

## KEY TO THE GENERA OF OHIO WOODY PLANTS IN THE WINTER CONDITION.

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The writer has been studying the winter condition of trees and shrubs for the past two years, having been attracted to the subject through observations on self-pruning. Many of the twig characters are exceedingly important and should be given more consideration in specific descriptions and in manuals. Incidentally some keys were constructed. These have been verified to a large extent by use in the class room and it is believed that a twig key can be used with as little difficulty as one based on the usual floral characters. A hand lens is necessary to determine some of the characters included.

1. Foliage leaves persistent and usually evergreen. 2.
  1. Foliage leaves deciduous each year. 20.
  2. Foliage leaves needle-shaped, subulate, narrowly linear, or scale-like; conifers. 3.
  2. Foliage leaves with expanded blades, netted veined. 8.
  3. With dwarf branches, each bearing 2-5 foliage leaves. PINUS.
  3. Without true dwarf branches. 4.
  4. Leaf buds scaly. 5.
  4. Leaf buds not scaly, naked. 7.
  5. Leaf scar not on a sterigma, prominent, circular; leaves flat. ABIES
  5. Leaf scar on a sterigma, the base of the leaf remaining as a scale on the twig. 6.
  6. Leaves flat, those on the upper side of the twig much shorter than the lateral ones. TSUGA.
  6. Leaves flat, all of about the same length. TAXUS.
  6. Leaves more or less 4-sided, spreading in all directions. PICEA.
  7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, closely covering the twigs which are decidedly flattened and fan-like; leaves of two shapes, the dorsal and ventral broader and less acute than the lateral ones; scales of the carpellate cone not peltate. THUJA.
  7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, closely covering the slightly flattened twigs which are not very fan-like; leaves nearly or quite similar; scales of the carpellate cone peltate. CHAMÆCYPARIS.
  7. Foliage leaves of two types, scale-like and subulate, opposite or in threes; the scale-like leaves 4-ranked, appressed, causing the twigs to appear quadrangular, the subulate leaves spreading; one or both types of leaves on a plant; carpellate cone developing into a bluish-black berry-like fruit. JUNIPERUS.
- 8 —
8. Leaves with spines or reduced to spines. 9.
  8. Leaves without spines. 10.
  9. Leaves compound, with spine-tipped teeth; or leaves of the main twigs usually without a blade and reduced to 1-5 prong-like spines, at length dry. BERBERIS.
  9. Leaves simple, with spine-tipped teeth or lobes; twigs grey. ILEX.
  10. Leaves opposite or whorled. 11.
  10. Leaves alternate. 13.

11. Leaves palmately veined; shrubs with green twigs parasitic on trees; twigs with self-pruning joints. PHORADENDRON.  
 11. Leaves pinnately veined; plants not parasitic. 12.  
 12. Leaves oval, the upper perfoliate, glabrous; twining plants. LONICERA.  
 12. Leaves oblong or oval, coriaceous, not perfoliate; shrubs or trees. KALMIA.  
 12. Leaves obovate or orbicular, hairy, crenulate, not perfoliate; stem trailing. LINNÆA.  
 13. Leaves serrate, serrulate, crenate, or dentate. 14.  
 13. Leaves entire. 15.  
 14. Leaves somewhat hairy; shrubs with thorns or thorn-like spurs. COTONEASTER.  
 14. Leaves glabrous, very aromatic, oval to obovate,  $\frac{1}{2}$  in. long; low slender trailing plant. GAULTHERIA.  
 14. Leaves glabrous, bitter, white beneath,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; slender trailing or ascending plants in bogs. OXYCOCCUS.  
 14. Leaves with prominent scurfy scales; erect shrubs without thorns. CHAMÆDAPHNE.  
 15. Leaves glabrous. 16.  
 15. Leaves pubescent or woolly at least below. 17.  
 16. Leaves green on both sides, thick, coriaceous, oblong to oblanceolate, 5-10 in. long; winter buds very scaly. RHODODENDRON  
 16. Leaves green on both sides or glaucous beneath, coriaceous, 2-5 in. long, oval to oval-lanceolate; winter buds naked; erect shrubs. KALMIA.  
 16. Leaves white beneath, linear-lanceolate, revolute-margined, acid, 1-2 $\frac{1}{2}$  in. long; a bog shrub. ANDROMEDA.  
 16. Leaves white beneath, revolute-margined, bitter,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; slender trailing or ascending plants in bogs. OXYCOCCUS.  
 17. Leaves revolute-margined. 18.  
 17. Leaves not revolute-margined. 19.  
 18. Leaves with a fragrant odor; densely tomentose beneath; erect resinous shrubs. LEDUM.  
 18. Leaves 2-ranked, small, oval or ovate, hairy; creeping shrubs. CHIOGENES.  
 19. Leaves lanceolate, mucronate, not evergreen; buds clustered at the tip of the twig; trees with 5-angled pith. QUERCUS.  
 19. Leaves oval or nearly orbicular, hirsute beneath; twigs hirsute; prostrate shrubs. EPIGÆA.  
 19. Leaves spatulate, minutely pubescent, with hairs on the margins; trailing or spreading shrubs. ARCTOSTAPHYLOS.
- 20 —
20. Climbing monocotyls with scattered vascular bundles, green bark, and two tendrils on the persistent petiole base; often prickly. SMILAX.  
 20. Not with scattered vascular bundles but with a ring of wood, true bark, and a central pith. 21.  
 21. Twigs with thick wart-like dwarf branches; conifers. 22.  
 21. Twigs without true dwarf branches. 23.  
 22. Young twigs covered with scales. LARIX.  
 22. Twigs without scales. GINKGO.  
 23. Twigs with numerous small scattered self-pruning scars, without apparent leaf scars but with minute dry scale leaves. 24.  
 23. Twigs with evident leaf scars and lateral winter buds. 25.  
 24. Trees with feather-like dwarf branches, some usually remaining in winter; foliage leaves spreading into two ranks; roots often with knees; a conifer. TAXODIUM.

24. Shrubs with delicate spray-like twigs which are self-pruned; leaves minute. TAMARIX.
25. With tendrils opposite the leaf scars; usually every third leaf node without a tendril; climbing plants self-pruning unripe twigs by means of cleavage planes in the leaf nodes. 26.
25. No tendrils opposite the leaf scars. 27.
26. With woody partitions in the brownish pith at the leaf nodes; lenticels inconspicuous; tendrils without adhering disks; surface of leaf scar irregular. VITIS.
26. Pith continuous, white; lenticels conspicuous; tendrils without adhering disks in our species; leaf scar rather smooth. AMPELOPSIS.
26. Pith continuous, white; lenticels conspicuous; tendrils usually with adhering disks; leaf scars smooth, concave, with small bundle scars scattered or in a ring. PARTHENOCISSUS.
- 27 —
27. Leaf scars alternate. 28.
27. Leaf scars opposite or whorled. 109.
28. Twigs with distinct and complete stipular ridges or rings at the leaf nodes. 29.
28. Twigs without complete stipular rings. 31.
29. Leaf scar surrounding the axillary bud, terminal bud self-pruned; wood with prominent medullary rays. PLATANUS.
29. Leaf scar not surrounding the axillary bud, terminal bud not self-pruned; buds enclosed in the large connate stipules. 30.
30. Buds glabrous; twigs brown; pith diaphragmed; leaf scars oval or circular; bark spicy-aromatic. LIRIODENDRON.
30. Buds downy, or if glabrous then the twigs red; pith with or without diaphragms; leaf scars U-shaped, oval, or circular; bark usually aromatic. MAGNOLIA.
31. With thorns, prickles, or spines; or with spur-like branches ending in thorns. 32.
31. Without thorns, prickles or spines but some may have thorn-like stunted branches. 42.
32. With leaves reduced to simple or branches spines. BERBERIS.
32. With stipular spines, a pair for each leaf scar. 33.
32. Twigs with typical lateral thorns, without terminal thorns. 34.
32. With thorns at the ends of branches or with spur-like branches ending in thorns, and in addition axillary thorns may be present. 35.
32. Stems or twigs with prickles, some of which may have the appearance of stipular spines. 39.
32. Bud scales tipped with spines; stem twining; leaf scar central. CELASTRUS.
33. Leaf scar covering the two or more superposed axillary buds. ROBINIA.
33. Leaf scar below the axillary buds; buds reddish, pubescent. XANTHOXYLUM.
34. With thorns beside the axillary buds; normally one for each leaf axil, becoming gradually smaller toward the tip of the twig, terminal bud absent. TOXYLON.
34. Thorns axillary, large, rarely branched except on the main trunk; usually with two lateral buds at the base which may develop as twigs; numerous axils without thorns. CRATÆGUS.
34. Thorns commonly branched, situated above the axil of the leaf; leaf scar covering the two or more superposed axillary buds; twigs polished, often zigzag. GLEDITISA.
35. Not with three distinct bundle scars. 36.
35. With three bundle scars. 37.

36. Climbing shrubs with axillary thorns, light gray bark and a prominent central scar. LYCIUM.
36. Erect shrubs with thorns at the ends of twigs or spurs. RHAMNUS.
37. Terminal bud self-pruned; twigs some shade of black, brown, or reddish. PRUNUS.
37. Terminal bud present. 38.
37. Most of the slender branches ending in thorns not showing a terminal bud or self-pruning scar; lateral thorns with one or two large buds at the base. CYDONIA.
38. Buds conical, pungent, pubescent, twigs glabrous or nearly so, mostly yellow-olive; trees with erect growth, the branches not spreading as in most of the apples. PYRUS.
38. Buds downy or pubescent, twigs usually pubescent, if glabrous then dark reddish-brown; trees with rounded crowns and spreading branches. MALUS.
39. Base of the petiole remaining on the stem. RUBUS.
39. Petiole separated close to the stem. 40.
40. Bundle scars numerous; pith large; erect shrubs or trees. ARALIA.
40. Bundle scars 3; low or slender shrubs. 41.
41. Leaf scars very narrow, often a mere line extending half way or more around the stem, not decurrent. ROSA.
41. Leaf scars rather broad, somewhat decurrent; older bark shreddy. RIBES.
- 42 —
42. Leaf scars quite regularly 2-ranked, that is with the third scar over the first. 43.
42. Leaf scars not 2-ranked. 56.
43. Pith interruptedly diaphragmed, with cavities, small, greenish-white; bundle scars 3. CELTIS.
43. Pith solid, or if with cavities then with a single bundle scar or with several scattered bundle scars. 44.
44. Terminal bud elongated, naked, silky or tomentose. 45.
44. Terminal bud with numerous or several bud scales. 46.
44. Terminal bud absent, the twigs showing a terminal self-pruning scar at the morphological tip. 49.
45. Pith diaphragmed; buds dark silky; lateral buds rounded not stalked; leaf scars U-shaped; bundle scars 5-7, stipular scars none; bark with fetid odor. ASIMINA.
45. Pith not diaphragmed; buds light gray; lateral buds elongated, prominently stalked, tomentose; stipular scars prominent; leaf scars not U-shaped. HAMAMELIS.
46. With 10-20 visible scale leaves; stipular scars and medullary rays very prominent; leaf scar oblique, beside the axillary bud. FAGUS.
46. Visible scales 3-8. 47.
47. Bundle scars several, scattered; pith more or less 5-angled; bark close with rough ridges; stipular scars present. CASTANEA.
47. Bundle scars 3. 48.
48. Trunk and larger branches with papery or leathery bark; catkins in winter; leaf scar oval or semicircular. BETULA.
48. Bark not papery or leathery; no catkins; leaf scar narrow, contracted between the bundle scars. AMELANCHIER.
49. Visible bud scales 1-3. 50.
49. Visible scales more than 3. 52.
50. Bundle scar 1; visible scales 2; twigs brown, pubescent; pith sometimes with cavities. DIOSPYROS.
50. Bundle scars scattered, several. 51.

51. Twigs grayish-brown or reddish, usually zigzag; bark mucilaginous, fibrous; buds rather fleshy, usually bright red; medullary rays prominent when the bark is removed; the winged fruiting panicle often persistent. *TILIA*.
51. Twigs glabrous or pubescent, reddish or yellowish-brown; pith 5-angled. *CASTANEA*.
51. Twigs downy, grayish-green; pith white, cylindrical, large; bark very fibrous. *BROUSSONETIA*.
51. Twigs coarsely glandular pubescent or sparingly hairy, brown; pith brown, cylindrical, small. *CORYLUS*.
52. Bundle scars scattered; leaf scars oblique; twigs gray or light brownish-gray. *MORUS*.
52. Bundle scars 3. 53.
53. Twigs dark reddish-brown, speckled, often zigzag; buds reddish-violet, often superposed or clustered; leaf scars not oblique but below the lateral bud. *CERCIS*.
53. Twigs dark brown, not speckled; buds not superposed; leaf scars oblique. 54.
54. Bark smooth, trunk and larger branches with peculiar fluted or projecting ridges; bud scales brown, finely pubescent; staminate catkins in the bud in winter. *CARPINUS*.
54. Trunk not with fluted or projecting ridges. 55.
55. Bark in rough ridges; no catkins; twigs and buds in most cases pubescent; some species with characteristic transverse self-pruning scars on the twigs, others with corky ridges. *ULMUS*.
55. Bark scaly, fine-furrowed, the furrows usually somewhat spiral; bud scales green with brown tips, nearly glabrous; staminate catkins exposed in winter. *OSTRYA*.
55. Bark of trunk and larger branches separating into papery or leathery sheets; catkins in winter. *BETULA*.

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56. With 2 or more superposed axillary buds; all except 1 may be very small. 57.
56. Axillary buds single or 2 or more side by side; not superposed. 67.
57. Pith diaphragmed, with air cavities, brown; twigs thick, with large leaf scars and 3 prominent bundle scars; large trees. *JUGLANS*.
57. Pith solid. 58.
58. Stems twining; leaf scars circular with numerous bundle scars; buds partly hidden. *MENISPERMUM*.
58. Stems not twining. 59.
59. Buds partly sunken, hardly projecting beyond the surface; terminal bud self-pruned or tips of branches withering. 60.
59. Buds not sunken in the epidermis. 61.
60. Leaf scar not surrounding the axillary buds; pith large, chocolate-colored; twigs robust, polished, mottled white and purplish-brown. *GYMNOCLADUS*.
60. Leaf scar surrounding the axillary buds, quadrangular U-shaped; bark with pungent odor; pith white. *PTELEA*.
60. Leaf scar covering the axillary buds; pith small; twigs brown, polished, often zigzag. *GLEDITSIA*.
61. Pith cylindrical or nearly so. 62.
61. Pith more or less 5-angled, yellowish or brownish; terminal bud large; bundle scars scattered; trees with tough twigs. *HICORIA*.
62. Leaf scar surrounding the hairy axillary buds; bundle scars 5-9; terminal bud self-pruned. *CLADRASTIS*.
62. Leaf scar not surrounding the axillary buds. 63.
63. Bark very spicy-aromatic, fragrant; buds often stalked and clustered. *BENZOIN*.

63. Bark not spicy-aromatic. 64.  
 64. Pith diaphragmed but solid; bundle scars definitely 3; trees. NYSSA.  
 64. Pith not diaphragmed; bundle scar usually central. 65.  
 65. Leaf scars with the dry stipules rather persistent; bark with strong odor. AMORPHA.  
 65. Stipules not evident, or minute; bark not with strong odor. 66.  
 66. Stipular scars or stipules present, stipules minute. ILEX.  
 66. Stipular-scars and stipules absent; buds small, twigs light gray. ILICIOIDES.

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67. Outer bud scales more than 1. 68.  
 67. Outer bud scale 1; twigs usually with brittle zones and hence very easily detached; stipular scars present; bundle scars 3. SALIX.  
 68. Terminal and lateral buds stalked; pith 3-angled; both staminate and carpellate catkins present all winter. ALNUS.  
 68. Buds sessile or nearly so; pith not 3-angled. 69.  
 69. Pith more or less 5-angled. 70.  
 69. Pith cylindrical or nearly so. 74.  
 70. Buds clustered at the tip of the twig; bundle scars numerous, scattered. QUERCUS.  
 70. Buds not clustered at the tip. 71.  
 71. Bundle scars numerous usually scattered. 72.  
 71. Bundle scars 3. 73.  
 71. Bundle scar 1; bark green, spicy-aromatic; internodes very unequal SASSAFRAS.  
 72. Buds small with about 3 outer scales; twigs reddish or yellowish-brown, glabrous or pubescent; terminal bud present or absent; stipular scars prominent. CASTANEA.  
 72. Terminal bud large with 4 or more visible scales, hairy or peltate pubescent; lateral buds usually superposed; twigs tough. HICORIA.  
 73. Without stipular or self-pruning scars; crushed buds fragrant, aromatic, not resinous, glabrous. LIQUIDAMBAR.  
 73. Stipular and self-pruning scars present; crushed buds not fragrant though they may have a resinous odor, resinous or if only slightly so then the twigs pubescent or tomentose. POPULUS.  
 74. Pith diaphragmed but solid; bundle scars 3; no stipular scars; trees. NYSSA.  
 74. Pith not diaphragmed or if diaphragmed then not solid. 75.  
 75. Bud scales tipped with short sharp points; stem twining; buds conical, pungent. CELASTRUS.  
 75. Bud scales not spiny-tipped; stems not twining. 76.  
 76. Pith very large, light brown, bark not resinous, ill-smelling; buds spherical or flattened at the apex, often clustered at the tip of the twig, brown and pubescent; bundle scars about 9 along the lower edge of the very large leaf scar which does not surround the axillary bud; large trees. AILANTHUS.  
 76. Pith small, or if large and brown then the leaf scar surrounding the axillary bud or the bark resinous. 77.  
 77. Bark with a resinous or sticky milky sap; pith usually large, if rather small then the bark aromatic, or the plants climbing by rootlets. 78.  
 77. Bark not resinous. 79.  
 78. Buds clustered at the tip of the twig; bark spicy-fragrant to the smell; base of petiole prominent with several bundle scars; fruiting panicles plumose. COTINUS.

78. Buds not clustered at the tip; bark sometimes aromatic, often very poisonous to the touch; leaf scar in some species surrounding the axillary bud in others only partly surrounding the bud or the bud covered; small trees or shrubs or woody vines climbing by numerous rootlets. RHUS.
79. Leaf scars surrounding the hairy sunken axillary buds; terminal bud self-pruned and thus the twigs with peculiar rings. DIRCA.
79. Leaf scars not surrounding the axillary buds and twigs not with peculiar rings. 80.
80. Base of petiole and stipules persisting, prominent, drying off; small shrubs. 81.
80. Petiole deciduous close to the base, leaving a definite leaf scar. 82.
81. Bundle scars 3; pith large; bark not shreddy. RUBUS.
81. Bundle scar 1; pith small; stipules sheathing the stem; bark dark brown, shreddy. DASIPHORA.
- 82 —
82. Bundle scar 1, or if several then closely crowded and confluent, appearing as 1. 83.
82. Bundle scars 3 or more, distinct. 96.
83. Climbing vines, the stems herbaceous above; young twigs gray pubescent. SOLANUM.
83. Stem climbing, woody throughout; bark light gray; buds often clustered. LYCIUM.
83. Stem not climbing, woody throughout. 84.
84. Stipular scars or stipules present. 85.
84. No stipular scars or stipules. 87.
85. Terminal bud present. 86.
85. Terminal bud absent; bud scales dark brown or black. RHAMNUS.
86. Stipules deciduous; low shrubs. CEANOOTHUS.
86. Stipules usually persistent, minute; erect shrubs. ILEX.
87. Terminal bud present. 88.
87. Terminal bud absent. 91.
88. Bark of twigs very spicy-aromatic, green; internodes very unequal. SASSAFRAS.
88. Bark not spicy-aromatic. 89.
89. Internodes very unequal; bark brown or gray. AZALEA.
89. Internodes not very unequal. 90.
90. Twigs glabrous, gray or blackish-brown. ILICIOIDES.
90. Twigs pubescent or tomentose, reddish or light-brown. SPIRÆA.
91. Trees with polished, greenish-brown, grayish-yellow, or red twigs; bark sour; leaf scar prominent, semi-oval, with a dark central scar usually in the form of a ring; buds small, not projecting much beyond the epidermis; the large terminal paniced raceme with capsules persisting all winter. OXYDENDRUM.
91. Trees with brown pubescent twigs; or shrubs. 92.
92. Trees with 2 visible scales in the triangular flattened bud; pith often with lenticular cavities; twigs pubescent, zigzag at the tip. DIOSPYROS.
92. Low shrubs with several visible scales in the bud. 93.
93. Twigs finely white-speckled and granulated, green or reddish. VACCINIUM.
93. Twigs not white-speckled. 94.
94. Buds of two kinds, large flower buds with many visible scales and small ones with 2 outer scales. GAYLUSSACIA.
94. Buds all alike, with several scales. 95.
95. Surface of leaf scar rather even; self-pruning scars present; twigs reddish-olive. POLYCODIUM.
95. Surface of leaf scar very uneven; no self-pruning scars; bud scales numerous. SPIRÆA.

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96. Terminal bud absent. 97.  
 96. Terminal bud present. 101.  
 97. Stipules or stipular scars absent or indistinct. 98.  
 97. Stipules or stipular scars present. 99.  
 98. Leaf scar very narrow, almost a line, not decurrent, extending half way around the stem; low shrubs or climbers. ROSA.  
 98. Leaf scar broad; twigs not glandular dotted; erect shrubs or trees. PRUNUS.  
 98. Leaf scar broad; young twigs glandular dotted; buds usually clustered at the tip. MYRICA.  
 99. Twigs glandular, dark, pubescent; buds globular; low shrubs. COMPTONIA.  
 99. Twigs not glandular 100.  
 100. Buds and twigs very downy, twigs dark brown or black. CYDONIA  
 100. Buds and twigs pubescent; twigs light or greenish brown. SORBARIA.  
 100. Buds downy or pubescent; twigs glabrous or pubescent, gray or brown. RHAMNUS.  
 101. Twigs green or yellowish-green, glabrous; internodes very unequal; lateral buds minute; small trees. CORNUS.  
 101. Twigs normally red above and green beneath, glabrous; bark very bitter; some axils with 2 or 3 hairy buds of nearly equal size; trees. AMYGDALUS.  
 101. Twigs not green or red and green unless the plants are low shrubs, but gray, brown, black, or reddish. 102.  
 102. Bundle scars 5 or more in the broad U-shaped leaf scar; tips of the buds quite downy; small trees. SORBUS.  
 102. Bundle scars 3. 103.  
 103. Leaf scars very narrow, often a mere line extending half way or more around the stem, not decurrent; low shrubs. ROSA.  
 103. Leaf scars rather broad often decurrent. 104.  
 104. Leaf scars strongly decurrent at the sides and middle; bundle scars close together, the central one large; shrubs with brown twigs. OPULASTER.  
 104. Leaf scars not decurrent or if so then the bundle scars distinctly separated. 105.  
 105. Buds elliptic, lanceolate or lance-linear; shrubs. 106.  
 105. Buds ovate or depressed; mostly trees or tree-like. 107.  
 106. Older bark shreddy; leaf scars somewhat decurrent at the middle and sides; bud scales very thin, light or dark brown. RIBES.  
 106. Bark close; buds pale brown or red; leaf scars not decurrent; bud scales rather thick; twigs pubescent. ARONIA.  
 107. Buds rounded at the apex, often clustered at the tip of the twig; twigs glandular dotted. MYRICA.  
 107. Buds rounded at the apex; scales thick; twigs often zigzag; plant usually with some thorns, not glandular dotted. CRATÆGUS.  
 107. Buds pointed; plants sometimes with thorn-like stunted branches, not glandular dotted. 108.  
 108. Buds glabrous or slightly pubescent; twigs usually glabrous and slender, some shade of black, brown, or reddish, often with 2 or 3 axillary buds; some with self-pruning scars. PRUNUS.  
 108. Buds downy or strongly pubescent, conical, pungent; twigs glabrous, mostly yellow-olive; trees with erect growth, the branches not spreading as in most of the apples. PYRUS.  
 108. Buds downy or strongly pubescent; twigs strongly pubescent or if glabrous then dark reddish-brown; trees with rounded or spreading crowns. MALUS.



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109. Pith large, white, with cavities or more or less diaphragmed; twigs robust, gray, with large lenticels; bundle scars in a ring in the large leaf scar; trees. PAULOWNIA.
109. Leaves with tendrils on the persistent petiole which shows 2 leaflet scars at the end; climbing vines with rather large, sometimes hollow pith. BIGNONIA.
109. Pith not diaphragmed nor with lenticular cavities; petioles not with tendrils. 110
110. Axillary buds evident. 112
110. Axillary buds minute and not evident, or covered by the persistent petiole base. 111.
111. Bundle scar forming a curved line; lateral buds sunken in the bark; leaf scars after in threes. CEPHALANTHUS.
111. Bundle scars 3; terminal bud with 2 acuminate visible scales.  
CORNUS.
111. Bundle scars 3; terminal bud small, dome-shaped; axillary buds bursting through the prominent petiole base; twigs many-angled  
PHILADELPHUS.
112. Twigs green or greenish, never twining. 113
112. Twigs gray, brown, or red, not green when ripe. 115.
113. Terminal bud self-pruned; stipular scars prominent; bark with strong odor. STAPHYLEA.
113. Terminal bud present. 114.
114. Leaf scars meeting and ending upward in a free appendage; base of petioles in some cases originally covering the axillary buds; bundle scars 3 or more. ACER.
114. Leaf scars not meeting; twigs more or less 4-angled; base of petiole not covering the axillary bud; bundle scar 1. EUONYMUS.
115. Twigs and buds brown-scurfy or stellate-pubescent; bundle scar 1; shrubs. LEPARGYREA.
115. Not brown-scurfy or stellate-pubescent. 116.
116. Bundle scars numerous in an ellipse or a ring; trees with small flat buds or woody vines climbing by rootlets. 117.
116. Bundle scars 1, 3, or 5, or sometimes more but not in a ring. 118.
117. Trees with small flat buds; twigs gray, robust; pith large, white; leaf scars often in threes. CATALPA.
117. Woody vines climbing by rootlets; ends of the twigs usually withering. TECOMA.
118. Pith very large, the soft wood small in proportion; twigs either with cleavage planes in the upper leaf nodes or with brown papery outer bark separating readily from the green inner layer; shrubs with robust twigs. 119.
118. Pith small or if rather large then the plants trees. 120.
119. Lenticels conspicuous; tips of twigs self-pruned in the leaf nodes.  
SAMBUCUS.
119. Lenticels inconspicuous; twigs not self-pruned; outer papery brown bark easily separated from the inner dark green layer.  
HYDRANGEA.

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120. Bundle scars 1, or several closely united in a curved line appearing as 1. 121.
120. Bundle scars 3 or more, distinct. 125.
121. Low shrubs with decurrent ridges from the middle of the leaf scar.  
122.
121. Trees or erect shrubs without decurrent ridges from the middle of the leaf scar but sometimes with ridges or wings from the ends of the leaf scar. 123.

122. Low creeping shrubs with delicate erect or ascending twigs.  
ASCYRUM.
122. Low erect shrubs; leaf scar close to the bark; fruit a capsule.  
HYPERICUM.
122. Low erect shrubs; leaf scar on the prominent petiole base; fruit a berry. SYMPHORICARPOS.
123. Terminal bud absent, the twig usually ending in a thorn.  
RHAMNUS.
123. Terminal bud present; or if absent on some twigs then the end buds large, pointed, angular, and usually green. 124.
124. Twigs and buds glabrous; buds ovoid-pointed, 4-angled, scales fleshy; fruit a capsule. SYRINGA.
124. Twigs very pubescent, buds less so; lateral buds rather flat, more or less triangular; bud scales fleshy; leaf scar on the short petiole base; fruit a drupe. LIGUSTRUM.
124. Twigs and buds pubescent; lateral buds cylindrical or hemispherical; bud scales dry; leaf scar concave, on the short petiole base; lenticels large and conspicuous; fruit a drupe. CHIONANTHUS.
124. Buds rough or pubescent; twigs glabrous or pubescent, sometimes 4-angled; lateral buds somewhat flattened, obtuse; bud scales rather dry; leaf scar close to the bark; lenticels not large; fruit a samara. FRAXINUS.
125. With a prominent pubescent ridge decurrent from the middle of the line connecting the leaf scars; low shrubs. DIERVILLA.
125. No pubescent decurrent ridge from the middle of the connecting line, but the ends of the leaf scars may be decurrent. 126.
126. Terminal bud with 2 long acuminate pubescent outer scales; line connecting the uppermost leaf scars notched. CORNUS.
126. Terminal bud with several pairs of visible scales, or with 1 large pair and a small pair at the base, or the tips of the twigs withering. 127.
127. Trees or shrubs with numerous bundle scars, sometimes in 3 areas, in a large heart-shaped leaf scar; pith rather large; terminal bud large, with numerous scales. ÆSCULUS.
127. Bundle scars 3 or sometimes 5. 128.
128. Visible scales of the axillary buds 4 or more pairs, or if less, then the outer pair equalling the bud in length and the second pair hairy. 129.
128. Visible scales of the axillary buds 1-3 pairs, the outer short, or if equalling the bud then the second pair glabrous or glutinous.  
VIBURNUM.
129. Upper edge of the leaf scar strongly concave; usually large trees, if shrubs then the first pair of scales equaling the bud. ACER.
129. Upper edge of the leaf scar nearly straight; shrubs or climbing plants, the pith sometimes hollow, sometimes with hardened pith at the leaf nodes. LONICERA.