technology transfer *fact sheet*

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Acer spp.
Maple

Family: Aceraceae

Maple (*Acer* spp.) contains about 120 species native to Asia [16], North America [13], Mexico and Guatemala [1], and the European/Mediterranean region [6], with the rest in Eurasia, Malaysia and northern Africa. The Maples can be separated into two groups based on the ray widths of their microscopic anatomy, the soft maple group and the hard maple group. Species within each group look alike microscopically. *Acer* is the classical Latin name of maple.
Acer barbatum- hammock maple, **Florida maple**, southern sugar maple, sugar maple

Acer circinatum- **vine maple**, mountain maple

Acer glabrum-bark maple, California mountain maple, Douglas maple, dwarf maple, mountain maple, New Mexico maple, **rocky mountain maple**, shrubby maple, sierra maple, soft maple

Acer grandidentatum- bigtooth maple, **canyon maple**, hard maple, large-toothed maple, sugar maple, ultravioletalde bigtooth maple, western sugar maple

Acer leucoderm-**chalk maple**, palebark maple, sugar maple, whitebark maple

*Acer macrophyllum**- big-leaf, **bigleaf maple**, broadleaf maple, broadleaved maple, bugleaf maple, Californian maple, Oregon maple, pacific maple, white maple

*Acer negundo**- ash maple, ashleaf maple, black ash, **boxelder**, boxelder maple, California boxelder, cut-leaved maple, inland boxelder, manitoba maple, negundo maple, red river maple, stinking ash, sugar ash, three-leaved maple, western boxelder

*Acer nigrum**- **black maple**, black sugar maple, hard maple, rock maple, sugar maple, white maple

Acer pennsylvaticum- buckwood, goose-foot maple, moosewood, mountain alder, northern maple, Pennsylvanian maple, striped dogwood, **striped maple**, whistlewood

*Acer rubrum**- Carolina red maple, drummond maple, drummond red maple, Oregon maple, **red maple**, scarlet maple, shoe-peg maple, silver maple, soft maple, southern soft maple, swamp maple, three-pointed-leaf maple, three-toothed red maple, water maple, white maple

*Acer saccharinum**- creek maple, papascowood, river maple, **silver maple**, silverleaf maple, soft maple, swamp maple, water maple, white maple

*Acer saccharum**- bird's-eye maple, black maple, curly maple, hard maple, rock maple, rough maple, sugar, **sugar maple**, sugar-tree, sweet maple, thumb-nail maple

Acer spicatum- goose-foot maple, low maple, moose maple, **mountain maple**, mountain maple-bush, spiked maple, water maple

*commercial species

Distribution

Throughout most of North America, with commercial species in the eastern United States and Canada and the western coast of the United States (bigleaf maple).

The Tree

Maples grow to heights of 120 ft (36 m), with a diameter of 3 ft (1 m). Forest grown trees may have a clear bole of 60 ft (18 m).

The Wood

General

Maple lumber comes principally from the Middle Atlantic and Lake States, which together account for about two-thirds of the production. The wood of sugar maple and black maple is known as hard maple; that of silver maple, red maple, and boxelder as soft maple. The sapwood of the maples is commonly white with a slight reddish-brown tinge; the heartwood is light reddish brown, but sometimes is considerably darker. The sapwood is from 3 to 5+ inches (76 to 127+ mm) thick.

Hard maple has a fine, uniform texture, turns well on a lathe, is resistant to abrasion and has no characteristic odor or taste. It is heavy, strong, stiff, hard, and resistant to shock, and it has large shrinkage. Sugar maple is generally straight grained but the grain also occurs as “birds-eye,” “curly,” and “fiddleback” grain.

The wood of soft maples resembles that of hard maples but is not as heavy, hard and strong, the better grade of soft maple has been substituted for hard maple in furniture. The sapwood in the soft maples is considerably wider than that in the hard maples and has a lighter heartwood color.

Maple lumber sometimes has olive or greenish black discolored areas known as mineral streak or mineral stain, which may be due to injury. Maple wood stains well and takes a high polish. It is intermediate in gluing and has low decay resistance.

Mechanical Properties (2-inch standard)

	Specific gravity	MOE X10^6 lbf/in^2	MOR lbf/in^2	Compression		WML[a] in-lbf/in^3	Hardness lbf	Shear lbf/in^2
				Parallel lbf/in^2	Perpendicular lbf/in^2			
Acer macrophyllum (bigleaf maple)								
Green	0.44	1.1	7,400	3,240	450	8.7	620	1,110
Dry	0.48	1.45	10,700	5,950	750	7.8	850	1,730
Acer nigrum (black maple)								
Green	0.52	1.33	7,900	3,270	600	12.8	840	1,130
Dry	0.57	1.62	1,330	6,680	1,020	12.5	1,180	1,820
Acer pennsylvaticum (striped maple)								
Green	0.44	–	–	–	–	–	–	–
Dry	0.46	–	–	–	–	–	–	–
Acer rubrum (red maple)								
Green	0.49	1.39	7,700	3,280	400	11.4	700	1,150
Dry	0.54	1.64	13,400	6,540	1,000	12.5	950	1,850
Acer saccharinum (silver maple)								
Green	0.44	0.94	5,800	2,490	370	11.0	590	1,050
Dry	0.47	1.14	8,900	5,220	740	8.3	700	1,480
Acer saccharum (sugar maple)								
Green	0.56	1.55	9,400	4,020	640	13.3	970	1,460
Dry	0.63	1.83	15,800	7,830	1,470	16.5	1,450	2,330

[a]WML = Work to maximum load.
[b]Reference (98).
[c]Reference (59).

Drying and Shrinkage

Type of shrinkage	Percentage of shrinkage (green to final moisture content)		
	0% MC	6% MC	20% MC
	Acer macrophyllum (bigleaf maple)		
Tangential	7.1	5.7	2.4
Radial	3.7	3.0	1.2
Volumetric	11.6	9.3	3.9
	Acer nigrum (black maple)		
Tangential	9.3	7.4	3.1
Radial	4.8	3.8	1.6
Volumetric	14.0	11.2	4.7
	Acer pennsylvaticum (striped maple)		
Tangential	8.6	–	–
Radial	43.2	–	–
Volumetric	12.3	–	–
	Acer rubrum (red maple)		
Tangential	8.2	6.6	2.7
Radial	4.0	3.2	1.3
Volumetric	12.6	10.5	4.4
	Acer saccharinum (silver maple)		
Tangential	7.2	5.8	2.4
Radial	3.0	2.4	1.0
Volumetric	12.0	9.6	4.0
	Acer saccharum (sugar maple)		
Tangential	9.9	7.6	3.2
Radial	4.8	3.9	1.6
Volumetric	14.7	11.9	5.0

[a]Birch shrinks considerably during drying. References: 0% MC (98), 6% and 20% MC (90).

Kiln Drying Schedules[a]

Condition	Stock				
	4/4, 5/4, 6/4	8/4	10/4	12/4	16/4
		Soft Maples[b]			
Standard	T8-D4	T6-C3	T5-C2	T3-B2	–
		Hard Maples[c]			
Standard	T8-C3	T5-C2	T3-B2	T3-A1	T3-A1

[a]References (6, 86).
[b]Bigleaf, red and silver.
[c]Black and sugar.

Working Properties: The wood turns well, is harder to work than softer woods, and has high nail-holding ability. It stains and polishes well, but is intermediate in gluing.

Durability: Rated as slightly or nonresistant to heartwood decay.

Preservation: Moderately resistant to penetration with preservatives.

Uses: **:** Lumber, distillation, veneer, crossties, paper pulp, flooring, furniture, pallets, boxes and crates, shoe lasts, handles, woodenware, novelties, spools and bobbins, bowling alleys, dance floors, piano frames, bowling pins, cutting blocks, pulpwood and turnery.

Toxicity: May cause allergic bronchial asthma, dermatitis and rhinitis (40).

Additional Reading and References Cited (in parentheses)

5. Betts, H.S. 1959. Maple. Washington, DC: U.S. Department of Agriculture, Forest Service, American Wood Series 496611-59.

6. Boone, R.S.; Kozlik, C.J.; Bois, P.J.; Wengert, E.M. 1988. Dry kiln schedules for commercial woods-temperate and tropical. Gen. Tech. Rep. FPL-GTR-57. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory.

29. Elias, T.S. 1980. The complete trees of North America, field guide and natural history. New York: van Nostrand Reinhold Company.

40. Hausen, B.M. 1981. Woods injurious to human health. A manual. New York: Walter de Gruyter.

55. Little, Jr., E.L. 1979. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. U.S. Government Printing Office.

59. Markwardt, L.J.; Wilson, T.R.C. 1935. Strength and related properties of woods grown in the United States. Tech. Bull. 479. Washington, DC: U.S. Department of Agriculture, Forest Service. U.S. Government Printing Office.

68. Panshin, A.J.; de Zeeuw, C. 1980. Textbook of wood technology, 4th ed. New York: McGraw–Hill Book Co..

74. Record, S.J.; Hess R.W. 1943. Timbers of the new world. New Haven, CT: Yale
University Press.

86. Simpson, W.T. 1991. Dry kiln operator's manual. Ag. Handb. 188. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory.

90. Summitt, R.; Sliker, A. 1980. CRC handbook of materials science. Boca Raton, FL: CRC Press, Inc. Vol. 4.

98. U.S. Department of Agriculture. 1987. Wood handbook: wood as an engineering material. Agric. Handb. 72. (Rev.) Washington, DC: U.S. Department of Agriculture.
466 p.