least 1 in. wide, but 1¼-in.-wide stickers are easier to handle because it's immediately clear which face goes against the lumber. The length of the stickers determines the width of the lumber pile. Unless you're stacking sawn logs exactly as they come out of the log (flitchsawn), sticker lengths of 3 ft. or more are better than shorter ones. Lumber in random widths and lengths is easier to stack when you have wide piles.

Some light-colored woods are prone to sticker stain, which is a discoloration beneath the stickers that can run all the way through the wood. To dry light-colored woods such as ash, maple, hickory and beech, restack the pile every week using dry stickers until the lumber's moisture content gets down to around 18%—about a month in most climates.

### Build a solid stack

Choose the location of your lumber pile carefully. It should be out of direct sun and not in a windy location. Find an area free of vegetation and standing water. Gravel makes an excellent foundation.

Lay down 4x4 or 6x6 timbers every 20 in. to 24 in. It is very important that the tops of these beams be level and even. Unevenness will be transmitted to every board in the pile.

On top of these timbers, place the first course of stickers. When stacking boards and stickers, work from the outside of the stack, keeping the sides of the stack even and vertical. Make sure that at least every other board is flush with the end of the stack to support the sticker that will be placed above it. Place an additional sticker if you need to support the ends of short boards. Keep each row of stickers directly over the previous row. Woods prone to warping, such as hickory and elm, should be stickered more closely together—as much as 12 in. on center.

After all of the lumber has been stacked, add a layer of stickers and pile as much weight on top as you can. Throw on cinder blocks, logs or whatever you have. Restraining the wood during drying will make for much flatter and straighter stock.

You'll need to protect the pile from rain and direct sun. Drying sheds keep weather off the lumber without restricting airflow, but tarps or sunshades work, too. The idea is to keep the tarp away from direct contact with the lumber and to tent it slightly to allow

## WHY BOTHER DRYING LUMBER?

***Furniture from a flitch.*** *Kelly Mehler, a woodworker in Berea, Ky., made this chest of drawers from a single cherry log, achieving a beautiful continuity in the grain pattern. Mehler often has logs flitchsawn, air-dries them in his shop, then stores the planks in the order they came off the log.*

Photos, this page: Albert Mooney

## ANATOMY OF A DRYING STACK

**A successful lumber-drying stack needs a level, dry foundation; protection from direct rain and sun; and level support for each layer of boards.**

Weight placed on top holds down roofing material and lumber below.

Rain/sun protection

Denser layer of stickers to distribute weight

Even sides and ends catch less water.

*Slide in an extra sticker to support the free ends of boards that fall short of the next sticker.*

Stickers, at least ¾ in. thick and no wider than 1¼ in.

Placing timbers (and stickers) 20 in. to 24 in. apart will provide plenty of support for most woods.

Support timbers

Support timbers can be laid directly on a bed of sand or gravel. Otherwise, cinder blocks offer an economical way to raise the foundation off the ground.

*Place one set of stickers on the support timbers before putting on the first layer of boards.*

***A solid lumber stack starts with a dry and level foundation.*** *Sight down the timbers to see which cinder blocks must be dug in a bit deeper. The blocks keep the lumber away from the moist soil below.*

Drawing: Jim Richey


***Add precision to the process.*** *Use a hygrometer (right) and an EMC chart to find the relative humidity and determine the EMC. Then a moisture meter (above) can tell you when your lumber reaches that EMC.*

## EQUILIBRIUM MOISTURE CONTENT (EMC)

**EMC is the final moisture content wood will achieve in a given environment, based on temperature and relative humidity.**

| TEMPERATURE (°F) | RELATIVE HUMIDITY 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 2.6 | 4.6 | 6.3 | 7.9 | 9.5 | 11.3 | 13.5 | 16.5 | 21.0 |
| 40 | 2.6 | 4.6 | 6.3 | 7.9 | 9.5 | 11.3 | 13.5 | 16.5 | 21.0 |
| 50 | 2.6 | 4.6 | 6.3 | 7.9 | 9.5 | 11.3 | 13.4 | 16.4 | 20.9 |
| 60 | 2.5 | 4.6 | 6.2 | 7.8 | 9.4 | 11.1 | 13.3 | 16.2 | 20.7 |
| 70 | 2.5 | 4.5 | 6.2 | 7.7 | 9.2 | 11.0 | 13.1 | 16.0 | 20.5 |
| 80 | 2.4 | 4.4 | 6.1 | 7.6 | 9.1 | 10.8 | 12.9 | 15.7 | 20.2 |
| 90 | 2.3 | 4.3 | 5.9 | 7.4 | 8.9 | 10.5 | 12.6 | 15.4 | 19.8 |
| 100 | 2.3 | 4.2 | 5.8 | 7.2 | 8.7 | 10.3 | 12.3 | 15.1 | 19.5 |

Chart data from USDA Forest Products Laboratory

water to run off. Some woodworkers use roofing metal or plywood on top, tilted slightly to allow water to run off, with the weight placed on top to hold it down.

### Keep an eye on the pile

Watch the stack closely for several weeks. You want to dry the wood as slowly as possible, to prevent both checking and case-hardening. However, mold is also a concern. Until the lumber gets down to 20% moisture content, any sign of mold indicates that the pile needs more air movement.

Checking is a sign that the pile is drying too quickly. Inspect the surface of the wood as well as the ends. If you find checks, slow down the air movement to prevent further degradation. Put a tarp on one, two or three sides of the pile to accomplish this.

Case-hardening occurs when the outer, drier shell of the board is stretched over a fatter and wetter interior and remains that way after the wood is dry, leaving severe internal stresses. Both case-hardening and checking occur when surface moisture evaporates faster than interior water can migrate to the surface. Each species has its own rate of diffusion, which determines how quickly the wood can be dried. A general rule of thumb is the lighter weight the wood, the faster it can be dried. Heavier woods, such as hickory, elm and oak, need more time.

### When to stop

Moisture content is expressed as a percentage of the wood's oven-dry weight. A moisture content of 6% means that 6% of that board's weight is water. Moisture content is what you monitor during drying, but you should check it against the equilibrium moisture content. The equilibrium moisture content for wood is a function of the surrounding humidity and temperature. Basically, when the moisture in lumber reaches equilibrium with the air around it, the wood is not going to get any drier in that location.

You can use a few relatively inexpensive instruments for monitoring moisture content and equilibrium moisture content, or you can just guess at drying time. In the more-humid areas of the country, such as the Northeast and Gulf states, the rule of thumb for drying time is one year for every inch of wood, but things will go faster in other regions. Many folks simply use this general rule as a minimum; it doesn't hurt the wood to sit outside for a few extra months or even years, as long as the stack is maintained.

Once the wood has reached its outdoor equilibrium moisture content, it's time to move the stack inside, if you have the space. You could also bring in lumber as you need it.

### Resticker the wood indoors

It's very important to finish drying your lumber in conditions similar to the furniture's final destination. Resticker the lumber in a heated space with adequate air movement and ventilation. Most basements are too humid. Generally, you can begin using the wood when it reaches 10% moisture content or so, depending on your region and the relative humidity of your home.

### The best way to learn is to do it

Knowing the seasonal conditions of your location will make drying lumber much easier. Start with small quantities and monitor them closely. After a year you'll know the quirks, and daily or weekly monitoring will no longer be necessary. The USDA Forest Products Laboratory offers a number of free publications on drying lumber, which can be read on-line at www.fpl.fs.fed.us. Of course, the recently revised *Understanding Wood* (The Taunton Press, 2000), by R. Bruce Hoadley, is the bible on wood technology, including air-drying.

Now, about that neighbor's walnut tree. □

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Photos, this page: Michael Pekovich