

Lesson #3: Softwood & Hardwood Trees (2-day assignment)

Objectives

Students will be able to...

- Identify tree species and recognize a hard or soft wood based on the physical properties of the tree.

Common Core Standards

Cabinetmaking and Wood Products Pathway

A1.4, A1.7, A2.1, A2.2, A3.1, A2.3, A6.1, A6.2 A3.4, A6.7, A4.1, A5.1, A5.2, & A5.4

Residential and Commercial Pathway

D2.1, D2.2, D3.1, D3.3, & D4.1

Reading 11-12.4

Writing 11-12.1

Problem Solving/Critical Thinking 5.4

Health and Safety 6.2, 6.3, 6.6, & 6.12

Responsibility and Leadership 7.4 & 9.3

Materials

Table of Softwoods, Hardwoods, Tropical & Exotic Woods Worksheet

Softwood and Hardwood Facts

Wood Grains, Figured Grains, and Wood Defects Information

Lesson Sequence

- Day 1 & 2: Explain to students that they will research information on Softwoods, Hardwoods, and Tropical & Exotic Woods by using the handouts and any other references. As they gather information they will fill in the table. They will need to find the origin (where you will find the wood), the properties/working characteristics, and the uses for five of each types of woods.

Assessment

Use data from student work to determine understanding of different types of woods.

Accommodations/Modifications

Reduce the Number of Woods Students Are Required To Research.
Provide Students with Highlighted Material with Information Needed To Fill In The Table.
Partner Students Up for Support
One-on-One Support
Check for Understanding
Extra Time

Table of Softwoods, Hardwoods, and Tropical & Exotic Hardwoods

Softwood , or conifers, from the Latin word meaning "cone-bearing," having needles.			
Name	Origin/Where will you find it	Properties and working Characteristics	Uses

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Tropical Hardwoods are not native to North America. They grow in the tropical forests of the world.			
Name	Origin/Where will you find it	Properties and working Characteristics	Uses

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Exotic Hardwoods are not native to North America. They come from all over the planet.			
Name	Origin/Where will you find it	Properties and working Characteristics	Uses

American Hardwoods and Softwoods

Lumber is obtained from two groups of trees

American Hardwoods



Alder	Hard Maple
Ash	Hickory and Pecan
Aspen	Pacific Coast Maple
Basswood	Poplar
Beech	Red Oak
Birch	Sassafras
Cherry	Soft Maple
Cottonwood	Sycamore
Cypress	Walnut
Elm	White Oak
Gum	Willow
Hackberry	



American Softwoods

Cedar, Western Red
Cedar, Yellow
Fir, Douglas
Fir, Silver
Larch
Pine
Redwood, European

Hard Wood and Soft Wood Facts

Softwood trees are known as a *gymnosperm*. *Gymnosperms* reproduce by forming cones, which emit pollen to be spread by the wind to other trees. These trees are *conifers* and they grow fast and straight, softwoods are generally less expensive than hardwoods

Douglas Fir: (*Pseudotsuga menziesii*) meaning false hemlock -- 'tsuga' is the Japanese name for hemlock; *menziesii*, named for Archibald Menzies, a Scottish surgeon and naturalist.

Used primarily to construct the structural parts of a house. In the not-so distant past, (20-30 years ago) when it was still lawful to harvest old-growth Douglas Fir, it was highly sought after as 'clear' stain grade softwood. This was due to its rich, warm color and overall beauty. Before it was cut down, a Douglas Fir was the tallest tree in the world. It measured out at a staggering 417 feet tall! This is 96' taller than tallest tree in the world today, a Coastal Redwood in California. It is estimated that the Douglas Fir can grow to be approximately 1000 years old. The cones of the Douglas fir have a unique three-pointed 'bract' that sticks out of the base of every cone-scale. This led to a Native-American legend explaining that each bract was actually the tail and two tiny legs of mice that sought refuge in the scales of the cones, which obligingly provided sanctuary for them during forest fires. The Douglas fir was named for the Scottish botanist David Douglas, who, in 1827, explored the western United States looking for seed specimens to send back to Europe. The Douglas Fir can be found growing from British Columbia in the north, to the Mexican Sierras in the south, also from the Pacific Ocean to Colorado in the east. It is the state tree of Oregon.



Sitka Spruce: (*Picea sitchensis*) meaning Spruce in Latin.

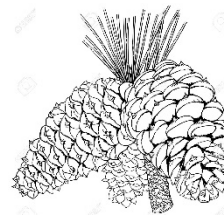


Spruce is pound-for-pound stronger than steel! Sitka Spruce was the primary material for aircraft construction during World War I, and was still in use as an aircraft construction material through World War II (the DeHavilland Mosquito being the most notable aircraft made from the material during WWII. (The 'Spruce Goose' doesn't count, as it was actually made out of birch!). Today we use Sitka Spruce primarily in



the construction of homes, usually for fascia and other trim boards. It is also used for making paper, and musical instruments. It grows primarily along the coasts of North America from British Columbia to Washington and Oregon (It has never been found any more than 40 miles inland). The life span of the Sitka Spruce is known to exceed 700 years. It is the state tree of Alaska.

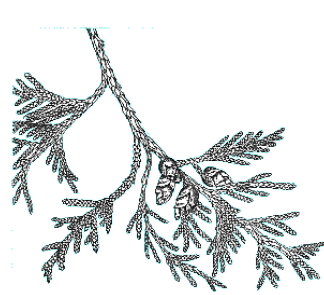
Ponderosa Pine: (*Pinus ponderosa*) Ponderosa means "large" or "heavy" in Latin.



Also known as 'Western Yellow Pine,' or 'Bull Pine,' it is the material we will use in the shop to make our machine tool project and our model houses. Like many softwoods, it is used heavily in the construction industry. Treated with preservatives, Ponderosa Pine is used to make telephone poles and railroad ties. In reality, it can be/is used to make just about anything you can imagine out of wood. Found growing in all the western states of the U.S.

It grows from British Columbia to Mexico, and from the Pacific Ocean to Nebraska including every state in between! Discovered in Washington by David Douglas in 1826. It has a strong smell (likened to turpentine) when freshly cut. The wood is rather light and soft, and machines easily. Due to its abundant availability, and the ease with which it could be worked, the pioneers who settled the 'wild west' heavily used Ponderosa Pine. They used it to build just about everything they needed, from the houses they lived in, to the beds they slept in, to the utensils they ate with. The life span of the Ponderosa Pine is known to be 4-500 years.

Western Red cedar *Thuja plicata* the name *plicata* comes from a Greek word meaning "folded in plaits," in reference to the arrangement of the leaves. It is sometimes called *arbor-vitae*, Latin for "tree of life."



The western red cedar is British Columbia's official tree. It prefers the maritime climate of the coastal fog belt, but is found also on dryer slopes, naturally occurring along the Pacific Ocean from the Alaskan panhandle through British Columbia, Washington, Oregon and just barely into northern California. The Western Red cedar has been called "the cornerstone of Northwest Coast aboriginal culture," and has great spiritual significance. Such was their respect and dependence on this tree that it was called "tree of life." Coastal people used all parts of the tree. They used the wood for dugout canoes, house planks, bentwood boxes, clothing, and many tools such as arrow shafts, masks, and paddles. The inner bark made rope, clothing, and baskets. The long arching branches were twisted into rope and baskets. It was also used for many medicines. The wood is naturally durable and light in weight. It is used for house siding and interior paneling as well as outdoor furniture, decking and fencing. Because of its resistance to decay and insect damage, the wood of large, fallen trees remains sound for over 100 years. Even after 100 years, the wood can be salvaged and cut into shakes for roofs. Western Red cedar grows rapidly, reaching 180' and develops massive, tapered boles and a broad, triangular shape – highly ornamental. The branches droop down but turn up at the ends. Both the wood and foliage are highly fragrant.

Yellow Cedar, Nootka Cypress named for the *Nuu-chah-nulth* people of Canada. The status of yellow cedar, a slow-growing tree that can live 1,200 years, is under review by the U.S. Fish and Wildlife Service, which is considering federal protection for the trees as either threatened or endangered; a listing petition was submitted in 2014 by three environmental groups and a tour company that operates in Southeast Alaska. Yellow Cedar is found only on the Pacific coast of North America from Alaska to southern Oregon and is the hardest known cedar in the world. Considered the crown jewel around boat builders, it has exceptional resistance to weather and insects. The various physical properties of yellow cedar make it an attractive material for general construction. Due to its slow growth it is hard and, like other cypress woods it is durable; it therefore offers good dimensional stability, and is resistant to weather, insects, and contact with soil. Alaskan Yellow Cedar has a distinct scent that is similar to raw potatoes. It works easily with hand or machine tools; it turns and carves quite well. It can be fastened with glues, screws, and nails. Alaska yellow cedar's texture, uniform color, and straight grain will take a fine finish. It resists splintering and wears smoothly over time. Yellow cedar is an attractive, valuable but not very abundant wood and is shipped in small quantities.



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Larch: western larch, hackmatack, western tamarack arch, any tree of the genus *Larix*, conifers of the family Pinaceae (pine family), which are unusual in that they are not evergreen. The larch is a conifer, but in autumn its needles turn a golden yellow and shed for the winter.



The various species are widely distributed in the Northern Hemisphere. A western American larch achieves a great height, and its lumber is used for interior construction, ties, posts, and cabinetmaking. The American, or black, larch, commonly called also tamarack and hackmatack, ranges from the Arctic Circle to cold swamps in more temperate regions of the NE United States and is cultivated elsewhere for its beauty. The wood of this species has been used in shipbuilding and for posts, ties, and poles. Mature larches are the most fire-resistant trees in the Northern Rockies because of their thick bark, their high and open branching habit, and the low flammability of their foliage.

Hardwoods most often are deciduous trees, usually showcasing broad, flat leaves and dense inner wood. They are common sights all across North America. Often these types of trees are harvested to make long-lasting furniture, decks, flooring, and construction. They grow slower than softwood trees, making hardwoods valuable, as they are more difficult to replace. They grow almost everywhere in America and comprise 40% of all trees.

A domestic hardwood is one that is "indigenous" to North America (which includes Canada). Indigenous means that these trees weren't planted in North America by the native peoples or the newly arriving settlers, they were already here before the people arrived.

American Beech

Usually picked out by its smooth silver bark and leaves with serrated edges, the American Beech is a gorgeous tree. Its attractive finish makes it a popular choice for flooring, furniture, and wood crafting. Until power tools, Beech was too thick of a wood to be readily cut and so many ancient tree specimens still grow in now protected forests. This is a blessing in disguise for today's wood industry, as Beech takes 40 years before it even starts to produce nuts and is one of the slowest growing hardwood trees.

Red Alder

Found mostly on the Western coast of North America, the Red Alder gets its name from the red coloring under its bark. This tree is essential to the landscape as its roots host a fungus that creates fertile soil, allowing the Alder to grow in very harsh soil, which adds nitrogen to previously barren surrounding soil. Usually used for indoor furniture and cabinets because of its fragile grain, this wood can also be used in electric guitars for the same reason.

Black Hickory

Growing mostly in sandy soils and reaching only 50 feet tall, the Black Hickory (or Texas Hickory) is a unique hardwood. With a noticeably stiffer, more shock absorbent wood than most other hardwoods; it is primarily used in bows, wheel spokes, and canes. While more shock resistant than other woods, it is not resilient against rot making it a poor choice for flooring.

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Maple: (*Acer saccharum*) The word *Acer* derives from a Latin word meaning "sharp", referring to the characteristic points on maple leaves. The word *saccharum* means sugar.

Without debate, this tree is one of the most prolific trees across America. The Sugar Maple has another equally impressive contribution to daily life, however: maple syrup. This is good for Americans everywhere, since it takes 40 gallons of tree sap to make just 1 gallon of maple syrup. Distinguished by their colorful autumn leaves and "helicopter" winged seeds, this tree is probably the most recognized tree on this list. Certain species found in America have been cited as at least 400 years old. The largest sugar maple ever recorded was 110 feet tall and 20 feet around. A Sugar Maple's wood is the most dense of all maple wood and is used frequently in furniture and flooring. Also known as hard, or rock maple, it is used in the construction of cabinets, furniture, butcher blocks, musical instruments, toys, indoor basketball courts/gym floors and even Barry Bonds baseball bats! Maple fibers are even added to softwood paper pulp to make paper that is stronger and excellent for writing and printing. Early American Colonists made soap from maple ashes, while Native Americans used the wood to make spear shafts. As late as the 20th century, the heels of women's shoes were made from maple. Its leaf is the symbol on the flag of our neighbor to the North, Canada. The sugar/hard maple grows primarily in the vast hardwood forests of the Eastern United States, but can be found as far north as Quebec, as far south as Georgia, as far east as Nova Scotia and as far west as South Dakota. The tree itself likes to form 'associations' (hang out) with other trees like white ash, forming groups of these two trees throughout a given forest. The sugar maple is the state tree of New York, Vermont, West Virginia, and Wisconsin.

Silver Maple

This tree is close behind the Sugar Maple in terms of being the most prolific tree in North America. With leaves that look very similar to the Sugar Maple, the Silver Maple's leaves are thinner with more defined points. Like the Red Maple, it is very hearty and tolerant of urban atmosphere, making it the most common tree to be planted near highways. A wide variety of uses for this wood include: pulp for paper, instruments, cabinets and crates.

Red Oak: (*Quercus rubra*) *Quercus* means oak in Latin and *rubra* means red.

Oak has been the standard for timber framing structures in both Western Europe and the eastern United States for centuries. It was also a staple of the shipbuilding industry. Did you know that the Mayflower, the vessel that in 1620 carried the Pilgrims across the Atlantic Ocean was made out of oak? There is only ship remaining in our Navy fleet that has ever sunk an enemy vessel- and it is the USS Constitution, which earned the nickname "Old Ironsides" for withstanding British bombardment during the War of 1812. The USS Constitution is a wooden-hulled, three masted heavy frigate of the United States Navy, named by President George Washington after the Constitution of the United States of America in 1797. It still sails and is undergoing restoration at the same place it was launched 219 years ago, the Boston Navy Yard.

Typical lifespan is 200-600 years, but some species can reach 1000 years of age. Oaks take a long time to mature. They usually don't bear seeds/acorns until they are at least 20 years old. The tree can grow to 115 feet (though at least one has reached 141') with a trunk diameter of three feet. The oldest (and largest living red oak is in Ashford, Connecticut and has a trunk circumference of 26 feet. Quarter sawn oak is a hallmark of the arts and crafts movement of the early 20th century. Used by colonists for furniture, fencing, horse-drawn carts, etc. Before the use of coke in smelting iron, oak charcoal was used. The wood holds its structure very well, as excavations of ancient Greek and Roman sites have discovered intact oak furnishings. Today, Oaks biggest uses

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are furniture, cabinetry and flooring. Red Oak can be found growing as far as Nova Scotia in the northeast, to Alabama in the south, and as far west as Kansas. More than 52% of all hardwoods in North America are oak trees. Oak is found in many colors: Red, White, Black, Green, Yellow, and Brown. Red oak is most readily identifiable by the shiny streaks down the center of its bark ridges. The Bur Oak is the most common oak in America and it can grow to a height of 160 feet tall and 8 feet wide. This wood is almost always labeled as white oak in the market. It's virtually insect and fungal resistant and is often used in construction frames and flooring.

The Red Oak is the state tree of Iowa and New Jersey and is often used for fence posts, firewood, and flooring, as well as for cabinetry and furniture making. Wood mice, squirrels, and crows are just some of the animals that use the oak acorns as food.

Yellow Poplar: (*Liriodendron tulipifera*) Greek: leirion (lily) and Dendron, tulipifera (tree) tulip bearing

Of the Magnolia family, Poplars grow taller than any other U.S. hardwood species. They can grow to 150 feet, with a trunk diameter in excess of eight feet. The roots, fruits, flowers, bark and leaves contain pharmaceuticals (medicines). It is the most valuable commercial species in the eastern hardwood forests, making up approximately 11% of all available hardwoods. Poplar has been used in the United States long before the first settlers arrived. In what is now New York, the Onondaga Indians used the wood to make canoes and utensils. When the Colonists arrived, they quickly learned about the usefulness of the poplar's wood. From it they constructed everything from baskets and boxes, to furniture. The versatility of the wood continues today. Though it is mainly used for moldings and cabinet construction, it is also used for construction lumber, plywood cores, matchsticks, pianos, paper, and furniture to name a few. The yellow poplar is a loner when it comes to the forest. It prefers to grow by itself, surrounded by other hardwoods and pines instead of other poplars. The name tulip tree comes from its greenish-yellow, tulip-like blooms that appear in the summer. One of the really neat things about poplar is that the color of its heartwood ranges from tan to gold, with streaks of green, blue/black, and even purple. Yellow poplar can be found growing in the vast hardwood forests of the east as far north as Vermont, as far south as Florida, as far east as Massachusetts and as far west as Louisiana. The poplar (also known as the tulip tree) is the state tree of Indiana, Kentucky & Tennessee.

White Ash: (*Fraxinus americana*) **Fraxinus** is the **Latin** name for Ash. **Americana** translates as "of the Americas".

Norse mythology describes the ash tree as "the mighty tree that supports the heavens" and that "below the earth its roots went down to hell." Ash is part of the olive family, and averages about 80-100 feet tall, with a two to five foot girth. Besides being used for cabinetry and flooring, it is also used to make electric guitars, and other musical instruments. It is also the wood of choice in making baseball bats, (Louisville Slugger) hockey sticks, pool cues, skis, oars, and tool handles. It is interesting to note that before tennis rackets were made from high-tech man-made materials such as aluminum, carbon-graphite and boron, they were made out of good old ash.

Due to all the sports and recreation equipment that has been/is made from white ash, it has been referred to by some, as the "all-American leisure wood." On a historical note, ash was also used to make the snowshoes that Admiral Richard Byrd and his men wore on their Antarctic expedition to fly over the South Pole. Byrd and his crew were the first to accomplish this feat on November 29, 1929.

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White Ash can be found growing from Nova Scotia in the northeast to Texas in the south, and Oklahoma in the west. Though similar in appearance to the Green Ash, this tree's leaves are noticeably lighter on the underside. With white, dense wood, the White Ash is the most common daily wood of the hardwood trees. This hardy tree has taken monumental hits lately from the Asian emerald ash borer. This bug has multiplied after being introduced to America through Asian shipping crates and has been cited as the killer for 50 million ash trees so far.

Black Walnut: (*Juglans nigra*) The Latin name for black walnut, *Juglans nigra*, means black or dark nut of Jupiter.

Grows from southern Ontario to South Dakota, from Georgia to Texas. The black walnut can most likely be found growing alongside rivers. It is a large tree growing on average to between 100-150 feet tall. Trunks with a three-foot diameter are most common, although trunks up to six feet in diameter have been recorded. They are known to live up to 250 years. The black walnut's wood is primarily used to make furniture, flooring, gunstocks and coffins. Unlike maple, black walnut does not necessarily like "neighbors." The tree produces a toxin known as juglone, which is poisonous to other plants and even animals! Most plants that grow too close to a walnut will be killed by it! The walnut tree produces seeds that are a very nutritious source of energy for creatures of every type including humans. The only problem is getting to the kernel (nut)! The nut is covered with a tough husk, somewhat like a coconut) that oozes with a foul smelling, and highly staining goo. Once you get through the husk, you have to deal with the shell, which is so tough, that certain tire manufacturers have used the crushed material as an ingredient to make their tires tougher! After all this, you have to wait two weeks before you can eat the walnut. If you don't, you're in for a nasty tasting surprise!

Black Cherry: (*Prunus serotina*) *Prunus* is an ancient Latin name for the plum. The suffix *-serotina* means flowering late.

In the first few years of its life, this tree can be mistaken for a birch. As it ages, however, its bark becomes dark (almost black) and heavily ridged. Growing mostly in the Midwest and Eastern regions, its seeds are a staple for many bird populations. Like all fruit trees, cherry belongs to the rose family. Most cherry trees average between 60 to 80 feet tall, and have a trunk diameter of 2-3 feet. However, the trees of the Appalachian and Allegheny Mountains of Pennsylvania and New York, can reach 100 feet in height and 4 feet in diameter. They are known to live between 150 and 200 years, although some live only into their 20's. These trees are considered the finest lumber producing trees in the United States. A cousin of the American Black Cherry is the European *Prunus avium*, which literally means 'Plum Tree of the Birds,' has been known to hit 100 feet in height with a trunk circumference of 12 feet. Cherry's popularity as a high-end American furniture wood began in the 1600's due to its qualities and abundance. Early colonial furniture makers referred to black cherry as 'New England Mahogany.' This was due to the fact that they substituted black cherry for very rare and expensive mahogany. White pine and maple were the woods of choice for making every day, or practical household items, including furniture. But cherry was reserved for the most elegant (and expensive) pieces, especially elegant adaptations of European designs. Cherry's use as a furniture wood goes much farther back than colonial America of the 17th century. The Greeks and the Romans used cherry to construct items such as tables and benches as far back as 400 B.C.! As mentioned above, cherry is a fruitwood. Like the apple and the pear tree, cherry trees provide delicious fruit to eat. Early colonists not only used the wood of the cherry tree for furniture, and its fruit for food, they also used the bark to make a medicine that they used to treat bronchitis. Though all cherry trees produce fruit, naturally

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growing forest trees differ from their orchard counterparts in that the orchard trees have to be constantly pruned (chopped off) at the top. Otherwise the orchard trees will end up growing as tall as their 'wild' brethren. Trying to harvest the cherries from a 60-80 foot tall tree is just not economically wise.

***Tropical Hardwoods** are not native to North America. They grow in the tropical forests of the world and must be imported for domestic use. While some tropical hardwoods can be used for interior applications, including flooring, the color, grain pattern, hardness and luster of many imported woods differ from those of American hardwoods.*

Honduras Mahogany: (*Swietenia macrophylla*) or "Genuine Mahogany," as it is also known. Any mahogany found on the Central American Mainland is given the "Honduras" name. From the early 1900's, until the early 1960's, the famous "Chris-Craft" motorboats were made from mahogany. The material was durable, strong, (as strong as oak) relatively light, and absolutely gorgeous! Besides, it already had a long established history as an excellent wood to build boats out of. In fact, the first glimpse Europeans got of mahogany was when the first ships from the New World (West Indies) began to arrive at their shores. It was not the English shipbuilders however, who would make the biggest impression with the new wood in Europe. It was furniture makers like Thomas Chippendale (1718-1779) who, by the late 1700's was producing furniture from mahogany that would have the most lasting impact. The first mahogany was 'discovered' by Spanish explorers who called it "caoba" in Cuba. Mahogany also grows throughout Central and South America/southern Mexico, but can also be found in Africa. By 1854 Phillip II of Spain was using the wood to decorate the Escorial Palace in Spain. In 1860, the English first used mahogany in Nottingham Castle (remember Robin Hood?) From 1715 onwards was readily available in England. The Mahogany tree is one of the largest trees in the tropical Rainforest. It height can reach 150 feet with a trunk that is 40 feet around! Today we use Honduras mahogany for high-end furniture and cabinet making, boat interiors and pianos. African Mahogany is still used today for boat making.

Padauk [orange] (*Pterocarpus soyauxii*) *Pterocarpus* is based on the Greek words 'pteran' meaning a wing and, 'karpos' meaning' fruit.

The freshly cut wood of this tree is an incredible rust-orange. However, with exposure to sunlight, the orange turns to a deep reddish-brown. All padauks are of African or Asian origin. Though most of this wood comes from Africa, some also comes from the Andaman Islands. These islands are in the Indian Ocean, about halfway between India and Malaya. The Padauk tree grows to about 100 feet in height, and has a girth of about 8 feet. It, like the black walnut, likes to grow beside rivers and creeks. In the 1800's, all the padauk harvested from the Andaman Islands was felled and processed by convicts. It was one of the prisoners 'jobs' while they were 'guests' at one of the English penal colonies set up on the islands. As with just about any tree, its uses go way beyond the lumber that can be sawn from its trunk. For instance, it is said that women in Africa would rub padauk on their underarms as a sort of antiperspirant. Also, people as a substitute for green vegetables use the leaves of the padauk. Padauk has also had a long and distinguished career working for royalty. During the 10th century B.C., King Solomon used stalwart padauk for pillars in the construction of the Temple in Jerusalem. 2600 years later, the French kings Louis the XV, and Louis the XVI, had chalices made for them out a wood they called "narra." The chalices made from the padauk wood had an unusual effect on any water that was placed in them. It would turn the water yellow. The kings believed this unusual 'yellow water' possessed medicinal properties! In the 19th century, padauk became a popular veneer known as "amboyna," and was a notable feature of 'empire'

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style furniture. More recently, the Pullman Company of Chicago imported a great deal of Andaman padauk for use as paneling in their railroad cars.

Padauk trees can be found growing in West Africa, India, Indochina, and the South Pacific. Padauk can also be found as a transplant growing in Florida.

Purple Heart (*Peltogyne porphyrocardia*) although an expensive, and extremely beautiful wood, purple heart is utilized in other parts of the world for heavy construction. It is used to build bridges, docks, boats, and homes, and is made into fresh water pilings as well as flooring. In America, it is used for turning, furniture making, and inlaying and marquetry work. Purple heart gets its name from the gorgeous deep purple-violet color of its heartwood. In Brazil the Indians have their own interesting name for the wood, they call it "coataquican," or, "monkey's hammock." This name does not come from the coloration or beauty of the trees wood, but instead comes from the trees long, slender, branchlets, which are apparently reminiscent of the popular instrument of rest used by humans. The Purple Heart tree can grow quite large, topping out at around 125 feet tall with a girth of 12 feet. It can be found growing alongside riverbanks and lakeshores in Central and South American rainforests from Panama to Venezuela, to Trinidad, Surinam, Guyana, and Northern Brazil.

Ebony (*Diospyros ebenum*) though there are many types of ebony, more commonly, ebony contains brownish stripes intermingled with the black. The striped ebony is what artisans used most often down through history. African Ebony, or Gaboon Ebony as it is sometimes referred to, is found growing throughout equatorial Africa. Hundreds of varieties of Ebony exist, but most are small shrubs, larger lumber-producing varieties are prized and becoming increasingly rare. The heartwood is a rich, jet-black color with no visible grain, and very fine pores. The Greeks fashioned drinking goblets from the wood, believing it to be an antidote for poison. Ebony is durable, resistant to insects and has high oil content, which can pose difficulties with gluing. Ebony has been a choice material for use as fingerboards and keys for musical instruments. It is also prized for knife handles, inlays, and turning. The small size of the trees and the high demand for the wood make African Ebony one of the most expensive woods in the world. *Over harvesting, combined with new harvesting regulations, ebony today is becoming harder and harder to acquire. The time appears to be quickly approaching when once again only the rich and powerful will have access to this beautiful wood.*

Yellow Heart: (*Euxylophora paraensis*) As the name implies produces a bright yellow wood through and through. This means that unlike most other woods where the heartwood is usually darker (if not a different color entirely) there is very little difference between yellow hearts heartwood and sapwood. It is used for furniture, cabinetry, flooring turning, pens, and inlays. The tree is native to Brazil.

Red heart (*Cosmocalyx spectabilis*) Like yellow and purple heart, the name is rather self-explanatory. This native of Mexico has dark red heartwood that is accentuated by the black stripes of the summer growth rings. Because red heart's color is so vivid, it is primarily used as an accent wood in furniture and cabinetry projects.

Exotic Hardwoods come from all over the planet and are used primarily for furniture making and musical instruments. Some posse very intense colors.

Zebrawood (*Microberlinia brazzavillensis*) It's heartwood has incredible contrast between spring (light colored rings) and summer growth (dark colored rings) giving the wood a striped appearance. Interestingly, the pale yellow sapwood does not possess this unique pattern. Zebrawood likes to grow near rivers on the west coast of

Africa, on or near the Equator. It is a small tree, attaining heights of usually no more than 65 feet, with a trunk diameter of no more than 6 feet. Easy to work with both hand and machine tools, but it must be carefully planned, or it will tear out due to interlocked grain and even occasional grain reversals. Used primarily for furniture, turnings (pens, tool handles) inlay, and veneer.

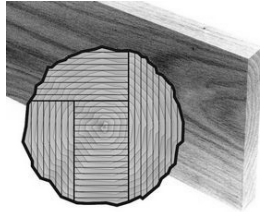
Lacewood (*Grevillea Robusta*) in 1770 a naturalist named Sir Joseph Banks discovered a tree in what is now known as Queensland that was eventually given the name *Grevillea Robusta*. Interestingly, it wasn't until around 1870 that the wood from this tree possessed a highly unique figure. The wood quickly became popular in Australia and Europe under the name "silky oak," which was in reference to the apparent similarities both woods possessed. When the material arrived on American shores however, it was given the name lacewood. Like many highly sought after woods of the 18th and 19th centuries, lacewood's popularity would prove to be its undoing. By the early 1900's, **all** the lacewood trees in Queensland had been cut down. However, a tree in northern Queensland was found to possess wood that was very close *Grevillea robusta*. This tree was named *Cardwellia sublimes*, and needless to say, the new wood was quickly deemed "lacewood" and the rest, so to speak; is history. Thankfully, the Australians learned their lesson, and today have some of the best forestry practices in the world. Through these practices, the Australians have ensured that lacewood will be readily available for generations to come. It is interesting to note that a new use has been discovered for lacewood; providing shade for tea and coffee trees. Such planting is now being practiced as far away as Africa. Today, lacewood is used mostly as an accent wood. Its ray-fleck (pebble) grain pattern is too 'busy' to construct a whole piece of furniture out of. However, you will find small projects like jewelry boxes made entirely out of the material. Native lacewood is only found in Australia.

East Indian Rosewood (*Dalbergia latifolia*) Damp growing conditions are said to be ideal for the tree, but it has a wide-growing area throughout Southern India scattered in the dry deciduous forests, but nowhere common; attains its best growth in the Bombay region. Heartwood varies in color from golden brown to dark purple brown, sometimes with a whole variety of greys, reds and browns. Darker purple streaks give an attractive figure; sapwood is yellowish often with purplish tinge and sharply demarcated from the heartwood. Has largely replaced Brazilian rosewood (because it is increasingly difficult to obtain) as a tone wood of choice for guitars and other instruments.

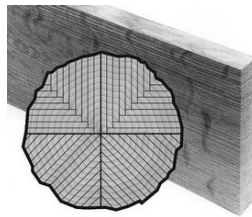
Wood Grains, Figured Grains, and Wood Defects Information

WOOD GRAIN IN LUMBER

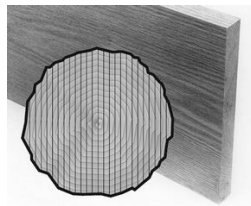
Sawyers use several methods to cut up a tree, each of which reveals different grain patterns.



The most common method is **plain sawing** because it produces the highest quantity of usable lumber. The sawyer begins by sawing several boards from one side of the log, turns it 90 degrees and saws several more, and continues in this manner “sawing around” the log. Plain-sawn boards show flat grain on their faces and quarter grain on the edges.

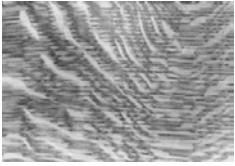


The sawyer might also **quarter saw** a log. First, he saws the log in quarters, then slices each quarter into boards, either by cutting boards from the two flat sides alternately or by gang-sawing the quarter (making parallel cuts). Quarter sawn boards show mostly quarter grain on their faces and flat grain on the edges.



On special request, a sawyer will **live saw** a log for a woodworker, gang-sawing the entire log. (This is sometimes called *sawing through and through*.) Live sawing produces much wider boards than other methods, and these boards show mostly mixed grain — flat grain near the center of the face and quarter grain near the edges.

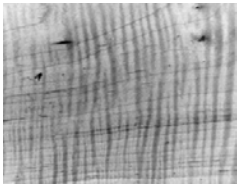
Wood grain isn’t always straight and even. The longitudinal and ray cells sometimes grow in unusual patterns, many of which are strikingly beautiful. These are known as **figured grain**.



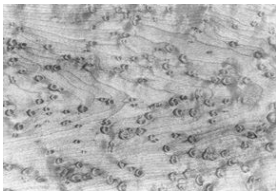
A few wood species, such as white oak, have especially prominent rays. When quarter sawn, these produce *silver grain*.



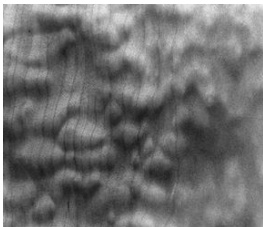
Crotch figure, such as this walnut crotch, is cut from the part of a tree where the trunk divides into smaller limbs and branches.



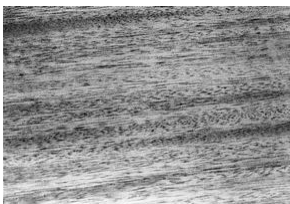
Curly grain occurs when the longitudinal cells grow in waves. This occurs in many species but is especially striking in maple.



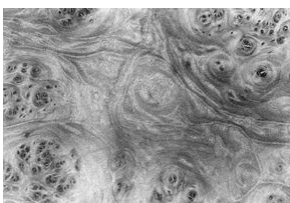
Bird's eyes, like these in this maple, are caused by small dimples in the layers of cells. These are thought to be caused by a fungus that affects the growth of the longitudinal cells.



Larger dimples result in *quilted figure*, like the quilting in this soft maple. This, too, is the result of a fungus.



The longitudinal cells of certain species, such as mahogany, sometimes spiral around the trunk, reversing direction every few growth rings. This creates *ribbon figure*.



Sometimes a tree produces a large growth on the side of the trunk or a branch. The cells seem to swirl around each other inside these growths. When sliced, these produce a *burl figure* such as this elm burl.