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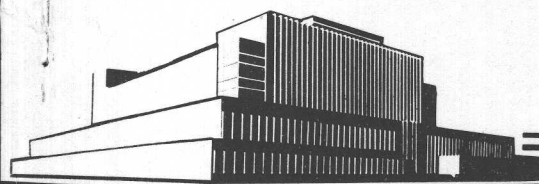
KEY FOR IDENTIFICATION OF WOODS USED FOR BOX AND CRATE CONSTRUCTION

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FOREST PRODUCTS LABORATORY
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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

In Cooperation with the University of Wisconsin

KEY FOR THE IDENTIFICATION

(Without the Aid of Hand Lens)

OF WOODS USED FOR BOX AND CRATE CONSTRUCTION¹

By

ELOISE GERRY, Microscopist

Forest Products Laboratory, ² Forest Service
U. S. Department of Agriculture

HARDWOODS

Woods from broad-leaved trees

Woods with pores or vessels,
that is, cells larger than
those surrounding them.

I. Pores Present: Sometimes not visible to the naked eye in certain diffuse porous woods in which, however, the distinct rays or lack of well-defined summerwood distinguish them from conifers:

A. Ring-porous woods: The comparatively large springwood pores are clearly visible especially in the sapwood at the beginning of each annual ring. On the end grain of a log these pores form distinct rings. The marked difference between springwood and summerwood is characteristic. Longitudinal surfaces appear coarse textured because of the large springwood pores which show as fine grooves or

¹Unless otherwise stated all observations of structure are made on a smoothly cut cross section or end grain showing growth rings of average width. A sharp knife is indispensable. All color determinations should be made on a freshly cut longitudinal surface of the heartwood. Identifications based on odor or taste are best made on green material or on freshly cut surfaces, shavings or sawdust, which have not before been exposed to the air.

²Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

furrows often producing a characteristic figure. These woods are mostly heavy and occur in container wood groups III and IV. Chestnut, which is a ring-porous wood, is an exception; it is fairly light when seasoned and is classed in group I.

1. Summerwood figured with wavy or branched radial bands. (Bands extend across the rings in the same direction as the rays.)

AA. Rays many, broad, and conspicuous. They appear as "flecks" or "silver grain" on quarter-sawed material.³ Wood heavy to very heavy. Sapwood rather narrow. 40-49³

THE OAKS IV⁴

BB. Rays not noticeable. Color grayish brown, texture coarse. Sapwood narrow. Wood moderately light. 30.

AMER. CHESTNUT I.

2. Summerwood figured with short or wavy tangential lines running more or less parallel with the rings often most noticeable toward the outer part of the growth ring.

AA. Heartwood not distinctly darker than sapwood (sapwood sometimes darker than heartwood on account of sap stain). Rays distinctly visible but fine. The wavy tangential lines conspicuous throughout the summerwood. Springwood pores numerous, in more than one row. Color pale to yellowish or greenish gray. Wood moderately heavy. 37.

HACKBERRY IV.

or SUGARBERRY

BB. Heartwood distinctly darker than sapwood. Rays barely visible.

(1) Springwood pores in more than one row.

³Figure indicates an average weight per cubic foot of the wood air dry, that is, containing 12 to 15 percent moisture, U. S. D. A. Wood Handbook.

⁴Number indicates group to which the wood belongs in the container wood classification.

- a. Very fine broken tangential lines visible in outer summerwood and especially prominent in wide rings. Sapwood several inches wide, heartwood brownish. Most pores or vessels, except in outer sapwood, appear somewhat closed, difficult to blow through. Wood hard, except pumpkin ash which is moderately heavy to heavy. 36-44.

PUMPKIN ASH III.

WHITE ASH IV.

GREEN ASH IV.

- b. Long and conspicuous wavy tangential bands throughout the summerwood. Sapwood very narrow. Heartwood brown with reddish tinge. Pores rather open. Wood moderately heavy. 37.

SLIPPERY ELM

- (2) Springwood pores in one more or less continuous row except in wide rings where there are occasionally more. Heartwood brownish.

- a. Pores in the springwood fairly conspicuous and visible, because of size and closeness together. Pores rather open. Wood moderately heavy. 35.

WHITE ELM III.

- b. Pores in the springwood inconspicuous, hardly distinguishable from those of the summerwood because relatively small, often not close together, and usually filled with tyloses. Wood heavy. 44.

ROCK ELM IV.

3. Summerwood generally not noticeably figured with radial or tangential bands.

AA. Several rows of large springwood pores which are usually open. Easy to blow through. Sapwood narrow, rarely over three-fourths of an inch wide. Heartwood grayish to olive brown. Wood moderately heavy. 34.

BLACK ASH III.

- BB. Springwood pores comparatively few, relatively small and disposed in broken single rows; usually closed with tyloses. Sapwood often wide. Heartwood brown to reddish brown. Wood heavy to very heavy. 45-51.

HICKORY IV.

B. Diffuse porous woods: No ring of large pores found at the beginning of each year's growth. Pores appear as fine grooves on the longitudinal cuts and are scattered with considerable uniformity throughout both the springwood and the summerwood. Pores vary in size from visible to the naked eye to barely visible or indistinguishable without a lens. The relatively small amount of difference in size between the springwood and summerwood pores makes it often difficult to distinguish the annual rings. Some of these woods are rather soft and light but are separated (because they contain pores or vessels) from "II, " the conifers, or softwoods which do not have true pores or vessels. Diffuse-porous woods are found in groups I, III, and IV of the container woods. Those in group I are lightest.

1. Individual pores plainly visible. Heartwood light chestnut brown. Sapwood narrow. Rays not visible on cross section. Wood light and soft. 26.

BUTTERNUT I.

2. Individual pores barely visible. Sapwood wide. Rays not visible on cross section.

AA. Pores not crowded. Heartwood reddish brown. Wood heavy. 38-44.

BIRCH IV.

BB. Pores crowded. Heartwood grayish to brownish. Wood moderately light to light. 24-28.

COTTONWOOD I.

WILLOW I.

3. Individual pores not visible.

AA. Rays comparatively broad and conspicuous, appear as flecks on quartered cuts and distinguish these woods from conifers. Color various shades of light reddish brown.

- (1) Rays crowded. No denser and darker band of summerwood noticeable. Wood usually lock-grained. Moderately heavy. 34.

AMER. SYCAMORE III.

- (2) Rays not crowded. A distinct denser and darker band of summerwood present. Wood fairly straight grained. Heavy. 44.

AMER. BEECH IV.

BB. Rays not conspicuous but visible, hence distinguishing these woods from conifers.

- (1) Heartwood dingy reddish brown often with darker streaks. Sapwood pinkish white moderately wide, usually over an inch; often sold as "sap gum," sometimes stained blue by sap stain. Annual rings not clearly defined. Rays very fine, close together, not plain even on quartered cuts. Wood moderately heavy. 34.

SWEETGUM (RED GUM) III.

- (2) Heartwood light reddish brown. Sapwood wide. Annual rings clearly defined by a thin darker reddish brown layer. Rays fine but distinct, conspicuous on quartered cuts because of darker color.
- a. Wood hard, difficult to cut across the grain. Pith flecks rare. Rays appear to be not very close together as compared with soft maple. Wood heavy. 43.

SUGAR OR HARD MAPLE IV.

- b. Wood comparatively easy to cut across grain. Pith flecks often abundant. Rays appear very close together compared with hard maple. Wood moderately heavy and moderately light. 32-37.

SILVER MAPLE III. RED MAPLE

- (3) Heartwood pale to yellowish with a greenish, sometimes (especially in yellow-poplar) purplish tinge. Sapwood usually over an inch wide. Annual rings clearly defined by a fine whitish line. Wood moderately light to moderately heavy. About 27-35.

YELLOW-POPLAR I.
CUCUMBER TREE I.
MAGNOLIA I.

- (4) Heartwood pale or creamy brown often with occasional dark or black marks or streaks. Heartwood not sharply defined from light creamy colored sapwood. Wood light. 26.

AMER. BASSWOOD I.

CC. Rays not distinctly visible on cross section. Annual rings usually not clearly defined which aids in distinguishing these woods from conifers.

- (1) Heartwood distinctly darker than sapwood.
- a. Heartwood reddish brown. Wood fairly straight grained, pith flecks sometimes found. Pores visible in a good light especially on longitudinal surfaces where they appear as fine lines or grooves. Wood heavy. 38-44.

BIRCH IV.

- b. Heartwood pale to grayish brown. Wood often very cross grained. Moderately heavy. 34-35.

BLACKGUM III.
WATER TUPELO III.

- (2) Heartwood not distinctly darker than sapwood. Wood odorless, tasteless.
- a. Color creamy. Annual rings inconspicuous, very faintly defined. Tangential surfaces show when smoothly cut, faint fine bands running across the grain produced by the regularly spaced or storied rays. Wood light and soft. 25.

BUCKEYE I.

- b. Wood whitish. Annual rings clearly defined by a fine sometimes whitish line. No figure such as is produced by storied rays. Wood moderately light. 28.

QUAKING ASPEN OR "POPPLE" I.

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CONIFERS

The softwoods, obtained from scale or needle-leaved trees. Woods without pores.

- II. No pores present. Wood usually appears fine textured, because the cells are small and regularly arranged and because no cells are strikingly larger than those surrounding them. Annual rings are clearly defined by a definite band of summerwood. Woods light, most of them are in boxwood and crate wood group I. A few heavier conifers make up group II.

- A. Odor and taste spicy-resinous. No resin ducts, pitch pockets or accumulations of pitch present.

THE CEDARS I.

1. Color creamy, shading to a pale brown. Heartwood odor strong in green material, somewhat suggests ginger. Wood moderately light. 31.

PORT ORFORD WHITE-CEDAR I.

2. Heartwood various shades of red and brown. Odor resembles that of cedar shingles. Wood light. 22.

RED CEDARS I.

NORTHERN WHITE-CEDAR OR EASTERN ARBORVITAE I.

- B. Odor and taste not spicy, may be resinous, especially in the pines. Pitch pockets and other accumulations of pitch including small exudations on the ends of boards often present. Knots usually more or less resinous. Resin ducts present.

1. Heartwood darker than sapwood.

AA. Resin ducts visible, relatively conspicuous as small light specks on the cross section or as fine lines of slightly different color on the longitudinal surfaces. Wood with pitchy resinous odor or taste. Heartwood creamy to orange brown.

THE PINES

- (1) Summerwood relatively inconspicuous, not much harder or denser than springwood. Change from springwood to summerwood gradual. Heartwood pale creamy to light reddish brown. Resin ducts often conspicuous, especially in sugar pine. Wood moderately soft and light. 26-29.

WHITE PINE I.
SUGAR PINE I.

- (2) Summerwood somewhat denser and more conspicuous than in (1). Color of heartwood reddish to orange brown. This group midway in density and appearance between (1) and (3). Weight 28-34.

PONDEROSA PINE I.
JACK PINE I.
RED PINE (NORWAY) I.
LODGEPOLE PINE I.

- (3) Summerwood very dense, horny. Change from springwood to summerwood often very abrupt. Resin ducts to be seen especially in or near the summerwood. Wood heavy. 35-45.

VIRGINIA AND NORTH CAROLINA PINE II.
SOUTHERN YELLOW PINE II.

BB. Woods with rather inconspicuous resin ducts, without piney odor but with somewhat resinous odor and taste. Marked and rather abrupt change from springwood to summerwood. Pitch pockets or streaks may be found.

- (1) Color of heartwood usually reddish, sometimes with yellow cast. Summerwood dense. Scattered resin ducts present. Often several seen as small white dots in short tangential

rows in or near the summerwood. Pitch pockets common. Wood moderately heavy. 30-34.

DOUGLAS-FIR II.

- (2) Heartwood dull russet brown. Summerwood sharply defined and fairly dense. Wood moderately heavy, especially that from butt cuts. 36.

LARCH II. TAMARACK II.

- (3) Heartwood pale reddish. Transition from springwood to summerwood more gradual. Split tangential surfaces especially if through the summerwood of narrow rings characteristically indented or "dimpled." Split surfaces show silky sheen. 26.

SITKA SPRUCE I.

2. Heartwood the same color as sapwood. Woods not conspicuously pitchy though resin ducts are present and pitch pockets may occur. Gradual transition from springwood to summerwood. Split surfaces show silky sheen. Moderately light. 24-28.

OTHER SPRUCES I.

- C. Wood without spicy odor, not pitchy or resinous. No resin ducts, pitch pockets or accumulations of pitch normally present in the wood though resin may in some cases exude from the bark.

1. Heartwood strongly colored, summerwood dense.

- AA. Heartwood deep brownish red. Wood without markedly characteristic odor. Wood moderately light. Annual rings rather regular in width. 25-30.

REDWOOD I.

- BB. Heartwood light to very dark brown. Odor somewhat rancid. Longitudinal surfaces feel waxy. Annual rings very irregular in width. Weight variable. Average 30.

BALDCYPRESS I.

2. Heartwood not strongly colored.

AA. Wood whitish at least in springwood. Summerwood darker, often sharply contrasted in color, tinged with red or purplish brown. Wood light. 23-28.

THE TRUE FIRS I.

BB. Wood has slight reddish hue in both springwood and summerwood. Wood splintery, often with cup shake. Odor somewhat sour when wood is fresh. Moderately light. 30.

HEMLOCK II.

APPENDIX

CLASSIFICATION OF CONTAINER WOODS⁵

The various species of woods generally used for constructing boxes and crates are classified into groups. This grouping is based on weight, strength and especially on the ability of the different woods to hold nails securely and resist the splitting action which is produced when they are driven, thus making it necessary to use smaller nails in the heavier, denser woods.

The specification groups are here subdivided according to structure:

Group 1

<u>Ring-porous</u>	<u>Diffuse-porous</u>	<u>Conifers</u>
American chestnut 30	Butternut 26	Cedar 22-31
	Cottonwood 24-28	Pine, white 27-29
	Willow 26	Pine, sugar 26
	Yellow-poplar 27	Pine, lodgepole 28
	Cucumber 33	Pine, ponderosa 28
	Magnolia 35	Pine, jack 29
	American basswood 26	Pine, red (Norway) 34
	Buckeye 25	Spruce, Engelmann 24
	Quaking aspen (popple) 28	Spruce, red 26
		Spruce, Sitka 26
		Spruce, white 28
		Redwood 25-30
		Baldcypress 30
		Fir, balsam 25
		Fir, noble 26
		Fir, Alpine 23
		Fir, red 28
		Fir, grand 27
		Fir, Pacific silver 27

⁵The figure at the right of the wood indicates the average air-dry weight per cubic foot of the species. U. S. D. A. Wood Handbook.

Group 2

Ring-porous

None

Diffuse-porous

None

Conifers

Pine, Southern yellow	35-45
Pine, (North Carolina)	37
Douglas-fir	30-34
Larch	36
Tamarack	36
Hemlock	28

Group 3

Ring-porous

Pumpkin ash	36
Black ash	34
Amer. elm	35

Diffuse-porous

Amer. Sycamore	34
Sweetgum (redgum)	34
Silver maple)	32-37
Red maple)	
Black gum	35
Water tupelo	34

Conifers

None

Group 4

Ring-porous

Oak	40-49
Hackberry	37
White ash	40-44
Rock elm	44
Hickory	45-51

Diffuse-porous

Amer. Beech	44
Hard maple	43
Birch	38-44

Conifers

None