

# Wood species guide

*Hardwoods—and some softwoods—continue to be one of the prime components in furniture, cabinet, and woodwork manufacturing. What follows are general uses and working and drying characteristic of the most frequently used species, including several tropical hardwoods.*

## BASIC MATERIALS

**By R. Sidney Boone, Donna Christensen, and Debra Squire**

### HARDWOODS

#### Ash (*Fraxinus*)

**Range**—Of the 65 species of trees and shrubs called ash, six—white, pumpkin, blue, black, green, and Oregon ash—are commercially important for lumber and other wood products. White ash grows throughout almost the entire wooded area of the U. S. east of the Great Plains, except the Gulf and South Atlantic coasts, and in southern Ontario and Quebec. Green ash has practically the same geographic distribution except that it also grows along the coast, follows the tributaries of the Mississippi River westward across the prairies, and extends farther northward in Canada. Black ash grows along the Great Lakes and St. Lawrence River from New England westward to Minnesota and northeastern Iowa.

**Uses**—The principal use of ash is in furniture, interior parts of upholstered furniture, kitchen cabinets, and architectural trim and cabinetry. Ash is straight

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grained, stiff, strong, and hard. White ash is superior to other ash species in these qualities. Ash also has good bending properties, high shock resistance, and it wears smooth in use.

**Characteristics**—White ash shrinks moderately but can be kiln dried rapidly and satisfactorily. Ash commonly is dried from the green condition in the kiln and requires 10-15 days for 1-inch lumber. It machines well, is better than average in nail- and screw-holding strength, and is intermediate for gluing. Other ash species have lower strength properties than white ash but still compare favorably with other native hardwoods. These species also split easier shrink more, are average in workability, and perform somewhat less favorable than white ash when exposed to extreme cycles of moisture content.

#### Aspen (*Populus*)

**Range**—Aspen grows throughout most of the northeastern and western U.S. Commercial stands are located principally in the Lake States and the Northeast; smaller amounts are found in the central Rocky Mountain region.

**Uses**—Once considered a weed tree, aspen is now used for a wide variety of exposed furniture parts and interior parts of upholstered furniture.

**Characteristics**—A lightweight

hardwood, aspen can be seasoned satisfactorily by air drying or kiln drying. The occurrence of "wet pockets" or "wetwood" in some lumber may require special attention during drying. The wood has low nail-withdrawal resistance but has little tendency to split under the action of nails or screws. It's easily worked and fairly easy to finish to a smooth surface. Aspen glues easily with a variety of glues and under a wide range of gluing conditions. It ranks among the best hardwoods in painting properties.

#### Beech (*Fagus grandifolia*)

**Range**—The natural range of beech in the U. S. extends from Maine to northern Florida and westward from the Atlantic coast into Wisconsin, Missouri, and Texas.

**Uses**—Beech is used in the manufacture of furniture, especially chairs; veneer, kitchen cabinets; and architectural woodwork. Its ability to maintain curvature after bending has led to increasing use for curved chair parts.

**Characteristics**—The wood is hard, strong, and machines well. Because its physical and mechanical properties are so balanced, it rates highly for nearly all wood-machining processes. It also has no characteristic taste or odor, making it suitable for woodenware, food containers, and novelties. It shrinks substantially during seasoning and requires maximum care to avoid checks, warping, and discoloration. It's typically kiln dried from the green condition to minimize these problems. This requires 12-15 days for 1-inch lumber.

#### Birch (*Betula*)

**Range**—Yellow birch grows in the Lake States, New England, New York, New Jersey, Pennsylvania, and along the Appalachian Mountains into southern Georgia. It reaches its best development near the Canadian border. Sweet birch grows in New England, New York, New Jersey, and Pennsylvania and

extends southward along the Appalachian Mountains to northern Georgia and Alabama. Paper birch has a transcontinental range extending throughout Canada to Alaska. In the U.S., it occurs eastward from the Lake States to New York and New England.

**Uses**—Yellow birch is one of the principal furniture woods in the U.S. because of its good machining and finishing properties, hardness, pleasing figure, and attractive color. Sweet birch lumber and veneer also are used in furniture. Both species are also used in kitchen cabinets and architectural trim, paneling, and cabinetry. Much paper birch is used for specialty veneer products such as toothpicks and tongue depressors.

**Characteristics**—The wood of yellow and sweet birch is relatively heavy, hard, and strong and has high shock resistance. Although the wood is difficult to work with handtools, it can be readily shaped by machine and ranks high in nail-withdrawal resistance. Sweet birch ranks slightly above yellow birch in most strength properties. The wood of paper birch is considerably lighter than the other two birches and ranks below them in hardness, strength, and stiffness.

All birches shrink considerably during drying. Yellow birch must be seasoned carefully to prevent checking and warping. Eleven to 15 days are required to dry 1-inch lumber from the green condition to 6 percent moisture content. Because yellow and sweet birch are difficult to glue, special veneer and adhesive treatments are usually required to obtain the best results. They're glued more easily with synthetic-resin glues than with natural glues.

#### **Black cherry** (*Prunus serotina*)

**Range**—Black cherry is found principally throughout the eastern half of the U. S. but grows in significant commercial quantities only in the northern Allegheny Mountains.

**Uses**—Cherry wood is reddish and takes a lustrous finish. It's a

prized furniture wood and brings high prices in veneer log form. It's increasingly popular in kitchen cabinets and is often used in architectural trim, paneling, and cabinetry.

**Characteristics**—Black cherry is relatively easy to dry, requiring 10-14 days to kiln dry 1-inch lumber from green to 6 percent moisture content. It stays in place well after seasoning and is comparatively free from checking and warping. It's easily machined, can be sawed cleanly, turns well, and planes excellently with standard cutting angles. Screw-holding ability is good. Gluing also is good except when gum streaks are present. The wood has sufficient hardness to allow it to take hard use and withstand knocks without marring.

Black walnut (*Juglans nigra*)

**Range**—Black walnut grows naturally over a large area extending from Vermont westward to Nebraska and southward to southern Georgia and southern Texas. The area of greatest commercial production is limited to the central part of this natural range.

**Uses**—Furniture is the outstanding use of black walnut, with gunstocks, kitchen cabinets, and architectural woodwork also using large amounts.

**Characteristics**—The wood is hard, strong, and stiff and has good shock resistance. Black walnut works easily with handtools and has excellent machining properties. It finishes beautifully with a handsome grain pattern. It takes and holds paints and stains exceptionally well, can be readily polished, and can be satisfactorily glued. The wood can be satisfactorily kilndried or air-dried and holds its shape well after seasoning. Kiln drying 1-inch lumber from green to 6 percent moisture content requires 10-16 days.

#### **Maple** (*Acer*)

**Range**—Commercial maples grow throughout the eastern U. S. and southeastern Canada, with the

exception of bigleaf maple, which grows on the West Coast. The wood of maples is often divided into two classes—hardmaple and soft maple. Hard maple includes sugar maple and black maple. Soft maple is made up largely of silver maple and red maple with a very small proportion of boxelder. Bigleaf maple is used as such in the regions where it grows.

**Uses**—Maple is a consistently popular wood for furniture and cabinetry. As much as 90 percent of the maple lumber produced is further manufactured into a variety of products such as furniture, kitchen cabinets, architectural woodwork, and flooring.

**Characteristics**—Maple is heavy, strong, stiff, and hard; has a high resistance to shock; and ranks high in nail-holding ability. The wood turns well on a lathe and is markedly resistant to abrasive wear. It takes stain satisfactorily and is capable of a high polish. In ease of gluing, it has an intermediate rank. The wood of soft maples is not as heavy, as hard, or as strong as that of the hard maples. Kiln drying 1-inch soft maple lumber from green to 6 percent moisture content requires 7-13 days and 11-15 days for hard maple.

#### **Oak** (*Quercus*)

**Range**—Oak species are found throughout the U.S. Commercial stands generally grow east of the Great Plains. Oaks are grouped as white oaks or red oaks.

**Uses**—Both red and white oak are used extensively for furniture and flooring. Oak is the most popular wood for kitchen cabinets and is widely used in architectural trim, paneling, and cabinetry.

**Characteristics**—Oak is hard, stiff, strong, and shock resistant. It's above average in all machining properties except shaping. The wood undergoes large shrinkage while drying; seasoning must be done carefully to avoid checking and warping. Historically, oak lumber is air dried for 60-90 days, then dried in a kiln for 5-10 days. A more recent trend is to use predryers—large, low-temperature,

warehouse-type dryers — today from green to about 25 percent moisture content, then finish drying in a kiln for 7-14 days to a 6 percent moisture content.

### **Pecan/hickory** (*Carya*)

**Range**—Pecan hickories and true hickories are similar in distribution and wood characteristics. Once the wood is processed into lumber, it cannot be distinguished by species based on physical appearance alone. True hickories, as a group, occur from central Maine and Ontario south through the eastern U. S. to Mexico. Pecan grows from northern Indiana south to the Gulf coast of Louisiana and Texas and from western Tennessee and western Alabama west to eastern Kansas and central Texas.

**Uses**—The main use of pecan and hickory today is in furniture, both in the form of lumber and veneer. It's also found in kitchen cabinets and architectural trim, paneling, and cabinetry.

**Characteristics**—The wood of the pecan hickories is rated as strong, still, very hard, heavy, and wry high in shock resistance. It rates below the wood of the true hickories but somewhat above white oak, sugar maple, and white ash in strength and other mechanical properties. Pecan and hickory are difficult to work with machines. Hickory can be glued satisfactorily, but requires close control of gluing conditions to obtain best results. Lumber and veneer have good finishing qualities and have a warm, appealing appearance. Pecan and hickory may be considered moderately difficult to dry and require 7-15 days in the kiln to dry 1-inch lumber from green to 6 percent moisture content.

### **Red alder** (*Alnus rubra*)

**Range**—Red alder occurs from Southern California to southeastern Alaska and is generally found west of the Cascade and Sierra Nevada Mountains.

**Uses**—Recent increases in the value of red alder and in its use

for furniture have resulted in greater interest. Nonstructural lumber is the major use of red alder; most of the lumber is used to produce furniture, kitchen cabinets, and pallets. In furniture and cabinets, red alder is used both as case and door stock or as framing for upholstered pieces.

**Characteristics**—The wood of red alder is moderately light and soft. Its physical and mechanical properties are comparable to those of other species such as aspen and butternut. It's rated low in shock resistance, however. Because of its uniform texture, red alder is excellent for turning and polishing and takes glue, paint, and stain well. When properly seasoned, the wood is fairly stable in all dimensions and surface checking is uncommon. Both conventional temperature and high temperature dry kiln schedules are used for drying. Final color can be controlled to give a honey-brown or lighter ivory color to the dried lumber.

### **Sweetgum** (*Liquidambar styraciflua*)

**Range**—Sweetgum occurs naturally in the southeastern U.S. and in Mexico, Guatemala, Belize, Honduras, El Salvador, and Nicaragua.

**Uses**—Sweetgum lumber is remanufactured into furniture parts and fixtures. Furnituremaking also uses large quantities of sweetgum plywood.

**Characteristics**—Heartwood of this species is also known as redgum and the sapwood as saggum. Saggum is much easier to dry than redgum, and if practical to separate, should be kiln dried with a different schedule. Saggum can be dried in about half the time required for redgum.

The wood of sweetgum is attractive, moderately heavy, even-textured, and machines reasonably well. It's moderately hard and stiff. Compared to other southern hardwoods, sweetgum is above average in turning, boring, and steam-bending properties, and intermediate for planing, shaping, bending, splitting, and nail- and

screw-holding ability. The heartwood requires special treatment before gluing can be done with best results.

### **Yellow-poplar** (*Liriodendron tulipifera*)

**Range**—Yellow-poplar occurs over most of the eastern U.S. The most extensive stands grow on the mountain slopes and plateaus of West Virginia, Virginia, North Carolina, Tennessee, Kentucky, and Georgia, and in the lower Ohio River basin.

**Uses**—Lumber is by far the largest use of yellow-poplar. In secondary manufacturing, lumber is cut mostly for furniture, frame parts, dimension stock, cabinet parts, and millwork. Yellow-poplar is well suited to manufacturing veneer. Yellow-poplar plywood is used for furniture and shipping containers.

**Characteristics**—Among the commercially important U.S. hardwoods, yellow-poplar wood ranks in the lower one-third of bending strength, toughness, and impact resistance. But it also has the reputation of being one of the easiest of all hardwoods to work with hand and machine tools. It planes well and has good turning and boring qualities. The wood is about average in mortising and in accepting nails and screws without splitting. It rates poor in shaping and sanding characteristics, however.

Yellow-poplar is one of the easiest woods to bond with many types of adhesives over a wide range of bonding conditions. It accepts and holds paint well and is easily stained. The initial shrinkage during seasoning is relatively large, but the wood stays in place well after drying. The lumber dries quickly and with only minimal loss of quality in air seasoning yards, forced-air dryers, and dry kilns. One-inch lumber can be dried from green to 6 percent moisture content in 6-10 days.

## SOFTWOODS

### **Eastern redcedar** (*Juniperus virginiana*)

**Range**—Eastern redcedar is the most widely distributed tree-sized conifer in the eastern U.S.; it is found in every state east of the 100th meridian.

**Uses**—Because of its aromatic quality, the lumber is used for chests wardrobes, and closet linings.

**Characteristics** — The wood is fine, uniform, straight grain, and is favored because of its exceptional cutting qualities, durability, rich color, and aroma. The wood is moderately low in strength and stiffness but high in shock resistance. It's moderate in hardness but still highly workable. The wood splits easily, holds nails reasonably well, and has excellent gluing characteristics.

Because of its natural beauty, most manufacturers merely apply a clear finish, which enhances the color and retards darkening. It shrinks very little during drying and isn't greatly affected by changes in atmospheric moisture. One-inch lumber requires 6-8 days to kiln dry from green to 6 percent moisture content.

### **Ponderosa pine** (*Pinus ponderosa*)

**Range**—Ponderosa pine is the most widely distributed pine in North America, extending from British Columbia into Mexico and from the Pacific coast to Nebraska.

**Uses**—Ponderosa pine is the principal millwork species and is used for window framing, sashes, doors, moulding, shelving, and paneling. It's well suited for furniture, kitchen cabinets, and architectural woodwork if hardness or high strength are not required.

**Characteristics** — The wood is comparatively light in weight, soft, moderately weak in bending, and moderately low in shock resistance. The grain is generally

straight but frequently shows dimpling on the tangential surface. It resists splitting when nailed but is only average in nail-holding ability. Ponderosa pine dries easily, either in dry kilns or by air seasoning, and is moderately low in shrinkage.

### **White pine** (*Pinus*)

**Range**—Western white pine (*Pinus monticola*) grows on western mountain ranges from southern British Columbia and southwestern Alberta to northern Idaho, northwestern Montana, and eastern Oregon to the southern end of the Sierra Nevada Mountains in California. Eastern white pine (*Pinus strobus*) grows from Newfoundland to Lake Winnipeg in Canada and southward through the Lake States and New England and in the Appalachians as far south as northern Georgia.

**Uses**—Eastern white pine is more commonly used for furniture, although some western white pine is used. Western white pine is often used for colonial period furniture reproductions.

**Characteristics**—The wood of eastern and western white pine have similar characteristics. Both are moderately soft, straight-grained, light woods that are moderately low in shock resistance. They work easily with tools, are easy to glue, and hold paint very well. They don't split readily when nailed, but have only medium nail-holding ability. They're fairly easy to dry, shrink moderately, and stay in place well when properly dried. The occurrence of "wet pockets" or "wetwood" in some lumber may require special attention during drying.

## IMPORTED WOODS

### **Banak** (*Virola*)

**Range**—Banak is found in Central and South America from Belize and Guatemala southward to Venezuela, the Guianas, and Brazil, and on the Pacific coast to Peru and Bolivia.

**Uses**—Banak is used in veneer and furniture components.

**Characteristics**—The wood works easily with both hand and machine tools and produces a good finish. Banak glues well and cuts well into veneers. It's generally reported to be moderately difficult to season with a strong tendency to warp and check as well as collapse and honeycomb. Thick stock is slow to dry.

### **Khaya** (*Khaya*)

**Range**—Khaya or African mahogany includes several species that grow in tropical west Africa. Distribution varies with the species.

**Uses**—Khaya is used in furniture and cabinets, decorative veneer, and plywood.

**Characteristics**—All species have good nailing and gluing properties. *Khaya grandifoliola* and *K. senegalensis* have good working properties with hand and machine tools. They dry rather slowly but fairly well with little checking or warp. However *K. ivorensis* and *K. anthotheca* tend to wooliness and torn grain.

These species dry rapidly with little degrade.

**Mahogany** (*Swietenia macrophylla*)

**Range** –Mahogany or Honduras mahogany occurs in southern Mexico southward to Colombia, Venezuela, and parts of the upper Amazon and its tributaries.

**Uses** –The reddish brown color of mahogany heartwood is popular for furniture, cabinets, architectural woodwork, and decorative veneers.

**Characteristics** –Mahogany is very easy to work with hand and machine tools, is easy to finish, and takes an excellent polish. It also slices and rotary cuts into fine veneer. Torn and chipped grain is common with figured material. The wood can be air-seasoned and kiln-dried easily without appreciable warping or checking.

**Meranti** (*Shorea*)

**Range** –Meranti species are grouped as dark red, light red, white, and yellow. They grow primarily in Malaysia, Indonesia, and the Philippines.

**Uses** –White meranti is generally not used for furniture. The other meranti groups are used for furniture, cabinets, and furniture components.

**Characteristics** –Dark red, light red, and yellow meranti work easily with hand and machine tools and have good gluing and nailing properties. Light red and dark red take a good finish. However, white meranti is very difficult to saw or machine due to the rapid dulling of cutters caused by high silica content; Stellite-tipped or carbide-tipped tools are suggested. Dark red is more difficult to dry than light red and white meranti.

**Primavera** (*Cybastax donnell-smithii*)

**Range** –Primavera is found in southwestern Mexico, the Pacific coast of Guatemala and El Salvador, and north central Honduras.

**Uses** –Primavera is used in fine furniture, cabinets, decorative veneers, and architectural woodwork.

**Characteristics** –The wood is cream colored, yellowish-white to pale yellowish-brown, often more or less striped. It is easy to work in all operations even though there may be considerable grain variation. It finishes smoothly and acquires an attractive polish. It produces a good quality veneer. The wood is easy to air season, drying rapidly with no checking and only slight warp.

**Ramin** (*Gonystylus*)

**Range** –Ramin is found in peat swamp forests of Malaysia throughout parts of Sumatra, the west coast of Borneo, and the Philippines.

**Uses** –A general utility wood, ramin is used in furniture, architectural woodwork, mouldings, and paneling.

**Characteristics** –The wood is creamy-white to pale straw with a fairly fine and even texture. The wood has an unpleasant odor when freshly cut and this may return if dried wood becomes wet. It's easy to saw and machine, dresses smoothly, and glues and finishes satisfactorily. The wood has a marked tendency to split on nailing. The wood dries readily with little warp but with a marked tendency to end splitting and surface checking.

**Rosewood** (*Dalbergia*)

**Range** –The three commercial species of rosewood come from three parts of the world, Belize, Brazil, and India. In all locations, their occurrence is scattered.

**Uses** –In addition to use as decorative veneers, rosewood is used in fine furniture, cabinets, and musical instruments.

**Characteristics** –Honduras rosewood is moderately difficult to saw and machine due to its hardness. It's excellent for turning and finishes well if not too oily. Brazilian rosewood has excellent working properties and slices

well. It needs to be dried slowly to prevent checking. Indian rosewood also is moderately difficult to work with hand and machine tools because of its high density but is easier to dry. It glues well and takes an excellent finish.

**Rubberwood** (*Hevea brasiliensis*)

**Range** –The para rubber tree is native to the Amazon Basin but is widely planted in Southeast Asia and West Africa for rubber production.

**Uses** –In addition to its use for furniture components, the wood of the rubber tree can be used in general construction, provided particular care is used to control stain and insect attack.

**Characteristics** –The timber is reported to saw without difficulty and planes easily to a smooth surface. The wood tends to split in nailing but air dries rapidly. Warp is severe unless stickers are closely spaced and piles are weighted.

**Teak** (*Tectona grandis*)

**Range** –Teak is native to India, Burma, Thailand, and Indochina. It's cultivated extensively in plantations within its natural range as well as in tropical areas of Africa and Latin America.

**Uses** –Teak is used in furniture, cabinets, paneling, and fixtures requiring high resistance to acids.

**Characteristics** –Teak is easily worked with both hand and machine tools and dresses to a very smooth finish if tools are kept sharp. It glues moderately well despite its oily nature. It seasons slowly but with little or no degrade; large variations in drying rates are reported. □

For specific drying schedules by species and product, refer to *Dry Kiln Schedules for Commercial Woods—Temperate and Tropical*, FPL-GTR-57, available from the USDA Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705.