EM 8688
Reprinted November 1998
$2.00

Identifying Common Northwest Wood Species

A Woodworker's Guide

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Many woods are impossible to tell apart without using a microscope. Sometimes, a great deal of knowledge and expensive laboratory equipment is needed to identify a wood species. On the other hand, you don't have to be an expert or have specialized equipment to identify many species. In fact, an experienced woodworker often can identify a wood with just a quick glance.

If you have a rough idea of the kind of wood you're dealing with, knowing a few key characteristics will help you distinguish it from similar woods. This publication is intended to help you be aware of those key characteristics[1] as well as recognize species that require a professional identification service to identify.

If a safety or health hazard may result from improper identification, please contact a professional wood identification service.

[1]Species descriptions used with the permission of the McGraw-Hill Book Company from the *Textbook of Wood Technology,* by A.J. Panshin and C. De Zeeuw, copyright 1949. Published by the McGraw-Hill Book Company, San Francisco.

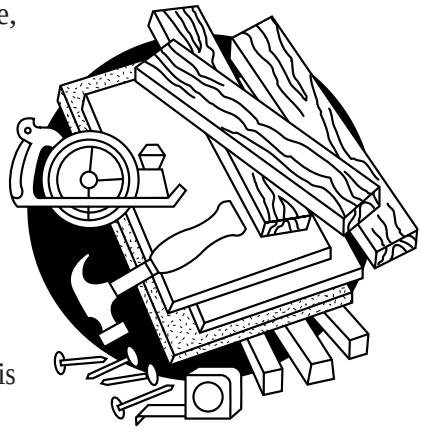
[2]Terms in italics are defined in the glossary at the end of the text.

Hardwood vs. softwood

The first question to ask is: Is this a *softwood* or a *hardwood*?[2] The terms softwood and hardwood do not always indicate the "hardness" of the wood. Pacific yew, for example, is a very hard softwood; and black cottonwood is a very soft hardwood.

Softwoods have needles or scale-like foliage and commonly are known as evergreens. There's an exception to every rule, however, and some softwoods, such as western larch, lose their needles in the fall and thus aren't evergreen. Softwoods also are known as conifers (cone-bearing) or scientifically as *gymnosperms.*

Hardwoods, on the other hand, are *deciduous,* meaning they lose their leaves at the end of the growing season. Again, there are exceptions to this rule. In the Northwest, some native hardwoods that are *not* deciduous (i.e., are evergreen) include Pacific madrone, tanoak, golden chinkapin, and myrtle-wood (also known as Oregon-myrtle or California-myrtle). The scientific term for hardwoods is *angiosperm.*



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Simply stated, the wood of hardwoods has *vessels* (also called *pores*—Figure 1), and the wood of softwoods doesn't. Sounds simple enough, and for some woods, such as oaks, it is, because you can see the pores in oaks with the naked eye.

In other woods, such as cottonwoods, the pores are too small to see with the naked eye. At first glance, the untrained eye might call cottonwood a spruce or fir, but with a magnifying lens, the presence of pores reveals that cottonwood is a hardwood.

In hardwoods, the major identifying characteristics are:

- Distribution of pores—*ring-porous*, *diffuse-porous*, or *semi-ring-porous* (Figure 1)
- Color, which may or may not be different between heartwood and sapwood (Figure 2)
- Size and distribution of *rays* (Figure 3)

For softwoods, there are a few major characteristics used in identification:

- *Gradual* or *abrupt transition* from *earlywood* to *latewood* (Figure 4)
- Color, which may or may not be different between *heartwood* and *sapwood* (Figure 2)
- Presence or absence of *resin canals* (Figure 4)
- Odor

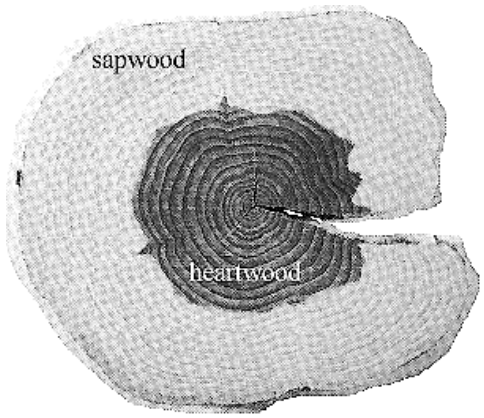


Figure 2.—Locations of sapwood and heartwood. Photo from *Understanding Wood*, by R. Bruce Hoadley (Taunton Press, 1980).

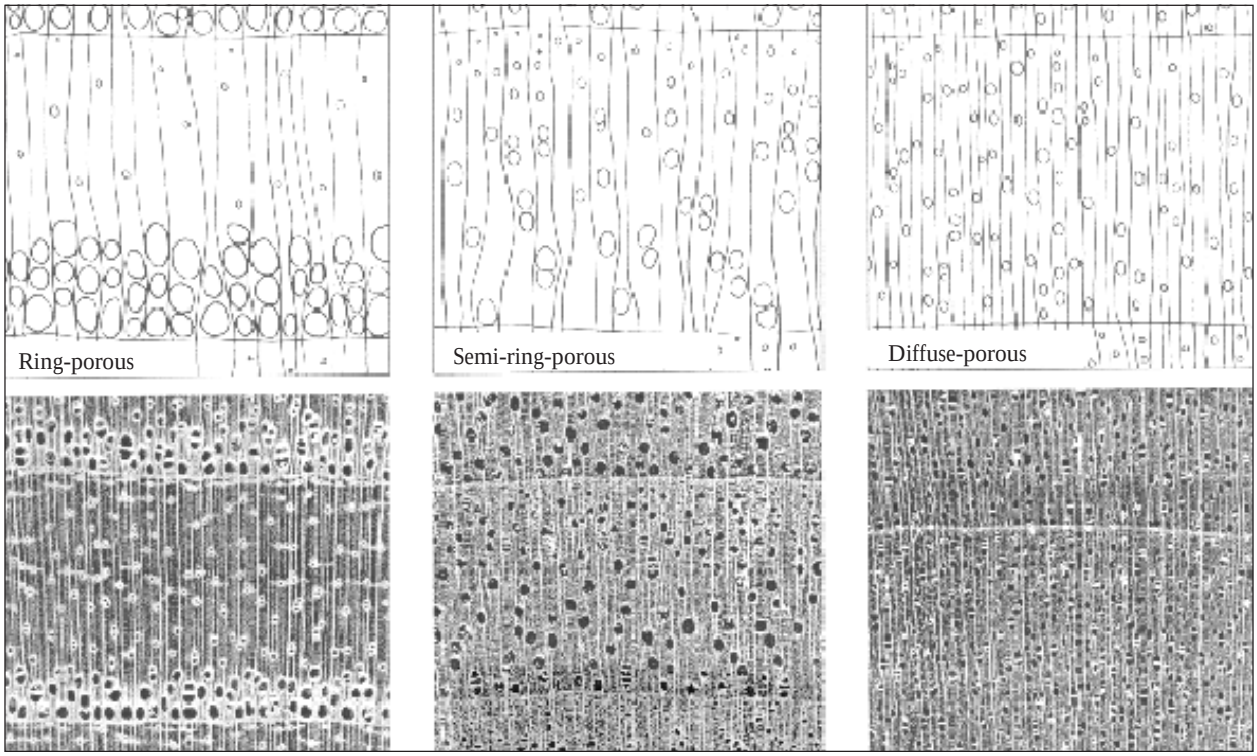


Figure 1.—Pore distribution in hardwoods. Photo from *Identifying Wood*, by R. Bruce Hoadley (Taunton Press, 1990).

For both hardwoods and softwoods, we often discuss which "side" of the board to examine for the important characteristics. Wood has three distinct planes or surfaces: the *cross-section* (also known as transverse section or end-grain), the *tangential* surface, and the *radial* surface (Figure 5). The tangential surface and radial surface are collectively known as edge-grain. For example, the description for Sitka spruce states, "often dimpled on the tangential surface," or for bigleaf maple, "pronounced *ray fleck* on the radial surface."

How to use this guide

To use this publication, you need to know whether the wood you're identifying is from the Pacific Northwest. To identify woods from other regions, see "For more information," page 16.

Helpful tools for identification are a 10x hand magnifying lens and a sharp knife or a heavy-duty utility knife.

The "Wood Identification Keys" on pages 14–15 might be your first step in identifying an unknown Northwest wood species. While the keys certainly help narrow the search, however, it's a good idea to read through the entire text at least once before using the keys. Reading about all the species will help you become familiar with them, especially the ones that are difficult to tell apart. Using the key alone, without the more detailed descriptions in the text, might lead you to misidentify a sample.

For example, if you're trying to identify a sample of slow-grown Douglas-fir that has a gradual transition from earlywood to latewood and lacks the familiar "Douglas-fir aroma," the key probably will lead you to identify it as a spruce. The text, however, states that slower-grown Douglas-fir and the spruces may be difficult to tell apart and gives some hints for how to distinguish them.

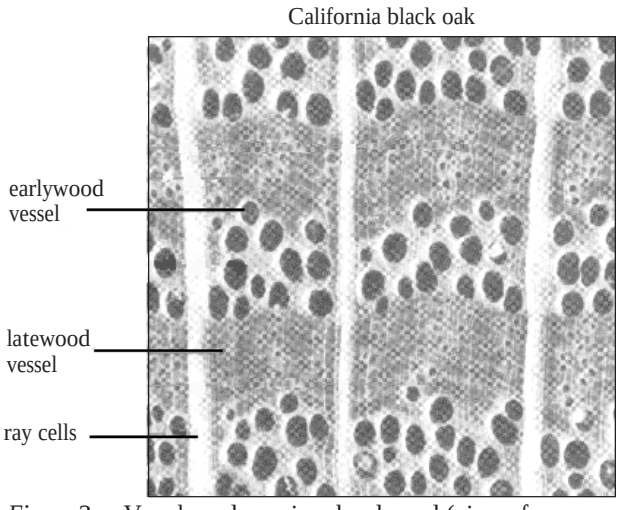


Figure 3.—Vessels and rays in a hardwood (view of transverse surface, i.e., "end grain"). Photo from *Understanding Wood*, by R. Bruce Hoadley (Taunton Press, 1980).

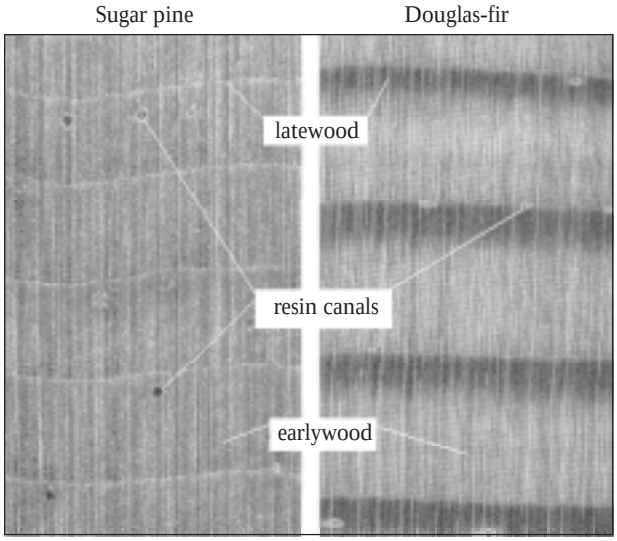


Figure 4.—Earlywood to latewood transition—gradual in sugar pine, abrupt in Douglas-fir (view of transverse surface, i.e., "end grain"). Photo from *Understanding Wood*, by R. Bruce Hoadley (Taunton Press, 1980).

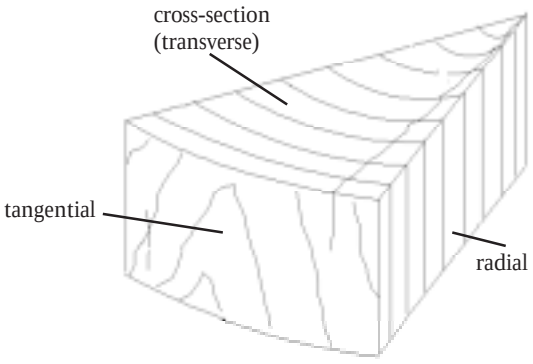


Figure 5.—The three principal axes of wood.

SOFTWOODS

Softwoods with normal longitudinal resin canals

Pines

Ponderosa pine

Sapwood	White to pale yellow
Heartwood	Yellowish to orange-brown
Odor	Distinctive resinous odor
Transition	Abrupt
Latewood band	Usually narrow
Resin canals	Present and generally visible to the naked eye (usually not as large as in sugar pine and western white pine, but larger than in lodgepole pine). Resin canals may show up as dark streaks along the grain.
Notes	Ponderosa pine often is *dimpled* on the tangential surface (although less conspicuously than lodgepole pine). Although ponderosa pine is difficult to tell apart from lodgepole pine, there are some major differences, which result from the fact that ponderosa pine trees generally are larger in both height and diameter and have fewer and larger limbs than do lodgepole pines. Therefore, long, wide, clear boards may indicate ponderosa pine. Ponderosa pine's heartwood may be reddish in color, whereas this seldom is the case with lodgepole pine. Finally, as previously mentioned, the resin canals in ponderosa pine generally are larger than those in lodgepole pine.

Lodgepole pine

Sapwood	White to pale yellow
Heartwood	White to pale yellow. Heartwood often is only slightly darker than sapwood and is not distinctive.
Odor	Distinctive resinous odor
Transition	More or less abrupt
Latewood band	Usually narrow
Resin canals	Present but difficult to see. Resin canals may form dark streaks along the grain.
Notes	Lodgepole pine is difficult to tell apart from ponderosa pine. (See description above.) It often is heavily dimpled on the tangential surface (more conspicuously than ponderosa pine).

Sugar pine

Sapwood	White to pale yellowish-white
Heartwood	Light brown to pale reddish-brown (not as deep reddish-brown as western white pine)
Odor	Faint odor
Transition	Gradual

Latewood band	Quite narrow
Resin canals	Present and visible to the naked eye. Resin canals appear as dark streaks on the tangential surface. *Transverse resin canals* often appear as brown specks on the tangential surface.
Notes	Sugar pine often exudes a sugary substance when green.

Western white pine

Sapwood	White to pale yellowish-white
Heartwood	Cream to reddish-brown
Odor	Slight resinous odor
Transition	Gradual
Latewood band	Usually narrow
Resin canals	Large and numerous

Spruces

Sitka spruce

Sapwood	Creamy white to light yellow
Heartwood	Pinkish-brown
Odor	No distinctive odor
Transition	Gradual
Latewood band	Often narrow
Resin canals	Present (white flecks in the heartwood)
Notes	Sitka spruce may be difficult to distinguish from other spruces as well as from Douglas-fir or larch. Spruce wood often is dimpled on the tangential surface, while larch and Douglas-fir usually are not. Also, spruce wood often has a sheen or luster, while Douglas-fir and larch generally do not. Color, resin canal size, and *dimpling* may help to distinguish Sitka spruce from Engelmann spruce. Sitka spruce typically has a more pinkish cast than Engelmann spruce. Resin canals also generally are larger in Sitka spruce than in Engelmann spruce. Finally, Sitka spruce may have more conspicuous dimpling on the tangential surface than Engelmann spruce.

Engelmann spruce

Sapwood	White to yellow-brown
Heartwood	White to yellow-brown, not distinct
Odor	No distinctive odor
Transition	Gradual
Latewood band	Narrow
Resin canals	Present but difficult to see
Notes	Wood is lustrous and low *density* (feels “light”). Engelmann spruce may be difficult to distinguish from other spruces as well as from Douglas-fir or

larch. (See the description of Douglas-fir below.) Spruce wood may have *dimpling*, while larch and Douglas-fir usually do not. Also, spruce wood often has a sheen or luster, while Douglas-fir and larch generally do not.

Other softwoods with normal longitudinal resin canals

Douglas-fir

Douglas-fir is not listed with the firs because it is not a true fir. (It is not in the genus *Abies*.) This tree has challenged botanists for many years. Over the years, the tree has been classified as a pine, a spruce, a hemlock, and a true fir. The cones of Douglas-fir resemble spruce cones, and the needles resemble those of the true firs. In 1867, it was given its own genus—*Pseudotsuga*, which means false hemlock. If you're not confused now, you're in great shape! Douglas-fir truly is in a class by itself.

Sapwood	White to pale yellow
Heartwood	Yellowish to pinkish to reddish-brown
Odor	Sweet resinous odor (different than pine)
Transition	Abrupt
Latewood band	Very distinct growth rings (dark and obvious latewood band)
Resin canals	Present and generally visible to the naked eye (although smaller than pines)
Notes	Slower-grown trees may be difficult to distinguish from larch or spruce. Douglas-fir wood typically feels dry, whereas larch may feel waxy or greasy. Douglas-fir also has a characteristic odor, whereas larch and spruce do not.

Western larch

Sapwood	Whitish to straw-brown
Heartwood	Russet or reddish brown
Odor	No characteristic odor
Transition	Abrupt
Latewood band	Pronounced (usually narrow) band of dark latewood
Resin canals	Present (as white flecks in latewood)
Notes	It may be difficult to distinguish western larch from Douglas-fir or spruces. (See the description of Douglas-fir above.)

Softwoods lacking normal longitudinal resin canals

"Cedars"

Common names for woods sometimes are confusing. None of the woods native to the Northwest known as cedars actually is scientifically classified as cedar. These species probably are called cedars because of their aromatic properties, common to the true cedars (trees in the genus *Cedrus*), which are native to the Mediterranean and the Himalayas. The four "cedars" native to the Northwest actually are from three different genera**,** *Thuja* (western redcedar), *Chamaecyparis* (Port-Orford-cedar and Alaska-cedar), and *Calocedrus* (incense-cedar). You'll notice that the names of all of our Northwest cedars are either hyphenated or "run together" as in redcedar. This practice distinguishes them from the true cedars.

Incense-cedar

Sapwood	Nearly white
Heartwood	Reddish-brown and sometimes with a tinge of purple
Odor	Very characteristic “pencil” odor
Transition	Gradual but conspicuous (Western redcedar’s transition is more abrupt)
Latewood band	Very narrow
Resin canals	Lacking
Notes	Incense-cedar also is known as “pencil cedar” due to its common usage for pencils. The *parenchyma* are abundant and may be visible to the naked eye in the latewood as one or two dark bands (a feature that may help distinguish it from western redcedar). Rays are fine but visible with a hand lens and form a fine fleck on the radial surface. (See *ray fleck* in the glossary.) Incense-cedar may be difficult to distinguish from western redcedar. Incense-cedar tastes bitter, whereas western redcedar is relatively tasteless. The pencil odor of incense-cedar also may help distinguish it from western redcedar.

Western redcedar

Sapwood	Nearly white
Heartwood	Reddish or pinkish-brown (may be very dark brown)
Odor	Characteristic sweet odor
Transition	More or less abrupt
Latewood band	Narrow
Resin canals	Lacking
Notes	Western redcedar may be difficult to distinguish from incense-cedar. (See the description of incense-cedar above.)

Port-Orford-cedar

Sapwood	White to pale yellowish-white
Heartwood	White to pale yellowish-white, often not distinguishable from sapwood
Odor	Very characteristic, almost medicinal or ginger-like odor
Transition	Gradual
Latewood band	Narrow and only slightly more dense than earlywood
Resin canals	Lacking
Notes	Port-Orford-cedar wood is very straight grained. It may be difficult to distinguish from Alaska-cedar. The odor of Port-Orford-cedar is more pungent than that of Alaska-cedar. Bands of parenchyma may be seen with a hand lens on a moist cross-section, whereas they usually are inconspicuous in Alaska-cedar.

Alaska-cedar

Sapwood	White to yellowish-white
Heartwood	Bright yellow (usually more yellow than Port-Orford-cedar)
Odor	Very characteristic odor (sometimes resembles raw potatoes)
Transition	More or less abrupt
Latewood band	Very narrow; little difference in color between earlywood and latewood
Resin canals	Lacking
Notes	Alaska-cedar may be difficult to distinguish from Port-Orford-cedar. (See the description of Port-Orford-cedar above.)

True firs

Individual true fir species are very difficult to distinguish from one another on the basis of wood anatomy. They also are difficult to tell apart from western hemlock. (See the description of hemlock below for some identification hints.)

White fir, grand fir, noble fir, California red fir, Pacific silver fir, subalpine fir

Sapwood	Whitish to pale gray
Heartwood	Whitish to pale gray; no distinctive heartwood color
Odor	No distinctive odor when dry. Some species, such as white fir, have a slight disagreeable odor when green.
Transition	Gradual
Latewood band	Slight sheen
Resin canals	Lacking

Other softwoods lacking normal longitudinal resin canals

Western hemlock

Sapwood	Whitish to yellow-brown
Heartwood	Whitish to yellow-brown, non-distinct heartwood
Odor	Usually odorless
Transition	Gradual
Latewood band	Often has a purplish tinge
Resin canals	Lacks normal resin canals
Notes	Hemlock can be very difficult to distinguish from true firs without a microscope. Hemlock may have a more abrupt earlywood to latewood transition than true firs. Also, hemlock usually is tasteless, whereas firs often have a bitter, unpleasant taste due to calcium oxalate crystals.

Pacific yew

Sapwood	Light yellow
Heartwood	Bright orange to rose-red
Odor	No characteristic odor
Transition	Very gradual
Latewood band	Very dense, variable in width
Resin canals	Lacking
Notes	Pacific yew wood is very fine-textured, very dense, and hard (the densest of the softwoods).

Western juniper

Sapwood	White to pale yellowish-white
Heartwood	Pinkish to deep reddish-brown
Odor	Very characteristic odor (similar to eastern redcedar)
Transition	Variable
Latewood band	Variable in width but conspicuous
Resin canals	Absent
Notes	*False growth rings* and *included sapwood* often are present. The grain rarely is straight due to large and numerous limbs.

HARDWOODS

Ring-porous hardwoods

Oregon white oak

Sapwood	Whitish to light brown
Heartwood	Light brown to dark brown
Odor	No characteristic odor
Pore distribution	Ring-porous. Growth rings are very distinct. Earlywood pores are large and visible to the naked eye in rows of one to three along the ring. Earlywood pores are plugged with *tyloses* in the heartwood (vs. black oak pores, which generally are open). Latewood pores are numerous (generally more so than black oak), thin-walled, and small (difficult to see even with a hand lens).
Parenchyma	Visible with a hand lens
Rays	Both broad and narrow. Broad rays are very evident on both the tangential and *cross sections* and appear as a very conspicuous fleck on the radial surface. The longest ray on the tangential surface is greater than 1¼ inch long (as compared to California black oak, which has rays no more than 1 inch long).

California black oak

Sapwood	Whitish to gray or pale red-brown
Heartwood	Pinkish to light red-brown
Odor	Often no characteristic odor, but occasionally faint vinegar odor
Pore distribution	Ring-porous. Growth rings are very distinct. Earlywood pores are large and visible to the naked eye in rows of one to four along the rings. Pores usually are open in heartwood (vs. white oak pores, which are plugged with *tyloses*). Latewood pores are much smaller (barely visible to the naked eye), thick-walled, in solitary radial lines, and abundant (although less numerous than in white oak).
Parenchyma	Visible with a hand lens
Rays	Both broad and narrow. Broad rays are very evident to the naked eye on both the tangential and cross-sections and as a very conspicuous fleck on the radial surface. The longest ray on the tangential surface is less than 1 inch long (as compared to Oregon white oak, which has longest rays greater than 1¼ inch long).

Golden chinkapin

Sapwood	Light brown with a pinkish tinge
Heartwood	Light brown, tinged or striped with pink (often barely distinguishable from the sapwood)
Odor	No characteristic odor
Pore distribution	Ring-porous. Growth rings are conspicuous. Earlywood pores are visible to the naked eye and generally are in a row of one pore (rarely two or more) along the ring. Transition from earlywood to latewood is abrupt. Latewood pores are small and seem to fan out from earlywood pores.
Parenchyma	Not evident
Rays	Very fine, barely visible with a hand lens

Diffuse-porous hardwoods

Red alder

Sapwood	Whitish when fresh sawn and ages to pinkish or tan (depending on how it's dried)
Heartwood	Whitish when fresh sawn and ages to pinkish or tan (depending on how it's dried); indistinct from sapwood
Odor	No characteristic odor
Pore distribution	Diffuse-porous. Whitish or brownish line separates growth rings. Small pores are evenly distributed and similar in size.
Parenchyma	Not evident
Rays	Broad rays form purplish streaks up to an inch long on the tangential surface

Bigleaf maple

Sapwood	Reddish-white (sometimes grayish)
Heartwood	Pinkish-brown
Odor	No characteristic odor
Pore distribution	Diffuse-porous. Growth rings often are difficult to detect, although they may be delineated by a fine brownish line. Pores are relatively evenly distributed and similar in size.
Parenchyma	Not evident
Rays	Visible to the naked eye (pronounced *ray fleck* on the radial surface and short lines on the tangential surface)
Notes	Wood occasionally is wavy grained.

Myrtlewood

Sapwood	Whitish to light brown
Heartwood	Light brown to gray brown and often with streaks of pigment (purple, dark brown, reddish, etc.)
Odor	Characteristic spicy odor
Pore distribution	Diffuse-porous. Growth rings are distinct. Very small pores often are surrounded by a whitish sheath of parenchyma
Parenchyma	See “Pore distribution,” above
Rays	Visible with a hand lens

Pacific madrone

Sapwood	White or cream colored (often with a pinkish tinge)
Heartwood	Light reddish-brown
Odor	No characteristic odor
Pore distribution	Diffuse-porous. Growth rings are barely visible but are separated by a single row of pores in the first-formed earlywood of each growing season. Pores are very small (except the pores in the first-formed earlywood of each growing season) and numerous. Pores may be solitary, in multiples, or in short radial rows.
Parenchyma	Not evident
Rays	Vary from barely visible to readily visible with a hand lens. A pepper-like *ray fleck* is visible to the naked eye on the radial surface.
Notes	Wood is heavy and hard.

Semi-ring-porous hardwoods

Tanoak	Not botanically classified as a "true" oak. (The scientific genus for true oaks is *Quercus*, whereas tanoak is in the genus *Lithocarpus*.) The large "oaklike" rays of tanoak make this wood resemble the true oaks (e.g., white oak and black oak). This resemblance to oaks probably is where tanoak derived its name.
Sapwood	Light reddish-brown (after aging, difficult to distinguish from heartwood)
Heartwood	Light brown tinged with red
Odor	No characteristic odor
Pore distribution	Semi-ring-porous. Growth rings are difficult to detect, although they may be delineated by a thin dark band. Pores are barely visible to the naked eye and are unevenly distributed, often forming radially oriented clusters extending across several growth rings.
Parenchyma	Visible with a hand lens on the tangential surface as wide ragged lines (similar in color to surrounding fibers)
Rays	Both broad (aggregate) and narrow. When broad, rays are readily apparent on the cross-section and as flecks on the radial surface.
Black cottonwood	
Sapwood	Whitish, frequently merging into the heartwood
Heartwood	Grayish-white to grayish-brown; not clearly differentiated from sapwood
Odor	Odorless to somewhat disagreeable odor when moist
Pore distribution	Semi-ring-porous to diffuse-porous. Growth rings are distinct but inconspicuous. Pores are numerous, small, and often decrease in size from earlywood to latewood. Pores are barely visible to the naked eye and are more crowded in the earlywood formed first in the growing season.
Parenchyma	Form a narrow line along growth rings
Rays	Very fine, barely visible with a hand lens
Notes	Wood is lightweight and soft.

GLOSSARY

From *Identifying Wood: Accurate Results with Simple Tools*, by R. Bruce Hoadley (Taunton Press, 1990).

Abrupt transition—Wood species characterized by an abrupt change within the annual growth ring from earlywood to latewood. See Figure 2.

Angiosperm—A member of the seed plant class whose seeds are enclosed in ovaries. Commonly called broad-leaved trees, deciduous trees, or hardwoods.

Cross section—A section cut perpendicular to the grain; also the surface exposed by such a cut. Also called transverse section. See Figure 5.

Deciduous—Trees whose current leaves normally drop after the yearly growth period is over.

Density—The weight of a body or substance per unit volume.

Diffuse-porous—A hardwood in which the pores are of approximately uniform size and distributed fairly evenly throughout the growth ring.

Dimpling—Numerous small depressions in the growth rings, most obvious on split tangential surfaces.

Earlywood (also known as springwood)—The first-formed portion of the growth ring, often characterized by larger cells and lower density. Generally, the lighter-colored wood in the growth ring.

False growth rings—More than one sequence of earlywood and latewood within a growth ring. (False rings may appear lighter in color than normal latewood.)

Genera—Plural form of **Genus.**

Genus—The level of classification below family but above and including one or more species. The genus name is the capitalized first word of the binomial term used to designate a species; e.g., in *Quercus garryana*, Oregon white oak, *Quercus* is the genus, and *garryana* is the species.

Gradual transition—Wood species characterized by a gradual change within the annual growth ring from earlywood to latewood. See Figure 2.

Gymnosperm—A member of the naked seed class of plants—plants whose seeds are not enclosed in ovaries. Commonly called evergreens, softwoods, or conifers.

Hardwood (see also angiosperm)—Woods from broad-leaved trees in the botanical group angiosperms. Since these woods have vessels, they also are called porous woods. (*Note*: the term hardwood or softwood does not describe the degree of hardness or softness of the wood.)

Heartwood—The central core of wood in mature stems that was at one time sapwood but no longer conducts sap or has living cells. In many species, the color is darker in the heartwood than in the sapwood.

Included sapwood—Areas of light-colored wood, apparently sapwood, found within the portion of the stem that has become heartwood.

Latewood (also known as summerwood)—The later-formed portion of the growth ring that is characterized by smaller cells and/or higher density. Generally, the darker-colored wood in the growth ring.

Parenchyma—Thin-walled wood cells (living when in the sapwood) that are involved mainly in food storage and distribution. Groupings of parenchyma may appear as light-colored areas on *cross sections* when viewed with a hand lens.

Pore—The cross-section of a hardwood vessel

Radial surface—A direction in wood perpendicular to the (longitudinal) grain direction and following the orientation of the rays. See Figure 5.

Rays—Flattened bands of tissue composed of ray cells extending horizontally in a radial plane through the tree stem.

Ray fleck—The conspicuous appearance of *rays* on an edge-grained surface.

Resin canals (longitudinal)—Tubular passageways in the wood of certain softwoods (pines, larches, spruces, and Douglas-fir) formed as intercellular spaces encircled by epithelial cells. The epithelial cells secrete resin into the canal. Longitudinal resin canals run along the grain and are longer than transverse resin canals. (See "transverse resin canals.")

Ring-porous—Hardwood in which relatively large pores are concentrated in the earlywood, and distinctly smaller pores are found in the latewood.

Sapwood—The active sap-conductive wood containing some living cells in mature stems. It comprises one to many of the outermost growth rings of the wood, and usually is lighter in color than the central heartwood.

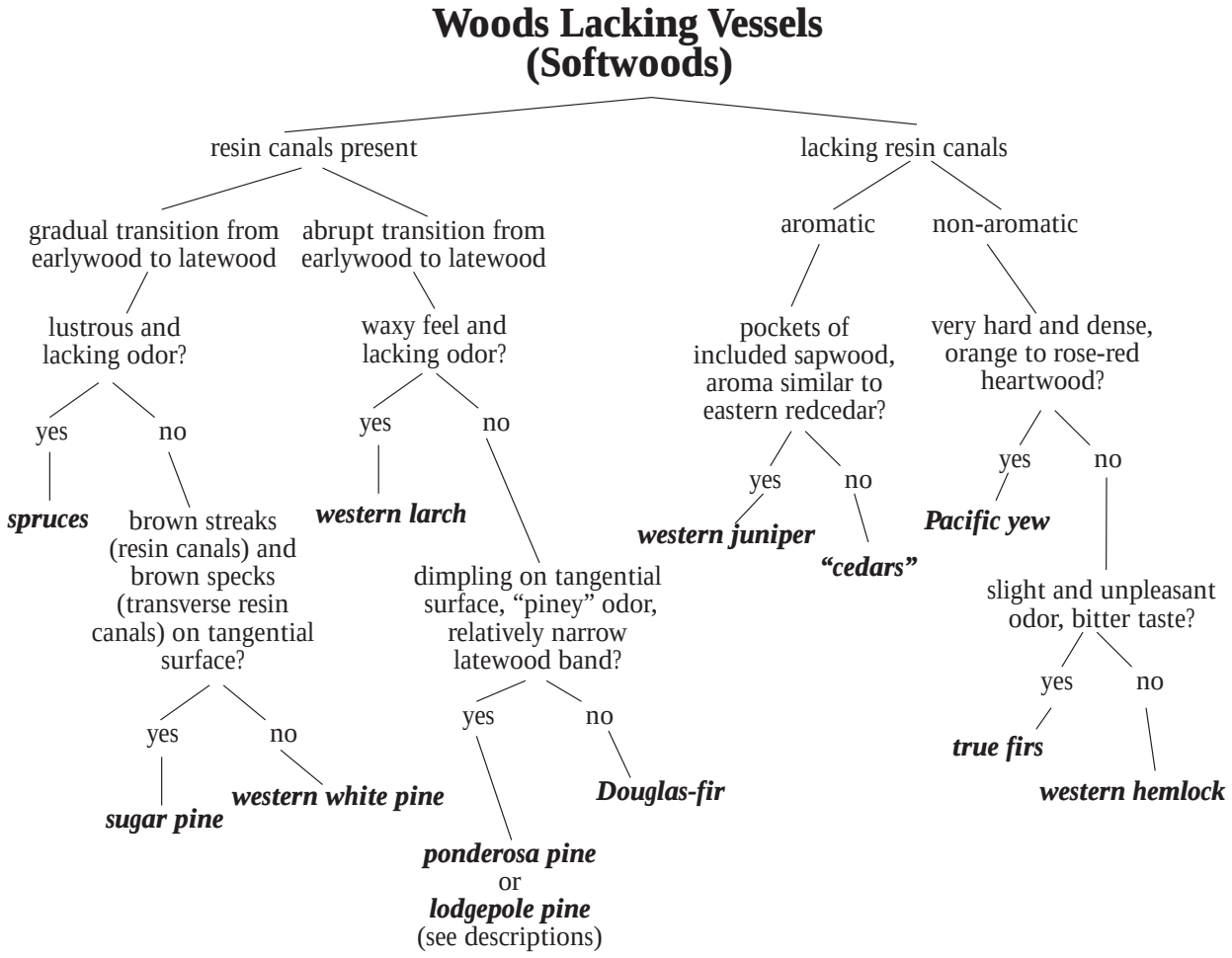
Semi-ring-porous—Hardwood with fairly evenly distributed pores whose size gradually decreases from the earlywood to latewood portion of the growth ring.

Softwood (see also *gymnosperm*)—Woods produced by coniferous trees in the botanical group gymnosperms. Since these woods lack vessels, they sometimes are referred to as nonporous woods. (*Note*: the term hardwood or softwood does not describe the degree of hardness or softness of the wood.)

Tangential surface—The direction in wood that is perpendicular to the grain and to the rays, and therefore is tangent to the growth ring. See Figure 5.

Texture—Relative cell size indicated by adjectives from fine to coarse; in softwoods, determined by relative tracheid (the elongated conductive cells comprising over 90 percent of softwood tissue) diameter; in hardwoods, determined by relative pore diameter. Also sometimes used to indicate evenness of grain, e.g., "uniform texture" and uniformity in size and distribution of pores, e.g., "even texture." *Fine texture*—small and closely spaced tracheids or pores. *Coarse texture*—relatively large tracheids or pores.

WOOD IDENTIFICATION KEY



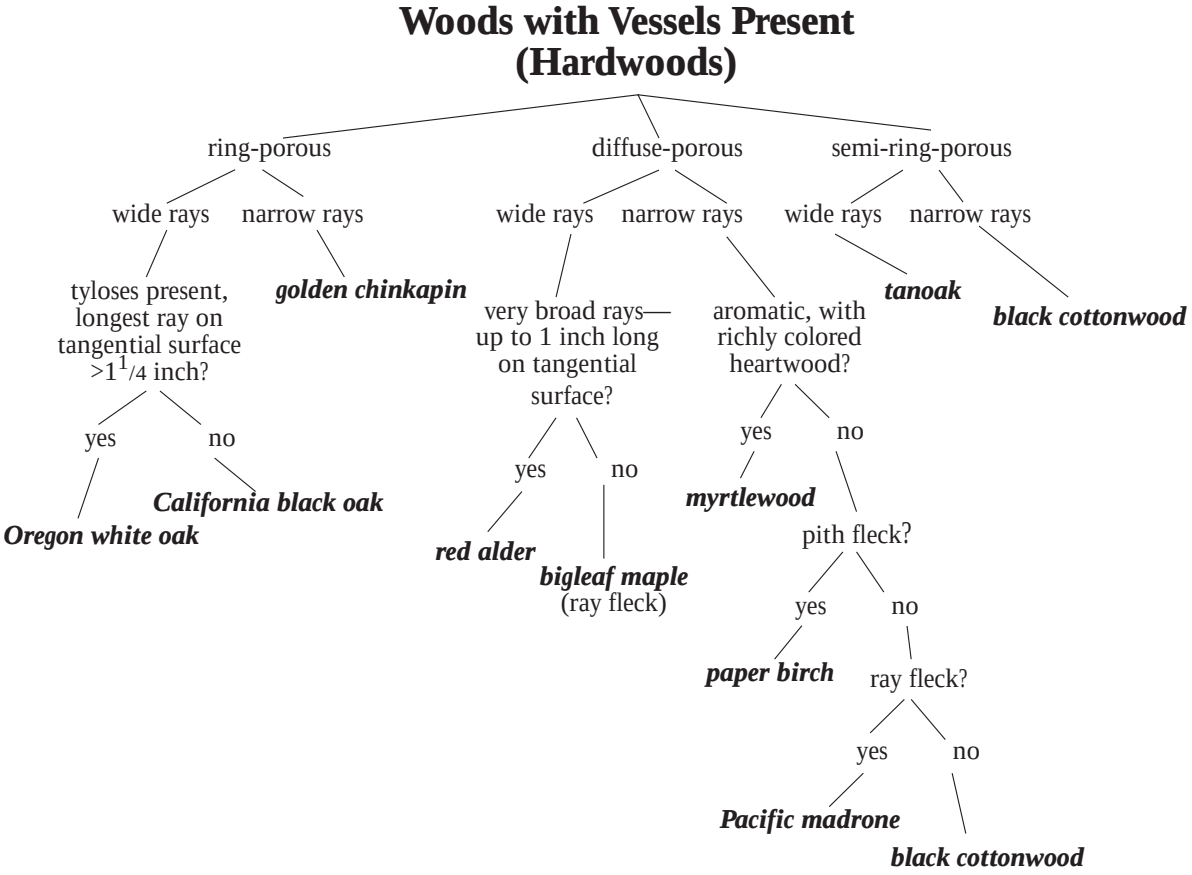
Transverse section—See cross section.

Transverse resin canal—Tubular passageways in the wood of certain softwoods (pines, larches, spruces, and Douglas-fir) formed as intercellular spaces encircled by epithelial cells. The epithelial cells secrete resin into the canal. Transverse resin canals run across the grain (with rays) and are shorter than longitudinal resin canals. (See "resin canals.")

Tylose—Bubble-like structures that form in the vessel elements of certain hardwood species, usually in conjunction with heartwood formation.

Vessel (also known as pores)—A longitudinal conductive passageway formed by an aligned series of vessel elements. Vessel elements are a type of hardwood cell with relatively large diameters, thin cell walls, and open ends.

WOOD IDENTIFICATION KEY (continued)



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Other publications

Panshin, A.J., and C. de Zeeuw. *Textbook of Wood Technology* (San Francisco: McGraw-Hill Book Co., 1980). 722 pp.

Hoadley, R.B. *Identifying Wood: Accurate Results with Simple Tools* (Newtown, CT: Taunton Press, Inc., 1990). 223 pp.

Hoadley, R.B. *Understanding Wood: A Craftsman's Guide to Wood Technology* (Newtown, CT: Taunton Press, Inc., 1980). 256 pp.

The Encyclopedia of Wood: Revised Edition (New York: Sterling Publishing Co., 1989). 466 pp. [Reprint of the USDA Forest Service Forest Products Laboratory's *Wood Handbook: Wood as an Engineering Material*, Ag. Handbook #72]

Woods of the Western USA (Oregon Department of Forestry in cooperation with the USDA Forest Service and the National Association of State Foresters, 1994). 23 pp.

Woods of the World CD ROM (Burlington, VT: Tree Talk Inc., 1994).

Sources of wood samples for identification

Carolina Biological Supply Company
2700 York Road
Burlington, NC 27215
919-584-0381

International Wood Collectors Society
Attn: Dennis Wilson
13249 Hwy. 84 N
Cordova, IL 61242-9708
309-523-2852

Wisconsin Crafts
W6407 20th St.
Necedah, WI 54646
608-565-2101

Garrett Wade Company
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1-800-221-2912

Educational Lumber Co., Inc.
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This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

Published January 1998. Reprinted November 1998.