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Woody Plants of Iowa in  
Winter Condition

H. D. Harrington

Iowa  
505  
I09  
v. 16, no. 1

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Volume XVI

Number 1

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### The Woody Plants of Iowa in Winter Condition

by

HAROLD D. HARRINGTON, Ph.D.

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Published by the University, Iowa City, Iowa

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# UNIVERSITY OF IOWA

## Studies in Natural History

G. W. MARTIN, *Editor*

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Volume XVI

Number 1

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## The Woody Plants of Iowa in Winter Condition

by

HAROLD D. HARRINGTON, Ph.D.

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In addition to the written references listed above the writer has had the very good fortune to have had the personal help and guidance of Dr. B. Shimek of the State University of Iowa throughout this work. His extensive familiarity with woody plants in winter, coupled with a wide knowledge of their distribution in Iowa, has been of great value.

Below are listed some of the structures and characteristics used to identify and distinguish woody plants in winter, with a brief discussion of their value.

## WINTER CHARACTERS OF WOODY PLANTS

*Habit*—Within certain limits the general form and appearance of a plant may serve as a help in recognition. The vase-like appearance of the American elm, the narrow cone-shape of the larch, or the fastigiate habit of the branches of the Lombardy poplar are some examples of valuable habit characters. The plants that are typically vines, shrubs, or trees can, of course, be partly identified by habit alone.

A great deal of caution is needed in using these characters. Differences in habitat, or cultural and varietal differences in the cultivated forms may cause plants of the same species to appear unlike.

*Bark*—The bark of the trunks and large branches has a definite value, especially in those cases where it is striking and unusual, as in the birch, sycamore, horse-chestnut, and beech. The bark often varies, and as soon as these limits of variability are learned, it becomes an important aid. The bark varies, however, in different individuals or on the same tree at different ages. The characters of the bark are usually hard to describe, and a photograph is the best means of giving the reader a true picture of its real appearance. Robinson, in a popular article, called attention to the value of the bark as an aid in recognizing trees (49).

*Twig characters*—These include the relative size, color, pubescence, and length of nodes of the twigs. All these characters are rather difficult to describe, and in the case of size the ordinary measurements do not allow for the unusual specimen. Sometimes the twig has corky wings or outgrowths; but these may not always be present. Gregory in a series of three articles (22, 23, 24) called attention to some specific examples of such cork formation.

The lenticels are often of value, especially in those cases where they differ in shape, as in the genus *Prunus*. The color, relative size, and shape of the pith in section, and whether it is spongy or chambered is of great value and should be used when possible.

*Leaf scars*—These are of great value. The opposite or alternate arrangement of the leaf scars usually forms the main categories of a key. This is rarely obscure, as reported by Boodle for the ash (5).



## THE USE OF THE KEY

The first part of the work is a key designed to take the user directly to the genus. It is strictly dichotomous in all cases and only one choice is necessary. Because of the diversity or variability of their species, some genera appear in more than one place in the key. Therefore, it is a good plan in all doubtful cases to run through the plant in more than one group.

Since a key must of necessity be brief, and since many of the characters used do not give the user an accurate mental visualization of them, at the end of the manual a series of explanatory notes is given covering definite categories in the key. These categories are followed by a number referring to the note explaining, interpreting, and giving cautions concerning them. These notes in turn refer to figures in the plates which illustrate the characters under consideration. These need be consulted only in case of doubt.

The genera are arranged under families and according to the sequence adopted in Rehder's Manual (46), employed because both cultivated and native species are included in it. When more than one species is found in a genus, a key to the species is added. Because of lack of space the species descriptions are not included here. A star before the species indicates that the plant is not native to Iowa. An interrogation point before the star means that there is question as to whether the species is really native or introduced.

It must be kept in mind that many species, especially the unusual cultivated ones, may not have been located in the present work. New forms are constantly being introduced into the state. These may not appear in the keys. It is hoped, however, that the common species of native and cultivated woody plants, those most apt to be located and worked with, have been included in this work.

## KEY TO GENERA

1. Leaf scars opposite or whorled (Note 1).
2. Stems climbing or twining, vine-like (Note 2).
  3. Climbing by coiled, persistent leaf petioles; stems 6- to 12-ridged, with cavities in cortex under ridges. —*Clematis*, p. 51
  3. Not climbing by coiled petioles; stems either without ridges or only 4-ridged; no cavities in cortex.
  4. Evergreen or almost so; twigs greenish; opposite leaf scars not connected by transverse ridges. —*Evonymus*, p. 78
  4. Deciduous; twigs not greenish; opposite leaf scars connected by a transverse line, sometimes faintly.
    5. Bundle scar 1 and C-shaped; not over 6 bud scales visible —*Campsis*, p. 99
    5. Bundle scars 3; more than 6 bud scales visible. —*Lonicera*, p. 103
2. Stems upright or at most scrambling; trees or shrubs (Note 2).
  6. Evergreen (Note 3).
    7. Twigs 4-lined below the node; rather square in cross-section (Note 4).
      8. Lvs. present as mature structures, oblong to elliptical; opposite leaf scars not connected.
        9. Pith greenish; lvs. entire. —*Buxus*, p. 76
        9. Pith soon brown; lvs. usually serrulate. —*Pachistima*, p. 79
      8. Lvs., if present, as partly developed, linear or lanc. structures; opposite leaf scars connected by transverse ridges. —*Hypericum*, p. 86
    7. No lines on twig or these at most very short; twigs terete (Note 4).
      - 9a. Lvs. in whorls or crowded near end of twig. —*Kalmia*, p. 91
      - 9a. Lvs. opposite, not crowded near the end of twig.
        10. Low, almost procumbent; definitely evergreen. —*Daphne*, p. 87
        10. Upright; only partly evergreen. —*Ligustrum*, p. 97
  6. Leaves deciduous or drying on the twig (Note 3).
    11. Spines present (Note 5).
      12. Buds superimposed, widely spreading. —*Forestiera*, p. 96
      12. Buds solitary or collateral, almost or completely appressed.
        13. Twigs covered with peltate, scurfy scales; outer bud scales almost as long as the bud. —*Shepherdia*, p. 88
        13. Twigs without peltate, scurfy scales; outer bud scales short. —*Rhamnus*, p. 82
    11. No spines present (Note 5).
      14. Bundle scars 3 or in 3 groups (Note 6).
      15. Pith excavated or very spongy in the internodes (Note 7).

16. Twigs stellate-pubescent; buds solitary or collateral, never superimposed.  
—*Deutzia*, p. 56
16. Twigs not stellate-pubescent; buds often superimposed.  
—*Lonicera*, p. 103
15. Pith solid and continuous (Note 7).
17. Leaf scars horse-shoe shaped, more than half encircling the bud (Note 8).
18. Opposite leaf scars connected by a transverse ridge; twigs pubescent, cortex not yellow.  
—*Calycanthus*, p. 54
18. Opposite leaf scars not connected; twigs glabrous, cortex yellow.  
—*Phellodendron*, p. 76
17. Leaf scars not horse-shoe shaped, not more than half encircling the bud (Note 8).
19. First bud scale next to the twig, the edges almost meeting in front of lateral bud.  
—*Cercidiphyllum*, p. 50
19. First bud scale of lateral bud not as above, or bud concealed.
20. Opposite leaf scars meeting or connected by a transverse ridge at least near end of twig (Note 9).
21. Twigs with long. ridges, 2 of which extend down the twig from a point midway between opposite leaf scars.
22. Buds partly or completely concealed by the leaf scar.  
—*Philadelphus*, p. 55
22. Buds not at all concealed.  
—*Diervilla*, p. 102
21. Twigs without ridges or with ridges that never extend down from a point between opposite leaf scars.
23. Buds partly or completely concealed by the leaf scar.  
—*Philadelphus*, p. 55
23. Buds not concealed by the leaf scar, though sometimes partly hidden by the base of the petiole.
24. Pith large, over one-half and usually at least two-thirds the diameter of the twig; very soft wooded (Note 10).
25. Twigs pubescent.  
—*Hydrangea* p. 56
25. Twigs glabrous.
26. Pith brown; buds often stalked.  
—*Sambucus*, p. 100
26. Pith white; buds sessile.
27. Buds short, conical, often superimposed; lenticels large; bundle scars often more than three.  
—*Sambucus*, p. 100
27. Buds oblong to ovoid, not superimposed; lenticels inconspicuous; bundle scars three.  
—*Hydrangea* p. 56
24. Pith seldom over one-half the diameter of the twig; definitely woody (Note 10).
28. Twigs stellate-scurfy pubescent.  
—*Viburnum*, p. 100

28. Twigs glabrous or pubescent with hairs not stellate.
29. First two bud scales the length of the bud, often the only ones visible (Note 11).
30. Some of the buds much enlarged, biscuit-shaped or globose.  
—*Cornus*, p. 89
30. Buds not enlarged, biscuit-shaped or globose; if swollen, only at base of bud.
31. Some of end buds definitely enlarged near base from flower cluster inside, hence rather "flask-shaped" (Note 12).
32. Buds scurfy but not pubescent, enlarged bud often over 1 cm. long.  
—*Viburnum*, p. 100
32. Buds not scurfy, seldom 1 cm. long, at least puberulent.  
—*Cornus*, p. 89
31. None of buds enlarged at base from flower cluster (Note 12).
33. Twigs glabrous.
34. Twigs brownish to gray, somewhat long. angled or ridged from below leaf scar.  
—*Viburnum*, p. 100
34. Twigs greenish to reddish, not at all long. angled or ridged.  
—*Acer*, p. 80
33. Twigs pubescent to puberulent at least near the ends.
35. Terminal bud absent.  
—*Acer*, p. 80
35. Terminal bud present or replaced by remains of inflorescence.
36. Older twigs conspicuously white streaked.  
—*Acer*, p. 80
36. Older twigs not white streaked.
37. Terminal bud often somewhat enlarged at base, fruit if present berry-like in a flat topped or paniculate cyme; pith white or occasionally light tan.  
—*Cornus*, p. 89
37. Terminal bud not enlarged at base; fruit a samara not in flat topped or paniculate cymes; pith orange to brown; very rare in Iowa.  
—*Acer*, p. 80
29. First two bud scales shorter than the bud, more than two visible (Note 11).
38. Leaf scars usually in whorls of three; buds often superimposed.  
—*Lonicera*, p. 103
38. Leaf scars rarely whorled; buds not superimposed.
39. Terminal bud present (Note 13).
40. Typically trees.  
—*Acer*, p. 80
40. Not tree-like  
—*Viburnum*, p. 100
39. Terminal bud absent (Note 13).
41. Twigs puberulent to short villous, becoming shreddy; fruit dry and hispid.  
—*Kolkwitzia*, p. 102
41. Twigs glabrous, not shreddy; fruit berry-like and glabrous.
42. Twigs long. ridged or angled; buds solitary; fruit red.  
—*Viburnum*, p. 100

42. Twigs not ridged or angled; buds often collaterally multiple; fruit blackish. —*Rhodotypus*, p. 67
20. Opposite leaf scars separated, not connected by a ridge (Note 9).
43. Only one bud scale visible. —*Salix*, p. 38
43. More than one bud scale visible.
44. Older twigs white striped; two or four bud scales visible. —*Staphylea*, p. 80
44. Older twigs not white striped; usually more than four bud scales visible.
45. Twigs stout; bundle traces more than three; terminal bud usually over 1 cm. long. —*Aesculus*, p. 81
45. Twigs moderate; bundle traces one or three; terminal bud usually small or replaced by a spine. —*Rhamnus*, p. 82
14. Bundle scars not three or in groups of three (Note 6).
46. Bundle scars forming vertically oval ring; trees, with whorled leaf scars. —*Catalpa*, p. 99
46. Bundle scars not forming a ring; leaf scars opposite, or if whorled, never tree-like.
47. Bundle scars four to seven, not confluent; twigs moderate to large (Note 6).
48. Tree; terminal bud large, usually over 1 cm. long. —*Aesculus*, p. 81
48. Typically shrubs; terminal bud small or absent.
49. Older twigs with white streaks; pith moderate in size, the twig definitely woody. —*Staphylea*, p. 80
49. Older twigs without white streaks; pith very large, the twigs soft wooded. —*Sambucus*, p. 100
47. Bundle scars one, or many confluent; twigs small to moderate (Note 6).
50. Opposite leaf scars connected by a transverse ridge (Note 9).
51. Very soft wooded sub-shrubs (Note 14).
52. Twigs square in section; leaf scars U to crescent-shaped with bundle scars in a transverse line. —*Vitex*, p. 97
52. Twigs terete, though often angled or ridged; leaf scars half round to triangular, bundle scars not in a transverse line. —*Buddleia*, p. 97
51. Definitely woody (Note 14).
53. Twigs lined, angled, or ridged. —*Hypericum*, p. 86
53. Twigs not at all angled or ridged.
54. Leaf scars raised, forming a shelf on which the bud sits, bundle scars not U or C-shaped; lenticels not conspicuous. —*Symphoricarpus*, p. 101
54. Leaf scars not forming a definite shelf; bundle scars U or C-shaped; the open side up; lenticels rather conspicuous.

55. Buds very small, appearing partly concealed, usually located some distance above the leaf scar; leaf scars often whorled; fruit remains a globose ball. —*Cephalanthus*, p. 99
55. Buds distinct, located right above the leaf scar; leaf scars never whorled; fruit remains pod-like. —*Campsis*, p. 99
50. Opposite leaf scars not connected by transverse ridges (Note 9).
56. Pith excavated or chambered. —*Forsythia*, p. 94
56. Pith continuous.
57. Twigs with long, corky wings. —*Evonymus*, p. 78
57. Twigs not corky winged though often ridged.
58. Twigs covered with white or brown peltate, scurfy scales. —*Shepherdia*, p. 88
58. Twigs without such scales.
59. Lateral bud with two bud scales visible, bud small, seldom over 1.5 mm. long. —*Kalmia*, p. 91
59. More than two bud scales visible on the larger lateral buds.
60. Buds superimposed (Note 15).
61. Buds at a node separate, not crowded. —*Forestiera*, p. 96
61. Buds crowded at a node, not separate.
62. Bundle scars U-shaped; lenticels very conspicuous; lateral buds seldom 2 mm. long. —*Chionanthus*, p. 96
62. Bundle scars round or oval; lenticels not conspicuous; lateral buds larger. —*Ligustrum*, p. 97
60. Buds not superimposed (Note 15).
63. Twigs green or rosy red; fruit four-lobed. —*Evonymus*, p. 78
63. Twigs brown, olive, or gray; fruit not four-lobed.
64. Buds with tips curved in toward the twig; bundle scars often three; twig often spine-tipped. —*Rhamnus*, p. 82
64. Bud tips not curving in toward the twig; bundle scars always one, or many confluent; twigs never spine tipped.
65. Bundle traces short and little transversely elongated; twigs slender; lenticles inconspicuous. —*Ligustrum*, p. 97
65. Bundle traces as a transverse line C, U or bow-shaped; twigs usually moderate to stout, typically over 2.5 mm. in diameter.

66. Bundle trace U- or C-shaped; lateral buds small, seldom over 2 mm. long. —*Chionanthus*, p. 96
66. Bundle trace bow-shaped; lateral buds usually over two mm. long. —*Syringa*, p. 95
1. Leaf scars alternate (Note 1).
67. Climbing or twining, vine-like (Note 2).
68. Stem with scattered vascular bundles, greenish, often with long shiny-black prickles. —*Smilax*, p. 37
68. Stem with bundles in a ring or circle.
69. Lvs. definitely evergreen. —*Arctostaphylos*, p. 92
69. Lvs. deciduous or drying on the twig.
70. Spines present at many nodes. —*Lycium*, p. 98
70. No spines present, prickles present or absent.
71. Climbing by tendrils or tendril discs (Note 16).
72. Pith brown, with a solid partition at each node; bark of twig becoming shredded. —*Vitis*, p. 83
72. Pith greenish or white; no solid partitions at the nodes; bark not shreddy.
73. Tendrils twining without disc-like adhesive tips; pith often with partitions extending in from the outer wall. —*Ampelopsis*, p. 84
73. Tendrils usually ending in disc-like adhesive tips; no partitions in pith. —*Parthenocissus*, p. 84
71. No tendrils or tendril discs (Note 16).
74. Leaf scar with a prominent knob-like projection at the lower side; fruit a pod. —*Wisteria* p. 73
74. Leaf scars without such a projection; fruit not a pod.
75. Climbing by aerial roots. —*Rhus*, p. 77
75. No aerial roots.
76. Leaf scars narrowly linear or U-shaped, bundle traces three.
77. Buds almost concealed in a downy hairy pad, almost surrounded by the leaf scar; no prickles. —*Aristolochia*, p. 50
77. Bud not at all concealed, not almost surrounded by the leaf scar. —*Rosa*, p. 68
76. Leaf scars not narrowly linear or U-shaped, bundle scars one or about seven, often indistinct, but not three.
78. Leaf scars large, almost as broad as the twig; bundle scars more than 1; twigs fluted. —*Menispermum*, p. 53

78. Leaf scars moderate to small, bundle scar one or indistinct; twigs sometimes angled but not fluted.
79. Bud scales distinct, keeled, and mucronate at apex; pith not spongy. —*Celastrus*, p. 79
79. Bud scales rather indistinct, obtuse, and not keeled; pith often spongy.
80. Buds pubescent; twigs never spiny. —*Solanum*, p. 98
80. Buds glabrescent; twigs often spiny. —*Lycium*, p. 98
67. Stems upright, trees or shrubs (Note 2).
81. Lvs. evergreen (Note 3).
82. Lvs. compound (Note 28).
83. Lfts. three, entire —*Cytisus*, p. 73
83. Lfts. more than three, spiny toothed. —*Mahonia*, p. 52
82. Lvs. simple (Note 28).
84. Lvs. with margins crenate-serrate to spiny toothed. —*Ilex*, p. 78
84. Lvs. with entire margins.
85. Twigs with two wide wings; hardly woody. —*Genista*, p. 72
85. Twigs terete or at most angled or ridged.
86. Twigs with scale-like flattened hairs. —*Rhododendron*, p. 91
86. Twigs without such hairs.
87. Prostrate, trailing plants, branches rooting. —*Arctostaphylos*, p. 92
87. Upright trees or shrubs, or if decumbent, branches not rooting.
88. Stipular scars as a ring encircling the entire twig; often tree-like. —*Magnolia*, p. 53
88. No stipular scars; never tree-like.
89. Lvs. small, less than 2 cm. long; rather procumbent.
90. Lvs. pubescent beneath; leaf scar definitely raised. —*Cytisus*, p. 73
90. Lvs. glabrescent beneath; leaf scar little raised. —*Daphne*, p. 87
89. Lvs. larger.
91. Terminal bud of some twigs much enlarged, often with more than fourteen keeled and attenuated bud scales visible. —*Rhododendron*, p. 91
91. Terminal bud not greatly enlarged, with less than fourteen bud scales visible, these not keeled nor attenuated. —*Kalmia*, p. 91
81. Lvs. deciduous or drying on the twig (Note 3).
92. Spines or prickles present (Note 5).
93. Remains of leaf rachis present as a spine (Note 17).



94. Inner bark and usually the wood and pith lemon yellow.  
—*Berberis*, p. 52
94. Bark, pith and wood not yellow.  
—*Caragana*, p. 74
93. Remains of leaf rachis not spiny, usually absent (Note 17).
95. Some of the spines, prickles, or bristles scattered on the internodes.
96. Twigs stout, usually over one cm. in diameter; bundle scars more than three (Note 21).
97. Leaf scars encircling the twig about one-half; pith seldom over one-half total diameter of twig.  
—*Acanthopanax*, p. 88
97. Leaf scars encircling the twig almost completely; pith large, over one-half the diameter of the twig.  
—*Aralia*, p. 89
96. Twigs moderate to slender; bundle traces three (Note 21).
98. Spines present at some of the nodes, internodes with bristles or weak prickles.
99. Buds elongate, fusiform, more than six bud scales visible; pith spongy.  
—*Ribes*, p. 57
99. Buds not elongated, less than six bud scales visible; pith continuous.  
—*Rosa*, p. 68
98. No spines at nodes.
100. Buds partly concealed by the leaf scar.  
—*Robinia*, p. 74
100. Buds not at all concealed.
101. Buds hairy-tomentose, especially near the end; leaf petiole usually remaining as a shriveled remnant; leaf scar, if present, oval or flattened oval.  
—*Rubus*, p. 67
101. Buds glabrous or nearly so; leaf petiole usually deciduous; leaf scar narrow.  
—*Rosa*, p. 68
95. No spines or prickles on the internodes.
102. Spines or prickles two at a node, stipular (Note 5).
103. Buds wholly or partly concealed by the leaf scar.  
—*Robinia*, p. 74
103. Buds not concealed under the leaf scar.
104. Twigs long. lined or ridged; bundle scars usually one.  
—*Caragana*, p. 74
104. Twigs not ridged; bundle scars three.
105. Buds pubescent and indistinctly scaly; leaf scars not narrowly linear or U-shaped.  
—*Zanthoxylum*, p. 75
105. Buds glabrescent and scaly; leaf scars narrowly linear or U-shaped.  
—*Rosa*, p. 68
102. Spines or prickles not stipular, usually one or three at a node or as the end of short twigs (Note 5).
106. Pith chambered; stipules covering the woolly mass of buds.  
—*Prinsepia*, p. 70
106. Pith not chambered; stipules, if present, not covering the bud.
107. Inner bark and usually wood of younger twigs bright lemon yellow when cut.  
—*Berberis*, p. 52
107. Bark and wood not yellow.

108. Buds and usually the end of twig covered with small brown or silvery, peltate scales. —*Elaeagnus*, p. 88
108. No such scales present.
109. More than one spine present at a node. —*Ribes*, p. 57
109. Spines single at a node or as the end of twigs.
110. Twigs with milky or sticky sap; spine usually lateral to bud. —*Machura*, p. 49
110. Twigs without milky or sticky sap; spine above or beneath the bud.
111. Bundle scars five or more. —*Acanthopanax*, p. 88
111. Less than five bundle scars present.
112. Bundle scar one. —*Lycium*, p. 98
112. Bundle scars three.
113. Buds partly concealed, superimposed; spines often with two short lateral branches. —*Gleditsia*, p. 71
113. Buds not at all concealed, solitary or collateral; spines not branched.
114. Thorns as the ends of short twigs roughened by leaf scars.
115. Terminal bud absent. —*Prunus*, p. 69
115. Terminal bud present.
116. Buds and twigs woolly-pubescent especially near ends. —*Malus*, p. 64
116. Buds and twigs glabrous or only slightly pubescent. —*Pyrus*, p. 66
114. Thorns at the nodes smooth, not roughened.
117. No true terminal bud. —*Chaenomeles*, p. 65
117. Terminal bud present.
118. Lateral buds rounded at the tip, reddish; usually trees; spines often over three cm. long. —*Crataegus*, p. 62
118. Lateral buds pointed at the tip, not reddish; never trees; spines usually shorter. —*Ribes*, p. 57
92. No spines or prickles present (Note 5).
119. Typically seen as trees (Note 18).

120. Pith five-pointed in cross-section (cut at several places) (Note 7).
121. Buds partially or wholly concealed by the leaf scar, finally breaking through, commonly leaving it in three plates. —*Robinia*, p. 74
121. Buds not at all concealed.
122. Only one bud scale visible. —*Salix*, p. 38
122. Over one bud scale visible.
123. No true terminal bud present (Note 13).
124. Lateral buds with two or three visible scales; leaf scars commonly two-ranked. —*Castanea*, p. 43
124. Lateral buds with more than three bud scales visible; leaf scars more than two-ranked. —*Prunus*, p. 69
123. Terminal bud present (Note 13).
125. Bundle scar as a transverse line, sometimes slightly broken. —*Sassafras*, p. 55
125. Bundle scars more than one.
126. Bundle scars more than three and scattered; lateral buds and leaf scars tending to crowd out near the end of the twig. —*Quercus*, p. 44
126. Bundle scars three or in three groups; lateral buds not crowded near the end of the twig.
127. Bundle scars forming three rings or U-shaped structures; leaf scars broadly heart-shaped. —*Carya*, p. 40
127. Bundle scars not forming rings; leaf scars not heart-shaped.
128. Stipules or stipular scars present and definite.
129. Shortest bud scale of lateral bud in front; pith usually definitely five-pointed. —*Populus*, p. 37
129. Shortest bud scale not in front; pith seldom definitely five-pointed. —*Prunus*, p. 69
128. Stipules or stipular scars not present, or very inconspicuous.
130. Longer bud scales long-ciliate; buds usually two-ranked; twigs never corky; bark of trunk smooth, native. —*Amelanchier*, p. 64
130. Bud scales at most short ciliate; buds more than two-ranked; twigs often corky; bark rough; not native. —*Liquidambar*, p. 57
120. Pith round or angled but not five-pointed (Note 7).
131. Older branches with wart-like twigs on which the leaf scars are crowded (Note 19).

132. Leaf scars of young twigs very numerous; bundle scar one; twigs slender, often bearing cones. —*Larex*, p. 36
132. Leaf scars present on the young twigs only at buds; bundle scars two; twigs moderate to stout, never bearing cones. —*Ginkgo*, p. 36
131. Wart-like twigs absent on older branches, although short lateral twigs may be present (Note 19).
133. Of percurrent growth, the main trunk not branching; trunk with shredding bark; young twigs mostly falling, leaving branch scars. —*Taxodium*, p. 36
133. Open-headed trees; bark of trunk not shredding; twigs not commonly deciduous.
134. Apparently no leaf scar present, the persistent leaf base covering it (Note 17).
135. Twigs long, ridged or angled; leaf-remains not scale-like if present at all; pith central. —*Caragana*, p. 74
135. Twigs not ridged nor angled; leaf-remains a scale; pith not central. —*Tamarix*, p. 87
134. Leaf scar not concealed, definite, although sometimes raised (Note 17).
136. Buds wholly or partly concealed beneath the twig or the leaf scar, or so flattened against the twig as to appear partially concealed (Note 20).
137. Pith colored, not white (Note 7).
138. Pith of older twigs salmon-red; buds superimposed. —*Gymnocladus*, p. 71
138. Pith of older twigs chocolate to yellow-brown; buds not superimposed.
139. Leaf scars horse-shoe shaped, bud end woolly. —*Rhus*, p. 77
139. Leaf scars broad, not horse-shoe shaped; bud-end glabrous. —*Ailanthus*, p. 76
137. Pith of healthy twigs white (Note 7).
140. Twig with gummy or milky sap; bundle scars usually more than three.
141. Twigs yellow to olive green; leaf scars not horse-shoe shaped; bud glabrous. —*Maclura*, p. 49
141. Twigs not yellow or olive green; leaf scars horse-shoe shaped; bud-end woolly. —*Rhus*, p. 77
140. Sap of twig not gummy or milky; bundle scars three.
142. Twigs definitely greenish, usually conspicuously swollen at the node. —*Sophora*, p. 72
142. Twigs not greenish, the nodes not conspicuously swollen.

143. End of bud woolly-hairy; leaf scar definitely horse-shoe shaped; seldom tree-like; fruit not a pod. —*Ptelea*, p. 75
143. End of bud glabrous or indistinctly hairy; leaf scar broad at first, later torn at the top by the developing bud; usually trees; fruit a pod.
144. Twigs shiny; buds superimposed and separate; fruit twisted. —*Gleditsia*, p. 71
144. Twigs not very shiny; buds crowded together under the leaf scar; fruit not twisted. —*Robinia*, p. 74
136. Buds not at all concealed and not flattened as to appear so (Note 20).
145. Pith with diaphragms which often separate chambers, at least near the nodes of the older twigs (Note 7).
146. Stipular scars as a ring surrounding the twig (Note 22).
147. Buds somewhat flattened; leaf scars perpendicularly oval; young lvs. in the bud abruptly bent back. —*Liriodendron*, p. 54
147. Buds not flattened; leaf scars not as above; young lvs. in bud not bent back. —*Magnolia*, p. 55
146. Stipular scars, if present, not as a ring surrounding the twig (Note 22).
148. Bundle trace single, U or C-shaped (Note 6).
149. Bark of older twigs silky-shreddy; buds often superimposed. —*Halesia*, p. 93
149. Bark not silky-shreddy; buds not superimposed.
150. Two bud scales visible. —*Diospyros*, p. 93
150. More than two bud scales visible. —*Eucommia*, p. 58
148. Bundle traces more than one, rarely joined but not forming a U or C-shaped line, sometimes U-shaped, when three are present (Note 6).
151. Bundle scars three U- or circle-shaped structures, the leaf scar three-lobed; pith rather brownish. —*Juglans*, p. 39
151. Bundle scars not three U- or circle-shaped structures, leaf scar not three-lobed; pith whitish.
152. End bud flattened, densely silk-hairy; bundle scars commonly five. —*Asimina*, p. 55
152. End bud lacking, the lateral buds glabrous to puberulent; bundle scars usually three. —*Celtis*, p. 48
145. Pith solid or spongy but not diaphragmed (Note 7).
153. Bundle scars one, or many confluent (Note 6).
154. Bundle scars C-shaped, the open side up; pith typically spongy on older twigs.
155. Only two bud scales visible. —*Diospyros*, p. 93
155. More than two bud scales visible. —*Zelkova*, p. 48
154. Bundle scars not C-shaped; pith continuous except on dried twigs.

156. Buds and usually the twig-ends silvery to brown from small peltate scales. —*Elaeagnus*, p. 88
156. Buds and twigs without such scales.
157. Twigs long, ridged; stipules present as weak prickles. —*Caragana*, p. 74
157. Twigs not long, ridged; no stipular prickles.
158. Twigs and buds greenish shaded with red; strongly aromatic. —*Sassafras*, p. 55
158. Twigs and buds brownish to gray; not aromatic. —*Rhamnus*, p. 82
153. Bundle scars more than one (Note 6).
159. Stipular scars as rings encircling the entire twig (Note 22).
160. Buds conical, without a scar at one side. —*Platanus*, p. 59
160. Buds not conical, a scar present at the side. —*Magnolia*, p. 53
159. Stipular scars if present not as encircling rings (Note 22).
161. Buds naked, no definite bud scales present (Note 23).
162. Leaf scars horse-shoe shaped, almost surrounding the bud.
163. Twigs stout; pith usually yellow-brown. —*Rhus*, p. 77
163. Twigs small to moderate in size; pith white. —*Cladrastis*, p. 72
162. Leaf scars not horse-shoe shaped.
164. Leaf scars two-ranked; flowers or unopened flower cluster present over the winter. —*Hamamelis*, p. 58
164. Leaf scars more than two-ranked; flowers concealed in the bud. —*Rhamnus*, p. 82
161. Buds with definite bud scales (Note 23).
165. Only one bud scale visible. —*Salix*, p. 38
165. More than one bud scale visible.
166. Floral structures present throughout the winter; terminal bud with two lateral stipules simulating bud scales, or, if broken off, leaving scars. —*Hamamelis*, p. 58
166. Floral structures not present except sometimes as partly developed catkins; true bud scales present.
167. Leaf scars two-ranked on the twig in normal, untwisted specimens (Note 24).
168. True terminal bud not present (Note 13).
169. Bud at end of twig obliquely unsymmetrical; the thick bark of the twig showing a ring of triangles in section. —*Tilia*, p. 85
169. Buds symmetrical; no triangular structures in the twig bark.
170. Bundle scars more than three or three groups. —*Morus*, p. 49
170. Bundle scars three or in three groups.

171. Leaf scar fringed at top; flower buds stalked; pith often pink-streaked. —*Cercis*, p. 71
171. Leaf scar not fringed; buds not stalked; pith not pink-streaked.
172. Bud scales two-ranked.
173. Visible bud scales four or less.
174. Buds less than 2 mm. long; bark of trunk not smooth or peeling in papery layers. —*Ulmus*, p. 47
174. Buds over 2 mm. long; bark of trunk smooth or peeling in papery layers on young branches. —*Betula*, p. 40
173. More than four bud scales visible. —*Ulmus*, p. 47
172. Bud scales more than two-ranked.
175. Less than six bud scales visible; bark often peeling in papery layers. —*Betula*, p. 40
175. More than six bud scales visible; bark not peeling.
176. Pith spongy; bark of trunk not smooth nor fluted or scaly; not native. —*Zelkova*, p. 48
176. Pith not spongy; bark of trunk smooth and fluted or scaly.
177. Bark of trunk brownish and scaly; bud scales longitudinally striated under the lens; the bud usually gummy within; partly developed catkins often present. —*Ostrya*, p. 42
177. Bark of trunk smooth, gray, and fluted; bud scales not or very slightly striated; buds not gummy; partly developed catkins never present. —*Carpinus*, p. 42
168. True terminal bud present (Note 13).
178. Some of buds stalked; pith triangular in section. —*Alnus*, p. 41
178. Buds not stalked except by the growth of the twig; pith not triangular in section.
179. More than twelve bud scales visible; leaf scar usually not directly under the bud. —*Fagus*, p. 43
179. Less than twelve bud scales visible; leaf scar directly beneath the bud. —*Amelanchier*, p. 64
167. Leaf scars more than two-ranked on the twig (Note 24).
180. Leaf scars and lateral buds crowding out near the end of the twig, the lateral buds often longer than the terminal (Note 25).
181. Only two to four bud scales visible; lenticels not conspicuous. —*Cornus*, p. 89
181. More than four bud scales visible; lenticels conspicuous. —*Prunus*, p. 69
180. Leaf scars and lateral buds not crowding out near the twig end.
182. Twigs with milky or sticky sap, olive-green to buff-yellow; bundle scars often over three. —*Machura*, p. 49

182. Twigs, without milky or sticky sap, reddish-brown to gray; bundle scars rarely over three.
183. No true terminal bud present (Note 13).
184. Accessory buds common. —*Prunus*, p. 69
184. No accessory buds.
185. Lenticels conspicuous. —*Prunus*, p. 69
185. Lenticels not conspicuous.
186. Pith tan in color; buds reddish-brown, not strongly ciliate. —*Prunus*, p. 69
186. Pith pale; buds dull brown, definitely ciliate. —*Rhamnus*, p. 82
183. Terminal bud present (Note 13).
187. Older twigs usually corky-ridged; pith somewhat spongy; fruit remains a spiny ball. —*Liquidambar*, p. 57
187. Twigs not corky-ridged; pith continuous; fruit remains not globose-spiny.
188. Twigs with gummy aromatic sap; heart wood of older twigs yellowish. —*Cotinus*, p. 77
188. Twigs without gummy or aromatic sap; heart wood not bright yellow.
189. Bundle scars five. —*Sorbus*, p. 63
189. Bundle scars three.
190. Individual bundle scars C- or ring-shaped, the leaf scars heart-shaped. —*Carya*, p. 40
190. Bundle scars not C- or ring-shaped; leaf scars not heart-shaped.
191. Some of buds stalked; pith triangular in section. —*Alnus*, p. 41
191. Buds not stalked except by growth; pith not triangular.
192. First bud scale as long as the bud, often only two visible.—*Cornus*, p. 89
192. First bud scale not as long as the bud, more than two visible.
193. Buds some shade of red, the lateral buds rounded at the tip, the bud scales thick and fleshy. —*Crataegus*, p. 62
193. Buds varying from brown or gray to dark reddish-brown, at least somewhat pointed, the bud scales usually not thick and fleshy.
194. Bud scales definitely gray-pubescent, usually woolly, at least near the end of the bud.



195. Buds often collateral; stipules or their scars present.  
—*Prunus*, p. 69
195. Buds solitary; no stipular scars.
196. Buds large, usually over 1 cm. long. —*Sorbus*, p. 63
196. Buds smaller. —*Malus*, p. 64
194. Bud scales glabrous or at most ciliate or puberulent.
197. Some of the buds over 7 mm. long.
198. Bud scales with a broad gray marginal band; stipular scars present. —*Prunus*, p. 69
198. Bud scales uniform in color; stipular scars not present.
199. Longer bud scales silky-ciliate; bark of trunk gray and smooth; buds long and narrow; native.  
—*Amelanchier*, p. 64
199. Longer bud scales slightly if at all ciliate; bark rough; buds ovoid; cult. fruit tree. —*Pyrus*, p. 66
197. None of the buds over 7 mm. long.
200. Older twigs becoming dull gray in color.  
—*Xanthoceras*, p. 82
200. None of twigs dull gray, except scurf of young twig which rubs off showing reddish-brown beneath.
201. Accessory buds present. —*Prunus*, p. 69
201. No accessory buds present.
202. Leaf scars compressed, semi-oval to half round or triangular; stipules or their scars present.  
—*Prunus*, p. 69
202. Leaf scars U- to crescent-shaped; no stipules or scar of stipules. —*Malus*, p. 64
119. Typically shrubs (Note 18).
203. Twigs with two broad green wings. —*Genista*, p. 72
203. Twigs terete or at most ridged, not winged.
204. Pith with diaphragms, especially at the nodes (Note 7).
205. Stipular scars as rings encircling the twig. —*Magnolia*, p. 53
205. Stipular scars, if present, not as rings.
206. Older twigs with silky-shreddy bark.  
—*Halesia*, p. 93
206. Twigs not silky-shreddy.
207. Only two bud scales visible.  
—*Diospyros*, p. 93
207. More than two bud scales visible.
208. Leaf scars two-ranked; lenticels inconspicuous. —*Symplocos*, p. 93
208. Leaf scars more than two-ranked; lenticels conspicuous or twig warty.
209. Twigs definitely angled or winged.  
—*Tripterium*, p. 79
209. Twigs not angled or winged.  
—*Eucommia*, p. 58
204. Pith without diaphragms (Note 7).

210. Leaf scars not evident, covered by the persistent petiole or leaf base (Note 17).  
 211. Twigs angled or ridged; pith central; leaf remains as weak spines.  
     —*Caragana*, p. 74
211. Twigs not angled or ridged; pith not central; leaf remains scale-like.  
     —*Tamarix*, p. 87
210. Leaf scars definite, though sometimes small or raised (Note 17).  
 212. More than three bundle scars present (Note 6).  
 213. Stipular scars as a ring encircling the twig. —*Magnolia*, p. 53  
 213. Stipular scars, if present, not as a ring.  
 214. Leaf scars and lateral buds tending to crowd out near the  
     end of the twig (Note 25).  
 215. Buds seldom present, replaced by the scars of fallen  
     branches; or inflorescences; pith terete.  
     —*Hibiscus*, p. 86
215. Buds present; pith five-pointed in section.  
     —*Quercus*, p. 44
214. Leaf scars and lateral buds not crowded near twig-end  
 (Note 25).  
 216. Stipules persistent; the upper bud commonly devel-  
     oping into a branchlet. —*Colutea*, p. 74  
 216. Stipules not persistent; buds not developing until  
     spring.  
 217. Leaf scars almost encircling the twig; wood of  
     young twigs bright yellow. —*Zanthorhiza*, p. 51  
 217. Leaf scars not almost encircling the twig; wood  
     not bright yellow.  
 218. Pith triangular in cross-section; some of  
     buds stalked. —*Alnus*, p. 41  
 218. Pith not triangular; buds rarely stalked ex-  
     cept by growth.  
 219. Twigs with gummy sap or aromatic  
     odor (Note 26).  
 220. Bud scales not evident.  
     —*Rhus*, p. 77
220. Bud scales definite.  
 221. Leaf scars linear or U-  
     shaped; twigs pubescent;  
     low shrub.  
     —*Artemisia*, p. 104
221. Leaf scars crescent to tri-  
     angular; twigs glabrate; of-  
     ten a tall shrub.  
     —*Cotinus*, p. 77
219. No gummy sap or aromatic odor  
 (Note 26).  
 222. Buds large, often over 1 cm.  
     long. —*Paeonia*, p. 50  
 222. Buds much smaller.

223. Twigs long, ridged or angled; bud scales definite. —*Physocarpus*, p. 59
223. Twigs not ridged; bud scales not definite.
224. Leaf scars horse-shoe shaped, almost encircling the bud.
225. Twigs stout, with gummy or milky sap. —*Rhus*, p. 77
225. Twigs slender, no gummy or milky sap.
226. Buds short, appearing partly concealed; twigs flexible and rubbery. —*Dirca*, p. 87
226. Buds longer, often over 4 mm. long, not at all concealed; twigs not so flexible. —*Cladrastis*, p. 72
224. Leaf scars not horse-shoe shaped, surrounding the bud less than one-half. —*Rhus*, p. 77
212. Bundle scars three or less (Note 6).
227. Buds wholly or partially concealed beneath the twig surface, or so flattened against it from the end as to appear so (Note 20).
228. Stipules persistent but not spine-like; upper bud usually developing into a small branchlet. —*Colutea*, p. 74
228. Stipules absent or spine-like; buds not commonly developing until spring.
229. Twigs straw colored or gray; bundle scar one. —*Lyceum*, p. 98
229. Twigs brownish to gray; bundle scars three.
230. Weak bristles present on younger twigs. —*Robinia*, p. 74
230. No bristles present.
231. Twigs green, with nodes conspicuously swollen. —*Sophora*, p. 72
231. Twigs not greenish, nodes not conspicuously swollen.
232. Leaf scar broad at first, but usually broken into three plates by the growth of the bud beneath; lenticels not conspicuous. —*Robinia*, p. 74
232. Leaf scars clearly U- or horseshoe-shaped, not broken; lenticels rather conspicuous. —*Ptelea*, p. 75
227. Buds not at all concealed (Note 20).
233. Pith triangular; cones often present. —*Alnus*, p. 41
233. Pith not triangular; cones never present.
234. Incipient or well developed flowers present. —*Hamamelis*, p. 58
234. Flowers concealed in the buds, or as a partly-developed catkin.
235. Low, weak, hardly woody sub-shrubs (Note 14).
236. Twigs glabrous.
237. Twigs greenish in color; not native. —*Kerria*, p. 67
237. Twigs light brown to greenish gray. —*Amorpha*, p. 73
236. Twigs pubescent.

238. Leaf scars narrow-linear to U-shaped; usually more than eight bud scales visible; aromatic odor. —*Artemisia*, p. 104
238. Leaf scar not linear or U-shaped; less than eight bud scales visible; no aromatic odor.
239. Leaf scars triangular, somewhat three-lobed; twigs usually long-ridged; fruit a small pod. —*Amorpha*, p. 73
239. Leaf scars not triangular or three-lobed; twigs not ridged; fruit a capsule, usually fallen, leaving a shallow, three-lobed saucer-shaped receptacle. —*Ceanothus*, p. 83
235. Larger, definitely woody plants (Note 14).
240. Bundle scars three (Note 6).
241. Terminal bud flattened, no evident bud scales. —*Rhamnus*, p. 82
241. Terminal bud if present not flattened, buds with evident bud scales.
242. Only one bud scale visible. —*Salix*, p. 38
242. More than one bud scale visible.
243. Leaf scars and lateral buds tending to crowd out near the end of the twig (Note 25).
244. Only two to four bud scales visible; lenticels not conspicuous on young growth. —*Cornus*, p. 89
244. Over four bud scales visible; lenticels conspicuous. —*Prunus*, p. 69
243. Leaf scars not tending to crowd out near the twig end (Note 25).
245. End of twig and base of bud with yellow resin dots.
246. Twigs angled or ridged; leaf scar V-shaped; pith whitish, often spongy. —*Ribes*, p. 57
246. Twigs not angled; leaf scars triangular; pith greenish, not spongy. —*Myrica*, p. 39
245. No yellow resin-dots present.
247. Twigs both greenish and longitudinally angled or ridged (Note 4).
248. Stipules remaining; leaf scar oval or kidney-shaped. —*Colutea*, p. 74
248. No stipules; leaf scars crescent-shaped. —*Kerria*, p. 67
247. Twigs not both greenish and longitudinally angled or ridged, rarely either one (Note 4).
249. Accessory buds present (Note 15).
250. Buds superimposed (Note 15).
251. Leaf scars horseshoe-shaped, almost surrounding the bud. —*Cladrastis*, p. 72
251. Leaf scars not horseshoe-shaped.

252. Leaf scars two-ranked; pith usually light brown.  
—*Stephanandra*, p. 59
252. Leaf scars more than two-ranked; pith whitish. —*Amorpha*, p. 73
250. Buds collateral (Note 15).
253. Leaf scars more than two-ranked; commonly three buds at a node, the lateral ones usually broader. —*Prunus*, p. 69
253. Leaf scars two-ranked; sometimes obscurely so; lateral buds usually smaller.
254. Stipular scars present; pith pale, spongy. —*Zelkova*, p. 48
254. Stipular scars not present; pith brown, continuous.  
—*Sorbaria* p. 61
249. Buds solitary (Note 15).
255. Stipules or stipular scars present, usually very distinct (Note 27).
256. Leaf scars two-ranked (Note 24).
257. Pith whitish and spongy between the nodes; no catkins present; rare. —*Zelkova*, p. 48
257. Pith tan, not spongy; catkins often present; often common.\* —*Corylus*, p. 42
256. Leaf scars more than two-ranked (Note 24).
258. Leaf scars narrowly U-shaped, partly surrounding the bud.  
—*Cydonia*, p. 66
258. Leaf scars not U-shaped.
259. Lateral buds with only two bud scales visible and definite, these lateral and exposing the woolly bud end; fruit a small pome. —*Cotoneaster*, p. 62
259. More than two bud scales visible; fruit not a small pome.
260. Buds woolly near end; twigs greenish to reddish.  
—*Prunus*, p. 69
260. Buds glabrous or at most ciliate; twigs gray to brownish-red.
261. Lenticels conspicuous; buds glabrous, reddish-brown. —*Prunus*, p. 69
261. Lenticels inconspicuous; buds ciliate, dark-brown. —*Rhamnus*, p. 82
255. No stipules or definite stipular scars present (Note 27).
262. Pith and inner bark orange in color. —*Prunus*, p. 69
262. Pith and inner bark not orange in color.
263. Buds definitely pubescent, often woolly.
264. More than six bud scales visible; pith spongy.  
—*Ribes*, p. 57
264. Less than six bud scales visible; pith solid.  
—*Malus*, p. 64
263. Buds glabrous or at most ciliate to sparingly puberulent.
265. Leaf scars linear or narrowly U-or V-shaped (Note 8).

\**Betula glandulifera* Butler., a shrubby birch very rare in this state, would fall about here. It differs from *Corylus* by having fewer bud scales visible, of which there are seldom over three.

266. Pith spongy; twigs usually ridged or angled —*Ribes*, p. 57
266. Pith not spongy; twigs not ridged or angled.
267. Buds sitting on shelves formed by the raised leaf scars; leaf scars not extending one-half the way around the twig.
268. First bud scale as long as the bud, often only two visible. —*Cornus*, p. 89
268. First bud scale shorter than the bud, more than two visible.
269. Buds with long acuminate points which usually bend, lateral buds appressed or nearly so.
270. Second shortest bud scale one-half the length of the bud or more. —*Aronia*, p. 63
270. Second shortest bud scale less than one-half the bud length.
271. Bud scales ciliate or glandular-toothed; twigs never spiny.
272. Bud scales silky-ciliate, especially near the end, not glandular-toothed. —*Amelanchier*, p. 64
272. Bud scales glandular-toothed but not silky-ciliate. —*Aronia*, p. 63
271. Bud scales neither silky-ciliate nor glandular-toothed; twigs rarely spiny. —*Pyrus*, p. 66
269. Bud tips obtuse or merely acute, straight; lateral buds not appressed.
273. Terminal bud present; more than six bud scales visible on the lateral bud. —*Exochorda*, p. 61
273. Terminal bud lacking; about four bud scales visible on lateral buds. —*Photinia*, p. 64
267. Leaf scars scarcely raised, often extending one-half around the twig. —*Rosa*, p. 68
265. Leaf scars broad to crescent-shaped (Note 8).
274. True terminal bud lacking; low, rather soft-wooded. —*Sorbaria* p. 61
274. Terminal bud present; not soft-wooded.
275. Twigs with a gummy aromatic sap; heart wood on older branches usually yellow. —*Cotinus*, p. 77
275. No gummy aromatic sap; heart wood not yellow.
276. Scales of terminal bud with filiform tips, the lateral buds pointed; pith brownish. —*Xanthoceras*, p. 82
276. Scales of terminal bud rounded at the tip; the lateral buds obtuse; pith whitish. —*Crataegus*, p. 62
240. Bundle scars one or grouped as one aggregate (Note 6).

277. Buds and usually the end of the twig covered with silver or brown scurfy peltate scales. —*Elaeagnus*, p. 88
277. No such scales present.
278. Stipules persistent, if partly broken off then the stipular scar raised (Note 27).
279. Bundle scar an elliptical ring; no evident bud scales; twigs usually stellate-hairy. —*Grewia*, p. 85
279. Bundle scar not in a ring; bud scales evident; twigs not stellate.
280. Leaf scar small, less than two-thirds as long as the width of the bud.
281. Only two bud scales visible, these lateral and exposing the woolly end of the bud. —*Cotoneaster*, p. 62
281. More than two bud scales visible.
282. Twigs definitely ridged from the leaf scar; bark of older twigs close; pith pale. —*Caragana*, p. 74
282. Twigs not or only slightly ridged; bark of older twigs exfoliating; pith brownish. —*Potentilla*, p. 68
280. Leaf scar larger, more than two-thirds the width of the bud.
283. Stipules large, always present; twigs more than two-ridged from each leaf scar.
284. Buds superimposed, the upper commonly developing into a branchlet; usually one bundle scar. —*Colutea*, p. 74
284. Buds solitary or collateral; one bundle scar typical. —*Genista*, p. 72
283. Stipules small or broken off; twigs only two-ridged from each scar.
285. Twigs gray to brown; buds sometimes superimposed. —*Ilex*, p. 78
285. Twigs greenish to gray-green; buds never superimposed. —*Cytisus*, p. 73
278. Stipules absent, stipular scars if present very small and inconspicuous (Note 27).
286. Twigs and buds yellow to tan, scurfy pubescent. —*Clethra*, p. 90
286. Twigs and buds not yellow- to tan-pubescent, although they may be gray-pubescent.
287. Leaf scars mostly whorled or sometimes alt.; lvs. partly evergreen. —*Kalmia*, p. 91
287. Leaf scars always alt., lvs. definitely deciduous.
288. Young twigs definitely greenish in color. —*Cytisus*, p. 73
288. Young twigs not greenish in color.
289. Twigs with two or three ridges or angles from each leaf scar (Note 4).

290. Lenticels large and wart-like; bundle scars C-shaped.  
 —*Tripterygium*, p. 79
290. Lenticels small and inconspicuous; bundle scars not C-shaped.
291. Terminal bud often present; twigs gray to dark-brown; buds commonly superimposed; small stipular scar present.  
 —*Ilex*, p. 78
291. Terminal bud rarely if ever present; twigs straw- to reddish-brown; buds solitary, grouped or collateral; no stipular scar.
292. Twigs reddish-brown to light-brown; pith not spongy.  
 —*Spiraea*, p. 60
292. Twigs light gray to straw-colored; pith spongy.  
 —*Lyceum*, p. 98
289. Twigs either not at all ridged or only one-ridged from each leaf scar (Note 4).
293. Buds long and pointed with usually more than ten bud scales visible.  
 —*Spiraea*, p. 60
293. Buds shorter, ovoid, oblong to globose, less than ten bud scales visible.
294. True terminal bud present (Note 13).
295. Leaf scars definitely raised, usually decurrent; small inconspicuous stipules or their scars present. —*Ilex*, p. 78
295. Leaf scars little raised; no stipules or stipular scars present.
296. Terminal bud with three oblong narrow scales visible, or these falling, leaving scars; wood not fetid.  
 —*Clethra*, p. 90
296. Terminal buds with more than three scales visible; fresh-cut wood fetid-smelling. —*Daphne*, p. 87
294. No terminal bud present (Note 13).
297. Bundle scar as a transverse line, sometimes broken into three transverse segments; small stipular scars present (Note 6).
298. Low, scarcely woody, sub-shrubs; fruit remnants usually present as shallow three-lobed saucer-shaped receptacles in a corymbose panicle. —*Ceanothus*, p. 83
298. Definitely woody; fruit remnants seldom present, if so not as above. —*Rhamnus*, p. 82
297. Bundle scar circular, oval or C-shaped, not as a transverse line; no stipular scars (Note 6).
299. Bud-ends and often the twig bearing yellow resin dots. —*Gaylussacia*, p. 92
299. No yellow resin dots present.
300. Bundle scars C-shaped. —*Diospyros*, p. 93
300. Bundle scars small, oval or circular, not C-shaped.
301. Low, dwarf shrubs; twigs reddish-brown; bark of older twigs close.  
 —*Vaccinium*, p. 92
301. Not low or dwarf-like; twigs light-brown to straw-colored; bark of older twigs tending to shred. —*Buddlia*, p. 97



## DESCRIPTIONS OF GENERA AND KEY TO SPECIES

### Family GINKGOACEAE

#### GINKGO L. Ginkgo

**Habit**—Trees with ashy-gray bark, becoming seamed and roughened. **Twigs**—Rather stout, somewhat zigzag, yellowish-brown, bark of older twigs shredding, with many short wart-like twigs on which the leaf scars are crowded. Lenticels not conspicuous. Pith greenish to yellow-tan, irregular in section. **Leaf Scars**—Semi-oval, upper margins usually fringed. Bundle scars two. Stipular scars none. **Buds**—Solitary, chestnut brown, rather conical, about four to five bud scales visible. **Bud Content**—Inner bud scales green-spotted. Lvs. with flattened involute veneration. **Leaf Remnants**—Rather fan-shaped, often two-lobed at apex but with edges entire. **Fruit Remnants**—Falling early, drupe-like, about 2.5 cm. long, present only on the ovulate tree. —\**G. biloba* L.

### Family PINACEAE

#### TAXODIUM Rich. Bald Cypress

**Habit**—Deciduous trees with shredding bark. **Twigs**—Slender, light-brown, glabrous. Lenticels not noticeable. Pith small, brown, sometimes angled and rather spongy. **Leaf Scars**—Usually lacking since many of the young twigs fall, leaving round branch scars, which are alternate and more than two-ranked, containing one bundle scar. Small scales often present, subtending the buds. **Buds**—Small, subglobose, with about four to eight obtuse scales visible, but usually absent or hard to find. **Bud Content**—Too small for detail. **Leaf Remnants**—Appear compound as a foliage spray but actually are simple and narrowly linear. **Fruit Remnants**—Small ellipsoid cone with thickened scales. —\**T. distichum* Rich.

#### LARIX Mill. Larch

**Habit**—Trees with percurrent trunk which becomes roughened by reddish-brown scales. **Twigs**—Rather slender, older twigs with short wart-like twigs. Lenticels inconspicuous. Pith small, brownish. **Leaf Scars**—Scattered on the young twig or clustered on the short wart-

like twigs, rather triangular to half round. Bundle scar one. Stipular scars none. **Buds**—Small, solitary, brownish with numerous but often indistinct scales. **Bud Content**—Inner scales longitudinally striated. Leaf mass sub-globose. Terminal bud of wart-like shoot with almost hollow area beneath the leaf cluster. **Leaf Remnants**—Flattened linear. **Fruit Remnants**—A persistent, ellipsoid cone with rather thin scales.

1. Cones over 2.5 cm. long, the scales puberulent; twigs yellowish or straw-colored. —\**L. decidua* Mill.
1. Cones under 2.5 cm. long, the scales glabrous; twigs typically reddish-brown. —\**L. laricina* K. Koch.

#### Family LILIACEAE

##### SMILAX L. Green-Brier

**Habit**—Deciduous, climbing by tendrils. **Twigs**—Rather slender, greenish to gray, often with long black prickles which are slender, not dilated at the base, glabrous. Lenticels not conspicuous. Pith not central but with the vascular strands scattered. **Leaf Scars**—Seldom present, the petiole base remaining. Stipules remaining and tendril-like. Lvs. alternate, appearing two-ranked. **Buds**—Concealed in the petiole base, widely spreading, one bud scale visible. **Bud Content**—Lvs. with broad thin petiole. Stipules at sides of leaves, leaf entire with involute vernation. **Leaf Remnants**—Ovate, cordate, entire, palmately veined. **Fruit Remnants**—Often present as black berries born in umbels. —*S. hispida* Muhl.

Other woody species have been reported in Iowa such as *S. rotundifolia* L. and *S. pseudo-china* L., but these seem to intergrade with the species here listed or have been doubtfully identified. It seems probable, however, that more than one woody species occurs in the state.

#### Family SALICACEAE

##### POPULUS L. Poplar

**Habit**—Deciduous, mostly trees. **Twigs**—Moderate to stout, terete or angled. Pith usually moderate, greenish-white and becoming tan or brown, five-angled in section. **Leaf Scars**—Alt., more than two-ranked, triangular or three-lobed to crescent-shaped. Bundle scars three. Stipular scars present and often conspicuous. **Buds**—Solitary, flower buds wider, lateral buds usually appressed with three to five scales visible, the shortest one in front. **Bud Content**—Stipules large and rather enclose the lvs. which are simple, vernation involute, rarely slightly so. Flower buds separate, containing catkins, dioecious. **Leaf**

**Remnants**—Ovate to deltoid or lance-ovate, petiole rather long. **Fruit**

**Remnants**—A two- to four-valved capsule, seeds with silky hairs.

1. Twigs typically three-angled from below each scar.
2. Twigs greenish to light brown; lenticels very conspicuous on young twigs and very much elongated longitudinally. —\**P. generosa* Henry
2. Twigs greenish to straw colored; lenticels not conspicuous and not over three times longer than broad. —\**P. szechuanica* Schneid.
1. Twigs not angled or exceptionally angled on the shoots.
3. Terminal bud seldom over 10 mm. long, buds not resinous or only slightly so; no definite odor.
4. Buds glabrous and slightly resinous, narrow, often lanceoloid.
5. Fastigate; twigs yellowish to yellowish green; cult. —\**P. nigra italica* Dur.
5. Not fastigate; twigs gray brown to reddish brown; native, seldom cult. —\**P. tremuloides* Michx.
4. Buds somewhat pubescent, not at all resinous, typically ovoid.
6. Branches green, fastigate. —\**P. alba pyramidalis* Bge.
6. Branches not definitely green, spreading.
7. End of twig coated with a thick cotton-like white felt, easily rubbed away; branches whitish or greenish-white. —\**P. alba* L.
7. End of twig not woolly pubescent; branches greenish. —\**P. grandidentata* Michx.
3. Terminal bud over 10 mm. long, heavily resinous and with a definite odor.
8. Twigs yellowish; terminal bud usually under 16 mm. long; ill scented; a common species. —\**P. balsamifera* L.
8. Twigs reddish brown to olive brown; terminal bud usually over 16 mm. long, buds fragrant, rare in Iowa. —\**P. tacamahaca* Mill.

This genus is fairly easy to recognize, but the nomenclature is not clear, and this adds to the difficulty. *P. balsamifera* as here considered, is the same as the *P. deltoides* of Gray's Manual, seventh edition. This genus often drops its twigs or branches, leaving abscission scars. This habit was noticed and described by Clute (7).

#### SALIX L. Willow

**Habit**—Deciduous shrubs or trees. Bark of trunk becoming fissured. **Twigs**—Usually slender, terete. Pith small to moderate, white, round or sometimes angled. **Leaf Scars**—Alt. more than two-ranked, or in one species opposite, narrow U- to V-shaped, often raised. Bundle scars three. Stipular scars present or absent. **Buds**—Appressed, solitary, end bud lacking, only one bud scale visible, bud usually flattened somewhat against the twig, with lateral angles. **Bud Content**—Flower bud always separate and enlarged, flowers in catkins, dioecious. Lvs. simple with straight veneration. **Leaf Remnants**—Simple, pinnately veined, margins toothed, usually long. **Fruit Remnants**—A two-valved capsule; seeds winged.

This is an extremely difficult genus as far as the individual species go in any condition, and a species key is not attempted.

#### Family MYRICACEAE

MYRICA L. Bayberry; Wax-Myrtle

**Habit**—Deciduous shrubs. **Twigs**—Moderate, twiggy, gray to deep brown, loose-hairy and resin-dotted. Lenticels inconspicuous. Pith greenish, moderate, somewhat angled. Often aromatic. **Leaf Scars**—Alt., more than two-ranked, rather triangular in shape, little raised. Bundle traces three. No stipular scars. **Buds**—Small, unless enlarged flower buds are present, dark brown to rose colored, often loose-hairy with yellow resin dots at the base of some, about four to seven scales visible. **Bud Content**—Vernation straight, with the leaf ends somewhat pinched together. **Leaf Remnants**—Oblong-lanc., pinnately veined, coarsely serrate near tip, petiole short (2 mm.). **Fruit Remnants**—Drupe 4 to 5 mm. wide, resin dotted.

—\**M. caroliniensis* Mill.

#### Family JUGLANDACEAE

JUGLANS L. Walnut; Butternut

**Habit**—Deciduous trees. **Twigs**—Stout. Lenticels pale. Pith moderate to large, tan to brown, chambered. **Leaf Scars**—Alt., more than two-ranked, shield shaped to three-lobed, large, raised. Bundle traces three, each usually U-shaped. Stipular scars usually lacking. **Buds**—Moderate to large, often superimposed, the terminal one much larger, with two to four bud scales visible; the outer scales the length of the bud and often with remnants of a compound leaf at the top, scurfy-hairy. **Bud Content**—Scales grade into lvs. which are pinnately compound and hairy, the vernation of the leaflets conduplicate. **Leaf Remnants**—Large, pinnately compound. **Fruit Remnants**—A nut enclosed in an indehiscent husk.

1. Downy pad present above the leaf scar; terminal bud usually elongated; pith light brown to dark brown.
2. Leaf scar with a notch at top; not native, rarely planted.
  3. Twigs very stout, often over 7 mm. in diameter; nut rugose or smooth, not ridged; pith often light brown. —\**J. Sieboldiana* Maxim.
  3. Twigs not so stout, seldom 7 mm. in diameter; nut strongly six to eight ridged; pith brown. —\**J. cathayensis* Dode.
2. Leaf scar without a notch at the tip; native trees, rather common.
 

—*J. cinerea* L.
1. Downy pad absent; terminal bud not elongated very much; pith light brown to tan.

4. Twigs glabrescent; buds puberulent; bark smooth; not native and rare.  
—\**J. regia* L.
4. Twigs pubescent; buds canescent; bark rough; native, rather common.  
—*J. nigra* L.

CARYA Nutt. Hickory; Pecan

**Habit**—Deciduous trees. **Twigs**—Moderate to stout. Lenticels pale and conspicuous, long, elongated. Pith moderate to large, five-pointed in section, sometimes obscurely so, pale to brownish. **Leaf Scars**—Alt., more than two-ranked, rather heart-shaped to three-lobed. Bundle scars in three groups, each a circle. Stipular scars none. **Buds**—Sometimes superimposed, rather large, the terminal bud largest. **Bud Content**—Lvs. compound with convolute vernation. Catkins, if present, in terminal bud. **Fruit Remnants**—A nut enclosed in a dehiscent husk.

1. Terminal bud narrow, lanceoloid; bud scales in pairs of equal length, the first pair about as long as the bud and almost covering it.
2. Buds conspicuously yellow, dotted with conspicuous glands; fruit and nut not elongated, seldom longer than wide. —*C. cordiformis* K. Koch.
2. Buds yellowish gray, only slightly glandular; fruit and nut elongated. —*C. pecan* Engl. & Graebn.
1. Terminal bud ovoid; bud scales not in pairs, outer scales short or broken off leaving scars.
3. Bark not shaggy on old trunks; terminal bud broadly ovoid, the outer woody scales falling early. —*C. alba* K. Koch.
3. Bark shaggy on older trunks; terminal bud ovoid, outer scales commonly persistent.
4. Twigs buff to orange in color, usually somewhat pubescent; native to low grounds. —*C. laciniosa* Loud.
4. Twigs dark reddish brown, seldom pubescent; native to uplands. —*C. ovata* K. Koch

*C. glabra* Sweet. has been reported from southern Iowa but if present is very rare.

Family BETULACEAE

BETULA L. Birch

**Habit**—Deciduous trees. Bark of young trunks and branches white to cinnamon-brown, often peeling in papery layers. **Twigs**—Slender, lenticels pale. Pith greenish white to brown, small to moderate. **Leaf Scars**—Alt., two-ranked, half-oval to triangular-crescent. Bundle scars three, often indistinct. Stipular scars narrow, occasionally conspicuous. **Buds**—Terminal bud absent except on very short shoots, buds solitary, ovoid to lanceoloid, three to four bud scales visible, the first two lateral. **Bud Content**—Leaf between broad scale-like

stipules, hairy on both sides, edges with plicate vernation. **Leaf Remnants**—Simple, doubly serrate, pinnately veined. **Fruit Remnants**—Cone-like stobilus, seeds winged and the staminate catkin usually present on some twig ends.

(Based on bark alone)

1. Bark easily separating into papery layers, generally peeling naturally.
2. Outer bark layers of young branches whitish.  
—*B. papyrifera* Marsh. & varieties or \**B. pendula* Roth.
2. Outer bark of young branches not white.
3. Outer bark layer of young branches reddish-brown. —*B. nigra* L.
3. Bark layer of young branches dirty yellow to orange. —*B. lutea* Michx.
1. Bark close, not easily separated.
4. A shrub, never tree-like. —*B. glandulifera* Butler.
4. Typically a tree. —\**B. populifolia* Ait.

(Based on twig and bark characters)

1. A shrub, never tree-like, buds seldom over 3 mm. long. —*B. glandulifera* Butler.
1. Typically trees; buds usually over 3 mm. long.
2. Bark of young branches gray or whitish.
3. Buds usually under 6 mm. long; bark close, not easily separating.  
—\**B. populifolia* Ait.
3. Buds usually over 6 mm. long; bark peeling.  
—*B. papyrifera* and varieties or \**B. pendula* Roth.
2. Bark reddish brown to cinnamon brown.
4. Buds unusually under 6 mm. long; both buds and end of the twigs downy hairy. —*B. nigra* L.
4. Buds usually over 6 mm. long; buds and ends of twigs glabrous or only partly hairy. —*B. lutea* Michx.

*Betula* is a genus best characterized by its bark and flower remains. Its species are often difficult in winter. *B. lenta* L. has been reported native in Iowa but is doubtfully present. Nursery stock has been sold and planted in Iowa under this name, but the ones examined by the writer were too small for accurate checking.

ALNUS MILL. Alder

**Habit**—Shrubs or large trees, deciduous. **Twigs**—Slender, terete or rather three sided. Lenticels fairly conspicuous. Pith becoming brown, moderate, definitely triangular in section. **Leaf Scars**—Alt. obscurely two-ranked, half round. Bundle scars three, sometimes U-shaped. Stipular scars narrow. **Buds**—Solitary, rather large and becoming stalked about three bud scales visible, all about the length of the bud. **Bud Content**—Lvs. with stipules, vernation plicate-edged. **Leaf Remnants**—Simple, broad ellipt. to obovate, pinnately veined,

doubly serrate-dentate. **Fruit Remnants**—Often present as cone-like structures, the staminate catkins present over winter.

1. Large tree; twigs and buds glabrous. —\**A. glutinosa* Gaertn.  
 1. Shrub or small tree; twigs and bud ends usually somewhat pubescent.  
 —*A. incana* Moench.

CARPINUS L. Hornbeam; Blue Beech

**Habit**—Rather small trees, deciduous, bark smooth gray, fluted in long. ridges. **Twigs**—Slender, reddish-brown, sometimes downy pubescent. Lenticels scattered, pale, rather conspicuous. Pith white, moderately large. **Leaf Scars**—Alt. two-ranked, flattened oval. Bundle scars three, often indistinct. Stipular scars not equal. **Buds**—Solitary, the terminal bud absent, reddish-brown, glabrescent except on the edges of the scales. Six to ten bud scales visible in more than two ranks. **Bud Content**—Stipules present with a rather hairy leaf between, vernation plicate edged and somewhat conduplicate. **Leaf Remnants**—Simple, oblong, pinnately veined, doubly serrate. **Fruit Remnants**—A ribbed nutlet with a three lobed bractlet, the catkins all enclosed in the bud. —*C. caroliniana* Walt.

This genus resembles *Ostrya* very closely in twig characters, but differs from it most strikingly in the bark.

OSTRYA Scop. Hop-Hornbeam

**Habit**—Deciduous trees, bark brownish, in small scales. **Twigs**—Slender, reddish-brown, rather zigzag, glabrous. Lenticels pale and small. Pith whitish, small. **Leaf Scars**—Alt. two-ranked, flattened oval. Bundle scars three but often indistinct. Stipular scars unequal. **Buds**—No terminal bud, solitary, reddish-brown, slightly pubescent, eight to nine bud scales visible, somewhat longitudinally striated. **Bud Content**—Stipules broad and scale-like, lvs. simple, whitish hairy, with edges plicate. **Leaf Remnants**—Pinnately veined, oblong-ovate, doubly serrate. **Fruit Remnants**—A ribbed nutlet enclosed in a bladder-like involucre, the staminate catkin usually present over winter. —*O. virginiana* K. Koch.

CORYLUS L. Hazel

**Habit**—Deciduous shrubs, rarely if ever tree-like. **Twigs**—Slender to moderate, rather zigzag, puberulent to pubescent. Lenticels paler, usually conspicuous. Pith becoming tan, small to moderate, often rather angled in section. **Leaf Scars**—Alt. two-ranked, half round to triangular. Bundle scars three or sometimes more. Stipular scars

long. **Buds**—No terminal bud, brown to gray, obliquely sessile, solitary, obtuse and blunt, ciliate, about ten bud scales visible. **Bud Content**—Leaf long silky-hairy with plicate edges and somewhat conduplicate, bud often sticky inside, red stigma often protruding. **Leaf Remnants**—Ovate to obovate, pinnately veined, coarsely doubly serrate, often rather lobulate. **Fruit Remnants**—A nut surrounded or included by an involucre, the staminate catkin usually present.

1. Bud scales ciliate but sparingly pubescent if at all.
  2. Lobes of the involucre entire or sparingly dentate; buds often over 5 mm. long. —\**C. heterophylla* Fisch.
  2. Lobes of the involucre dentate-serrate; buds seldom over 5 mm. long. —\**C. Avellana* L.
1. Bud scales ciliate and definitely pubescent, especially on the longer scales.
  3. Third bud scale as long as the bud, the outer scale commonly falling early, not over four bud scales visible; involucre prolonged into a tube; twig slightly if at all pubescent. —\**C. cornuta* Marsh.
  3. Third bud scale shorter than the bud, more than four bud scales visible; involucre not prolonged; twig with long glandular hairs. —\**C. americana* Marsh.

### Family FAGACEAE

#### FAGUS L. Beech

**Habit**—Deciduous trees, bark gray and smooth. **Twigs**—Rather slender, usually zigzag, gray to brown. Lenticels pale. Pith usually small, often angled, rays of wood prominent. **Leaf Scars**—Alt. two-ranked, half round, not directly beneath the bud. Bundle scars vary, sometimes in threes. **Buds**—Solitary, brownish, often seeming somewhat stalked, elongated and pointed, divergent with sixteen to twenty-four spirally four-ranked bud scales visible. **Bud Content**—Stipules present and resembling scales. Lvs. are simple and densely whitish hairy with plicate edges. Inner scales with translucent edges. **Leaf Remnants**—Often present, simple, ovate to elliptical, pinnately veined, obscurely serrate to dentate. **Fruit Remnants**—A nut in an involucre.

1. Bud scales ciliate on edges and at least somewhat pubescent; end of twig often hairy.
  2. Flat topped, with pendulous branches; end of twig densely hairy. —\**F. sylvatica purpurea-pendula* Rehd.
  2. Not flat topped, branches not pendulous; end of twig not densely hairy. —\**F. sylvatica* L.
1. Bud scales not ciliate on edges, glabrous; twigs glabrous. —\**F. grandifolia* Ehrh.

#### CASTANEA Mill. Chestnut

**Habit**—Deciduous trees with furrowed bark. **Twigs**—Moderate, gray to brown. Lenticels conspicuous, pale and raised. Pith white,



rather large, five-pointed in section. **Leaf Scars**—Alt. two-ranked or appearing more than two-ranked sometimes, half round. Bundle scars three or sometimes more. Stipular scars narrow and unequal. **Buds**—No terminal bud, solitary, rather oblique, two to three scales visible, the outer two-ranked. **Bud Content**—Lvs. between scale-like stipules, vernation straight, the edges a trifle plicate, very brown, hairy. **Leaf Remnants**—Simple, oblong-lanc., spiny-serrate, pinnately veined. **Fruit Remnants**—Nutlets in a spiny involucre.

1. Buds and twigs glabrous or minutely hairy. —\**C. dentata* Borkh.
1. Buds heavily short pubescent; twigs pubescent especially near the end. —\**C. mollissima* Bl.

### QUERCUS L. Oak

**Habit**—Deciduous in Iowa, usually trees. **Twigs**—Slender to moderate. Pith whitish to tan, moderate to large, generally five-pointed in section. **Leaf Scars**—Alt. more than two-ranked, half round and raised, tending to crowd out with the lateral buds toward the twig end. Bundle scars small, numerous, scattered. Stipular scars small or absent. **Buds**—Usually solitary, rather clustered near the end of the twig, bud scales usually numerous and five-ranked. **Bud Content**—Usually numerous inner scales which grade into stipules. Lvs. simple, pinnately veined, usually pubescent, vernation various, straight, conduplicate to revolute. Staminate flowers in catkins. **Leaf Remnants**—Often remaining, varying with the species but simple and pinnately veined. **Fruit Remnants**—An acorn, often present partly developed in winter or fallen on the ground beneath.

(Based on twig, fruit, and habit characters)

1. Shrubs, seldom over 2.5 m. high.
  2. Twigs stout, usually corky winged; acorns with fringed cup. —*Q. macrocarpa* Michx.
  2. Twigs not stout, not corky; acorn cup not at all fringed. —*Q. prinoides* Willd.
1. Typically trees.
  3. Twigs whitish gray, slender and without corky ridges; cup of acorn wholly or almost covering the acorn; very rare in Iowa. —*Q. lyrata* Walt.
  3. Twigs not whitish gray, or if gray with twigs stout and corky ridged; acorn cup more open.
    4. Younger twigs with a yellowish scurf especially on the under side, twigs stout but not corky. —*Q. stellata* Wagh.
    4. No yellow scurf; twigs slender or stout with corky ridges.
      5. Buds definitely downy pubescent over the entire bud surface.
        6. Buds very definitely white or grayish-white downy pubescent, ovoid; twigs glabrous; base of acorn cup obconical. —*Q. velutina* Lam.

6. Buds sparsely downy-pubescent; buds either short and wide or long and conical; twigs usually pubescent; base of acorn cup rounded.  
 7. Buds about as broad as long, obtuse; older twigs often corky ridged; scales of acorn cup fringed, the young acorn not on the tree over the winter, inner surface of acorn shell not tomentose.  
     —*Q. macrocarpa* Michx.
7. Buds long conical, acute; older twigs never corky ridged; acorn cup not fringed, partially developed acorns often present in winter, inner surface of shell tomentose.  
     —*Q. marilandica* Muenchh.
5. Buds glabrous or pubescent only at the margins of the scales or on a part of the bud but not downy over the entire surface.
8. Buds rounded at tip, usually not over one-half longer than broad.
9. Bark of older twigs scaling off in layers; acorn cup long stalked with acuminate cup scales.  
     —*Q. bicolor* Willd.
9. Bark not scaling off on older twigs; acorn cup either not long stalked or if so with scales blunt.
10. Buds very short, as wide or wider than long, the widest part at the base; acorn with prominently thickened scales but not long-stalked.  
     —*Q. alba* L.
10. Buds usually a trifle longer than broad, the widest part at the middle; acorn cup either without thickened scales or, if thickened, on a stalked acorn.
11. Bud scales with lighter, scarious margins; bark of trunk gray, rather scaly.  
     —*Q. Muhlenbergii* Engelm.
11. Margins of scales not scarious; bark dark and furrowed.
12. Bud scales whitish silky ciliate; lvs. with rounded lobes; acorns long stalked.  
     —\**Q. robur* L.
12. Bud scales not ciliate or only slightly so; leaf lobes sharp; acorns not long-stalked.  
     —*Q. ellipsoidalis* E. J. Hill.
8. Buds sharp-pointed, usually much longer than broad.
13. Terminal bud typically over 4 mm. long; acorn over 2 cm. long.
14. Bud scales darker toward the margins, sometimes pubescent near edges; cup of acorn flat below, acorn sides usually bulging.  
     —*Q. borealis* Michx.
14. Bud scales uniform in color, usually with scattered hairs over the entire bud; cup of acorn rounded below, its sides not bulging.  
     —*Q. Shumardii* Buchl.
13. Terminal bud typically 4 mm. or less in length; acorn cup usually less than 2 cm. long.
14. Young branches often beset with spur-like lateral twigs; lvs. lobed, not revolute in the bud; bud scales not scarious on the margins.  
     —*Q. palustris* L.
14. Younger branches not having spur-like twigs; lvs. entire, not lobed, revolute in the bud; bud scales often scarious on the margins.  
     —*Q. imbricaria* Michx.

(Based on leaf, twig, and fruit characters)

1. Lvs. with sharp bristle tips at end of leaf or at end of lobes; bark dark; acorns maturing in two seasons, inner surface of acorn shell usually tomentose. (Black Oak Group)
2. Lvs. with entire, rarely wavy margins, leaf bristle-tipped only at end. —*Q. imbricaria* Michx.
2. Leaf margins lobed with bristle-tips at end of lobes.
3. Lvs. broadly wedge-shaped, broad end out, seldom lobed below middle. —*Q. marilandica* Muenchh.
3. Lvs. not wedge-shaped, broadest part about at middle, lobed below middle.
4. Leaf lobes usually alternate, often pubescent below; buds woolly when mature; upper scales of acorn cup with flaring tips; inner bark orange-yellow. —*Q. velutina* Lam.
4. Leaf lobes usually opposite, glabrous beneath except for hairs in axils of veins in some; buds never woolly; scales of acorn cup appressed; inner bark not bright orange-yellow.
5. Lvs. deeply lobed, often three-fourths the way to mid-rib, most of lobes widest near end of lobe; acorns less than 2 cm. long.
6. Acorn cup flat, covering acorn less than one-half its length; native to lowlands; base of leaf mostly cuneate, sometimes truncate; lateral buds pointed at tip. —*Q. palustris* L.
6. Acorn cup obconical at base, usually covering acorn over one-half; native to uplands; lvs. usually truncate at base, sometimes cuneate; lateral buds rounded at tip. —*Q. ellipsoidalis* E. J. Hill
5. Lvs. lobed less than one-half to midrib, rarely deeper, most of the lobes widest at base of lobe; acorn usually over 2 cm. long.
7. Acorn cup flat at base, acorn sides usually bulging; bud scales darker toward the margins; leaf lobes usually cut-toothed; common. —*Q. borealis* Michx.
7. Acorn cup rounded at base, acorn sides not bulging; bud scales uniform in color; lobes of leaf only slightly cut; rather rare in Iowa. —*Q. Shumardii* Buchl.
1. Lvs. lacking bristle tips although sometimes with acute teeth; bark lightish; acorns maturing in one season, inner surface of acorn shell not tomentose (White Oak Group).
8. Leaf margins large-toothed, wavy or shallowly lobed, the lobes rarely reaching one-half way in to midrib.
9. Bark of smaller branches loosely peeling; acorn stalked, with scales of cup acuminate at tip. —*Q. bicolor* Willd.
9. Bark of smaller branches close; acorns various but not both stalked and with acuminate scales as above.
10. Shrubs, under 2.5 m. high.
11. Twigs stout, usually corky winged. —*Q. macrocarpa* Michx.
11. Twigs slender, not corky. —*Q. prinoides* Willd.
10. Tree-like.

12. Lvs. not lobed, with remote teeth, with main veins all ending in teeth; acorns neither fringed nor stalked. —*Q. muhlenbergii* Engelm.
12. Lvs. usually shallowly lobed; not all main veins ending in the lobe tips; acorns fringed or stalked.
13. Twigs grayish, sometimes corky; common native tree; acorns not long stalked, cup fringed at top; buds short, about as wide as long. —*Q. macrocarpa* Michx.
13. Twigs reddish brown to olive brown, never corky; a cultivated tree rare in Iowa; acorns long stalked, cup not fringed; buds longer than wide. —\**Q. robur* L.
8. Lvs. rather deeply lobed, usually over one-half way to midrib.
14. Lvs. glabrous, lobes rather equal in length and width; scales of acorn cup heavily tuberculate, without fringed tips. —*Q. alba* L.
14. Lvs. pubescent, below at least, lobes seldom equal; scales of acorn flat, or, if thickened, with long attenuated tips on some.
15. Young twigs yellow-scurfy, older twigs short-scurfy hairy; acorns small, seldom over 12 mm. in diameter, cup not at all fringed. —*Q. stellata* Wang.
15. Young twigs grayish, older twigs glabrous or nearly so; acorns usually over 12 mm. in diameter, cup more or less fringed.
16. Leaf lobes often acute; acorn cup almost or completely covering acorn, twigs never corky; a very rare tree in Iowa. —*Q. lyrata* Walt.
16. Leaf lobes usually obtuse or rounded; acorn cup rarely almost covering acorn; twigs sometimes corky ridged; a very common tree in Iowa. —*Q. macrocarpa* Michx.

The treatment of the oaks in this region in Rehder is not always satisfactory. *Q. Shumardii* Buchl. as considered here is the same as *Q. Schneckii* Britton, and the common red oak *Q. borealis* Michx. in this list is the *Q. rubra* L. of Gray's Manual, seventh edition. The most generally distributed oaks in Iowa are *Q. borealis*, *Q. macrocarpa*, *Q. velutina*, and *Q. alba*.

#### Family ULMACEAE

ULMUS, L. Elm.

**Habit**—Deciduous trees, bark rough. **Twigs**—Rather slender, often zigzag, sometimes corky, usually pubescent. Pith whitish sometimes becoming tan, small to moderate. **Leaf Scars**—Alt. two-ranked, half round to crescent-shaped or triangular, somewhat raised, slightly to one side of the bud. Bundle scars three or in three groups. Stipular scars unequal, the longer one under the bud. **Buds**—Solitary, rarely collaterally branched, about four to eight bud scales visible in two ranks. **Bud Content**—Lvs. simple, pinnately veined, vernation conduplicate with edges plicate. Flowers in separate thicker buds. **Leaf**

**Remnants**—Usually oblique at base and doubly serrate, dark green above. **Fruit Remnants**—A compressed nutlet, surrounded by a wing, seldom present.

1. Buds under 2 mm. in length, usually four bud scales visible. —\**U. pumila* L.
1. Buds over 2 mm. long, over four bud scales visible.
  2. Buds covered with rusty red hairs; twigs light gray in color. —*U. fulva* Michx.
  2. Buds glabrous or with hairs not rusty; twigs brown to gray-brown.
  3. Branches and older twigs typically with corky ridges or wings.
  4. Buds typically over 5 mm. long, rather long pointed; twigs brown to gray. —*U. racemosa* Thomas.
  4. Buds under 5 mm. long, ovoid; twigs light brown. —\**U. japonica* Sarg.
  3. Branches and twigs without corky ridges.
  5. Crown of tree flat and depressed, branches drooping; leaf buds broad, often over 6 mm. wide. —\**U. glabra pendula* Rehd.
  5. Crown not flat; leaf buds narrower.
  6. Buds blackish-brown; rarely seen in Iowa, not native.
    7. Bud scales white-ciliate, appearing woolly-white at end of bud; twigs straw to light brown in color. —\**U. foliacea* Gilib.
    7. Bud scales brown-ciliate, not woolly; twigs brownish to gray-brown. —\**U. glabra* Huds.
    6. Buds light brown; native and very common. —*U. americana* L.

#### ZELKOVA Spach.

**Habit**—Deciduous, usually trees with short trunks. **Twigs**—Rather slender, light brown, slightly pubescent near ends. Lenticels paler, rather conspicuous. Pith pale, small to moderate, spongy except near the nodes. **Leaf Scars**—Alt., two-ranked, triangular to flattened oval, some raised. Bundle traces three. Stipular scars unequal. **Buds**—Often collaterally multiple, brown, ciliate and sparingly hairy, about four to six bud scales visible in four ranks. **Bud Content**—Lvs. glabrous, ovate, serrate and pinnately veined, vernation conduplicate. **Leaf Remnants**—Ovate to oblong, oblique-rounded at base, sharply serrate. **Fruit Remnants**—A drupe, wingless. —*Z. serrata* Mak.

Another species *Z. sinica* Schneid. may be present, differing in its more definitely pubescent twigs and buds, but both are very rarely planted here.

#### CELTIS L. Hackberry

**Habit**—Deciduous trees with bark becoming warty and gnarled. **Twigs**—Slender, reddish-brown. Lenticels scattered, slightly raised.

Pith white, rather small, finely chambered at nodes. **Leaf Scars**—Alt. about two-ranked, triangularly oval. Bundle scars three or as a confluent group. Stipular scars narrow. **Buds**—No terminal bud, about 3 mm. long, dark brown, appressed, four bud scales visible in two ranks. **Bud Content**—Stipules as scales, lvs. glabrous with straight vernation. **Leaf Remnants**—Simple, ovate, long-acuminate, palmately veined. **Fruit Remnants**—A drupe, reddish to purple, about seven to ten mm. long. —*C. occidentalis* L.

## Family MORACEAE

## MORUS L. Mulberry

**Habit**—Deciduous trees with bark rather scaly. **Twigs**—Slender to moderate, sometimes with milky sap, gray to brownish, puberulent. Lenticels usually conspicuous. Pith whitish, moderate to large. **Leaf Scars**—Alt. two-ranked, oval flattened on the top, raised, running about parallel with the twig. Bundle scars many, scattered or in a ring. Stipular scars narrow, unequal. **Buds**—Terminal bud lacking, usually solitary, brownish, appressed or spreading, four to five bud scales visible in two ranks. **Bud Content**—Vernation of leaves straight. Flowers, if present, globose clusters in the axil of the lvs. **Leaf Remnants**—Simple, ovate, serrate-dentate, often with rounded lobes, palmately veined. **Fruit Remnants**—A syncarp of achenes.

1. Buds large, often up to 6 mm. long, usually spreading. —*M. rubra* L.
1. Buds smaller, rarely over 5 mm. long, appressed.
  2. Bud scales conspicuously darkened at margins; twigs gray to yellowish. —\**M. alba tatarica* Loud.
  2. Bud scales only slightly darkened at margins, twigs gray, reddish to brown.
    3. Twigs gray to brownish tan, a fairly common, rather large tree. —\**M. alba* L.
    3. Twigs gray to reddish brown; usually a small tree, rarely planted here. —\**M. nigra* L.

## MACLURA Nutt. Osage-Orange

**Habit**—Deciduous trees with furrowed, rather orange colored bark, the exposed roots very bright orange. **Twigs**—Rounded or three-sided, rather zigzag, commonly with dwarf branches, glabrous, commonly spiny, the spine being lateral to bud, with milky sap usually evident when twig is cut. Pith whitish, large. Heartwood becoming yellow. **Leaf Scars**—Alt. more than two-ranked, oval to half round, somewhat raised. Bundle traces vary, usually more than three, scattered, in a ring or in three groups. Stipular scars small or small stipules re-

main. **Buds**—Small, often collaterally branching, flattened from the end to appear partly concealed, terminal bud not evident, four to five bud scales visible. **Bud Content**—Too small to make out detail. **Leaf Remnants**—Long-elliptical, acuminate, entire, pinnately veined, with milky sap often evident. **Fruit Remnants**—A large globose syncarp of drupelets, often over 10 cm. in diameter.

—?\**M. pomifera* Schneid.

A thornless variety *M. pomifera inermis* Schneid. is occasionally planted.

#### Family ARISTOLOCHIACEAE

ARISTOLOCHIA L. Birthwort; Dutchmans Pipe

**Habit**—Deciduous, softwooded twiners. **Twigs**—Greenish, terete but swollen at the nodes. Lenticels not conspicuous. Pith rather large, whitish. Wood ducts and rays prominent. **Leaf Scars**—Alt. U- to horseshoe-shaped. Bundle scars three. Stipular scars none. **Buds**—Superimposed, almost concealed in a downy, olive-colored patch of hairs. **Bud Content**—Lvs. broadly ovate to heart-shaped, vernation straight or nearly so. **Leaf Remnants**—Base of petiole covers most of bud. Lvs. ovate, rather cordate at base, entire, palmately veined, petiole 4 to 5 cm. long. **Fruit Remnants**—A 6 ribbed capsule 6 to 8 cm. long.

1. Twigs tomentose especially near the ends.

—\**A. tomentosa* Sims.

1. Twigs glabrous.

—\**A. durior* Hill.

#### Family CERCIDIPHYLLACEAE

CERCIDIPHYLLUM Sieb. & Zucc. Katsura-Tree

**Habit**—Small deciduous trees. **Twigs**—Slender, gray to gray brown, glabrous. Lenticels rather conspicuous, becoming transversely elongated. Pith greenish to white, rather small. **Buds**—No terminal bud, laterals solitary, reddish to brown, glabrous, with two bud scales visible, the first one next to the twig and almost the length of the bud. **Bud Content**—Inner scales rose colored. Lvs. ovate, cordate at base, palmately veined, the edges with yellow glands on teeth, vernation involute. Stipules present. **Leaf Remnants**—Ovate, crenate-serrate, glabrous. **Fruit Remnants**—A pod, many seeded, 1.5 to 2 cm. long.

—\**C. japonicum* Sieb. & Zucc.

#### Family RANUNCULACEAE

PAEONIA L. Peony

**Habit**—Small, rather unsymmetrical, deciduous shrubs. **Twigs**—

Stout, gray to light brown, glabrous. Finely black-dotted under a lens. Pith large, becoming yellow-brown. **Leaf Scars**—Alt. more than two-ranked, half round to triangular, large, somewhat raised. Bundle scars about seven in a U-shape with a larger one in the center of the leaf scar. Stipular scars none. **Buds**—No terminal bud, laterals large, often 18 mm., solitary, brown to rosy pink near end, with nine to eleven bud scales visible in many ranks, keeled and attenuated under the tip of scale. **Bud Content**—Lvs. appear compound or deeply lobed, the vernation of the parts convolute, petiole base wide. Flower when present solitary, surrounded by lvs. **Leaf Remnants**—Large, bipinnate. **Fruit Remnants**—A pubescent follicle.  
—\**P. suffruticosa* Andr.

ZANTHORHIZA L'Herit. Yellow-root

**Habit**—Small deciduous, sparingly branched shrubs. **Twigs**—Gray to gray brown, glabrous. Lenticels not conspicuous. Pith rather large, lemon-yellow like the wood. Wood rays prominent. **Leaf Scars**—Alt., more than two-ranked, shallowly U-shaped, almost encircling the twig. Bundle traces eleven to twelve. Stipular scars lacking. **Buds**—Greenish-gray to yellow-brown, the terminal bud large, with mucronate tips, about four visible scales, glabrous but somewhat ciliate. **Bud Content**—Inner scales with leaf-like structure at tip. Lvs. pinnately compound, with three serrate lfts., base broad, glabrous, vernation of lfts. convolute. Flowers when present at the side of the leaf cluster. **Leaf Remnants**—Pinnately compound with five incised lfts. **Fruit Remnants**—In racemes, follicles one seeded.  
—\**Z. apiifolia* L'Herit.

CLEMATIS L. Virgins Bower

**Habit**—Soft wooded, climbing by petiole tendrils. **Twigs**—Ridged. Lenticels not conspicuous. Pith moderate, angled because of cavities in cortex, continuous except for a thin plate at the node. **Leaf Scars**—Petioles persistent, opposite, connected by a ridge. Stipular scars none. **Buds**—No terminal bud, small, solitary, pubescent, four to six scales visible in four ranks, outer keeled. **Bud Content**—Lvs. appearing three-lobed or ternate, small. **Fruit Remnants**—Globose head of achenes with plumose styles.

1. Twigs gray to straw-colored, with twelve angles, and heavy pubescence; lvs. if present compound, of three to five entire lfts., none simple.

—\**C. paniculata* Thunb.



1. Twigs light brown to reddish-brown or gray-brown, glabrous or finely pubescent; lvs., if present, with incised lfts., or entire with some of the upper ones simple.
2. Twigs reddish-brown; some of the upper lvs. simple with entire margins; never native. —\**C. Jackmani* Th. Moore.
2. Twigs brown to light gray-brown; lvs., if present, compound with three incised lfts.; often native.
3. Stems woody only at base; rather common. —*C. virginiana* L.
3. Stems woody throughout; very rare in Iowa. —*C. verticillaris* DC.

Two other species of *Clematis* are found in Iowa, *C. texensis* Buckl. a cultivated vine and *C. Pitcheri* T. & G., a native plant. They seldom, if ever, become woody here and for that reason are not included in the key.

### Family BERBERIDACEAE

#### MAHONIA Nutt.

**Habit**—Evergreen shrubs. **Twigs**—Rather stout, grayish-tan to straw-colored, slightly puberulent. Lenticels inconspicuous. Pith pale, large. Medullary rays of wood large. **Leaf Scars**—Alt., two or more ranked, narrow, half encircling the stem, little raised. Bundle scars eight to nine. Stipular scars lacking. **Buds**—Brown to greenish, four or five scales visible which often have three spine-like structures at the tip or two with a scar between. **Bud Content**—Scales grade into lvs. which have broad, flat bases, two stipules at sides, pinnately compound leaf with weakly conduplicate lfts. **Leaf Remnants**—About seven lfts., thick, and spiny-edged. **Fruit Remnants**—Bluish black, bloomy berry about 8 mm. wide.

—\**M. Aquifolium* Nutt.

#### BERBERIS L. Barberry

**Habit**—Deciduous shrubs. **Twigs**—Slender with angles or ridges below the leaf scars, reddish-brown to gray, glabrous, one to three spines below the leaf scars. Lenticels not conspicuous. Pith moderate and yellow like the wood. **Leaf Scars**—Alt., more than two-ranked, half round, grouped on a short shoot terminated by the bud. Bundle scars three, often indistinct. No stipular scars. **Buds**—Solitary, ovoid, glabrous, six to ten scales visible, outer with scars at the end. **Bud Content**—Scales grade into lvs., green and glabrous with straight veneration. **Leaf Remnants**—Often present, simple, pinnately veined, narrow, cuneate. **Fruit Remnants**—Often present, a red to purplish berry.

1. Twigs gray; thorns often three at a node. —\**B. vulgaris* L.  
 1. Twigs reddish brown; thorns usually one at a node. —\**B. Thunbergii* DC.

Family MENISPERMACEAE

MENISPERMUM L. Moonseed

**Habit**—Deciduous twiners. **Twigs**—Rather slender, fluted, straw-colored, glabrous. Lenticels not conspicuous. Pith white, very large, fluted or angled. Vascular strands show as enlarged structures below angles in the twig. **Leaf Scars**—Alt., oval or elliptical, concave, a line or tear extending down from the top, raised and parallel to the twig. Bundle scars seven, often in three groups. No stipular scars. **Buds**—Superimposed, with the lower covered by the scar, straw-colored to brownish-red with two to three obtuse, hairy, small, short visible scales. **Bud Content**—Too small to make out. **Leaf Remnants**—Petioles long, lvs. orbicular, ovate, cordate and somewhat pelate, palmately veined, entire. **Fruit Remnants**—A blue-black drupe 8 mm. in diameter with a ring-like or crescent-shaped stone.

—*M. canadense* L.

Family MAGNOLIACEAE

MAGNOLIA L. Magnolia

**Habit**—Deciduous or sometimes half evergreen trees or shrubs. **Twigs**—Rather aromatic, stout, with conspicuous terminal flower buds usually present. Lenticels pale. Pith large, sometimes diaphragmed. **Leaf Scars**—Alt., two- or more than two-ranked, broadly crescent, oval or U-shaped, little raised. Bundle traces many, often scattered. Stipular scars as a linear line encircling the twig. **Buds**—Solitary, ovoid or fusiform, terminal usually enlarged, one bud scale formed at the back. **Bud Content**—Under the two outer connate stipules is a conduplicate leaf, then two more stipules and another leaf. In the flower buds the flower is in the center of the lvs., flower parts often large, many stamens and pistils. **Leaf Remnants**—Simple, pinnately veined, entire. **Fruit Remnants**—Cone-like and of dehiscent carpels.

1. Leaf scars clustered at the swollen places on the twig; terminal bud acuminate, usually over 30 mm. long, glabrous.  
 2. Young lvs. in the bud with cordate, auriculate base. —\**M. Fraseri* Walt.  
 2. Young lvs. in the bud with long cuneate base. —\**M. tripetata* L.  
 1. Leaf scars scattered; terminal bud not elongately pointed, rarely 25 mm. long, hairy or glabrous.  
 3. Deciduous or half evergreen; pith sometimes with diaphragms; terminal bud under 10 mm. long, silky short-hairy or glabrous. —\**M. virginiana* L.

3. Deciduous; pith never with diaphragms; terminal bud usually over 10 mm. long, especially flower buds; hairs on bud coarse.
4. Leaf scars definitely U- or V-shaped, surrounding the bud over one-half; flower buds not swollen at middle. —\**M. acuminata* L.
4. Leaf scars crescent-shaped, not surrounding the bud over one-half; flower buds swollen at middle.
5. Young twigs greenish beneath pubescence; leaf buds and lateral buds only slightly hairy. —\**M. kobus* Thunb.
5. Young twigs reddish-brown beneath hairs; leaf buds and lateral buds coarse-hairy. —\*X *M. Soulangeana* Soul.

#### LIRIODENDRON L. Tulip-tree

**Habit**—Deciduous trees with ridged bark. **Twigs**—Rather stout, glabrous, reddish brown, smooth, rather aromatic and bitter tasting. Lenticels pale, elongated, conspicuous. Pith white, moderate, continuous but with firmer diaphragms. **Leaf Scars**—Alt. more than two-ranked, almost round, slightly raised, large. Bundle scars in a scattered obscure ring. Stipular scars narrow and encircling the twig. **Buds**—Solitary or superimposed, reddish brown, often glaucous, terminal bud flattened, blunt and appearing stalked, two bud scales visible. **Bud Content**—Beneath the two connate scales is a leaf with a broad truncate apex, vernation conduplicate and reclinate. Then a series of two more scales and another leaf, etc. **Leaf Remnants**—Simple, rather square in shape. **Fruit Remnants**—A spindle-like column, usually present, upon which the winged carpels were crowded. —\**L. Tulipifera* L.

#### Family CALYCATHACEAE

#### CALYCANTHUS L. Allspice

**Habit**—Deciduous shrubs. **Twigs**—Moderate, two-angled or ridged from each leaf scar, dark reddish-brown, short-hairy. Lenticels pale, rather conspicuous. Pith white, moderate to large, round or six-angled in section, odor rather spicy. **Leaf Scars**—Opp., U- to horse-shoe-shaped. Bundle scars two. Stipular scars none but opposite leaf scars connected by a transverse ridge. **Buds**—No terminal bud, laterals small, partly concealed, bud scales indistinct, silky hairy. **Bud Content**—Lvs. with straight vernation. **Leaf Remnants**—Elliptical, entire, pinnately veined, lighter and densely short hairy beneath. **Fruit Remnants**—An urn-like receptacle 6 to 7 cm. long containing ovoid achenes. —\**C. floridus* L.

## Family ANNONACEAE

ASIMINA Adans. Pawpaw

**Habit**—Small deciduous trees. **Twigs**—Moderate, often a trifle zig-zag, reddish brown. Lenticels inconspicuous. Pith white, rather small, becoming partitioned by inconspicuous green diaphragms. Bark of twig tough. **Leaf Scars**—Alt., two-ranked, horseshoe- to U-shaped. Bundle scars commonly five. Stipular scars none. **Buds**—Terminal bud flat, elongated, densely covered with silky dark brown hairs, no evident bud scales, some of laterals globose. **Bud Content**—Lateral globose flower buds contain flowers with three sepals, three petals, many stamens in a ball near the top and six pistils in the center. **Leaf Remnants**—Obovate, entire, cuneate, with acuminate tip. **Fruit Remnants**—An oblong, fleshy berry. —*A. triloba* Dun.

## Family LAURACEAE

SASSAFRAS Nees. Sassafras

**Habit**—Deciduous trees with bark deeply furrowed into flat ridges, separated by narrow horizontal cracks. **Twigs**—Stout to slender, greenish to reddish brown, glabrous and glaucous near the end. Lenticels dark, not very conspicuous. Pith pale, moderate, sometimes five-angled. Odor of twigs and roots aromatic. **Leaf Scars**—Alt., more than two-ranked, half round, somewhat raised. Bundle scars one as a transverse line, sometimes broken. Stipular scars none. **Buds**—Solitary, greenish to brown, with four to five bud scales visible, which are somewhat keeled. **Bud Content**—Inner scales silky-hairy and grading into the leaves, these being hairy on the back with straight vernation. **Leaf Remnants**—Ovate, entire, often three-lobed and obovate. **Fruit Remnants**—A drupe.

—\**S. officinale* Nees & Eberm.

## Family SAXIFRAGACEAE

PHILADELPHUS L. Mock Orange

**Habit**—Deciduous shrubs. **Twigs**—Slender, six- to eight-angled, the bark soon peeling off in small plates, usually reddish-brown. Lenticels not conspicuous. Pith white, moderate to large. **Leaf Scars**—Opposite, crescent to half-round in shape, often broken at tip by the bud, raised. Bundle scars three, these sometimes U- or C-shaped. Stipular scars none but opposite leaf scars connected by a transverse ridge. **Buds**—Solitary, small, often partially concealed by leaf scar, about two to three somewhat pubescent bud scales visible. **Bud**

**Content**—Lvs. valvate, boat-shaped but with straight vernation. **Leaf Remnants**—Simple, remotely serrate, pinnately veined. **Fruit Remnants**—Often present, a four-valved capsule.

This is a genus with well marked winter characters but with the species almost impossible to distinguish in any condition. X *P. Lemoinei* seems rather definite and differs from the other forms collected, by its short hairy twigs. No species key was attempted.

#### DEUTZIA Thunb. Deutzia

**Habit**—Deciduous shrubs. **Twigs**—Moderate to slender, often rather angled, stellate-pubescent, bark usually exfoliating finally. Pith small to large, white or brown, spongy or excavated in center between the nodes. **Leaf Scars**—Opp., V- to crescent-shaped, slightly raised. Bundle scars three. No stipular scars but opposite leaf scars connected by a transverse ridge. **Buds**—Solitary or collaterally branched, slightly stellate-scurfy with four to ten bud scales visible in four ranks, the outer keeled and often attenuated. **Bud Content**—Scales grade into lvs. which are pinnately veined, simple, vernation straight but the leaf keeled. Flowers in a cone-shaped cluster in center of leaves. **Leaf Remnants**—Serrate, stellate-hairy on one side at least, pinnately veined. **Fruit Remnants**—Three- to five-valved capsule.

1. Pith brownish; bud scales short attenuated. —\**D. scabra* Thunb.
1. Pith whitish; bud scales long attenuated.
  2. Twigs not angled; lvs. if present stellate only above. —\**D. gracilis* Sieb & Zucc.
  2. Twigs six-angled from the leaf scar; lvs. stellate on both sides. —\*X *D. Lemoinei* Lemoine

#### HYDRANGEA L. Hydrangea

**Habit**—Deciduous shrubs or small trees. **Twigs**—Moderate to stout, soft-wooded, often straw-colored. Lenticels not conspicuous. Pith large, white. **Leaf Scars**—Opposite or whorled, crescent-shaped, very little raised. Bundle scars three. Stipular scars lacking but opposite leaf scars connected by transverse ridges. **Buds**—Straw to brown, six to eight bud scales visible in four ranks, solitary. **Bud Content**—Lvs. valvate with straight vernation. **Fruit Remnants**—A capsule but remnants of flower usually present in a panicle or corymb.

1. Buds short, conical, at about right angles to the twig; leaf scars often whorled; inflorescence remains elongated. —\**H. paniculata* Sieb.
1. Buds ovoid, not so spreading; leaf scars rarely whorled; inflorescence remains rather flat topped. —*H. arborescens* L.

RIBES L. Currant; Gooseberry

**Habit**—Deciduous shrubs. **Twigs**—Usually moderate and somewhat ridged or angled, epidermis quickly shredding, often with prickles, especially at the nodes. Pith whitish, at least at first, usually moderate, becoming spongy. **Leaf Scars**—Alt., more than two-ranked, U- or V-shaped to crescent, slightly raised. Bundle scars three. Stipular scars none. **Buds**—Solitary, often becoming stalked, ovoid or lanceoloid with about five to eight usually keeled bud scales visible. **Bud Content**—Lvs. with broad flat base. Flowers in center of lvs. with five sepals. **Leaf Remnants**—Simple, palmately veined and lobed. **Fruit Remnants**—A berry, rarely present.

1. Thorns or prickles present at some of the nodes.
  2. Cult. in gardens for fruit; not native. —\**R. Grossularia* L.
  2. Not cultivated for fruit ordinarily; found native. Three species seem to fall here, indistinguishable in winter condition and showing intergradations in any condition.
    - R. Cynosbati* L., —*R. missouriensis* Nutt., —*R. oxyacanthoides* L.
1. No thorns or prickles.
  3. Bud scales and often the twig with sessile, yellow resin-dots or glands. —\**R. nigrum* L.
  3. No yellow glands present.
    4. Twigs gray-tomentose. —\**R. odoratum* Wendl.
    4. Twigs glabrous to short puberulent.
      5. Buds downy-pubescent, especially near the ends. —\**R. sativum* Syme.
      5. Buds glabrous or puberulent.
        6. Twigs and buds glabrous. —\**R. alpinum* L.
        6. Twigs and usually the buds short, puberulent, ciliate.
          7. Native; twigs puberulent. —*R. americanum* Mill.
          7. Cultivated, not native; twigs glabrous.
            8. Terminal bud obtuse, reddish-brown. —\**R. aureum* Pursh.
            8. Terminal bud acute, light brown to gray. —\**R. petraeum* Wulf.

*R. missouriense* is here considered to be the same plant as *R. gracile* of Gray's Manual, seventh edition, and *R. americanum* the same as *R. floridum*. The taxonomy of this genus is somewhat confused.

In addition to the species listed in the key *R. glandulosum* Grauer., a prostrate or reclining currant, has been reported somewhat doubtfully from Dubuque County.

Family HAMAMELIDACEAE

LIQUIDAMBAR L. Sweet Gum

**Habit**—Deciduous, rather conical trees, bark dark, furrowed. **Twigs**—Moderate to stout, often with corky ridges, often developing short spur-like twigs. Lenticels light, rather conspicuous. Pith pale, be-

coming brown, moderate, rather five-angled and spongy. **Leaf Scars**—Alt., more than two-ranked, half round. Bundle scars three. Stipular scars none. **Buds**—Solitary, reddish-brown, sometimes appearing stalked, short ciliate, about eight to nine rather apiculate bud scales visible. **Bud Content**—Lvs. deeply lobed with conduplicate, serrate, acuminate lobes. Stipules at side of leaf. **Leaf Remnants**—With five to seven lobes, like a star. **Fruit Remnants**—Capsules in long stalked globose clusters, seeds winged. —\**L. Styraciflua* L.

The corky ridges on the bark of this species were described by Gregory in 1888 (22).

#### HAMAMELIS L. Witch-Hazel

**Habit**—Deciduous shrubs or small trees. **Twigs**—Rather slender, zigzag. Lenticels not conspicuous. Pith pale, moderate. **Leaf Scars**—Alt. usually two-ranked, rather triangular. Bundle scars usually three but sometimes more or less. Stipular scars unequal, separated from leaf scar. **Buds**—Solitary, hairy, naked except for two lateral stipules which often remain, stalked. **Bud Content**—Lvs. conduplicate, edges appearing plicate, very hairy. Flowers present all winter outside the bud, but often closed, perianth parts in four, with four stamens, one ovary and two styles. **Leaf Remnants**—Oblong to obovate, simple, pinnately veined, somewhat stellate-hairy on the veins below. **Fruit Remnants**—Often present, a two-valved, two-seeded capsule, the seeds black.

1. Flowers opening in the autumn, remaining open all winter; terminal bud often over 7 mm. long. —*H. virginiana* L.

1. Flowers remaining closed until spring; terminal bud usually less than 7 mm. long. —\**H. vernalis* Sarg.

#### Family EUCOMMACEAE

##### EUCOMMIA Oliv.

**Habit**—Deciduous, becoming trees. **Twigs**—Moderate, rather zigzag, reddish-brown with a gray scurf often present. Lenticels paler and somewhat elongated, rather conspicuous. Pith white, rather large, becoming chambered. Inner bark with rubbery strands. **Leaf Scars**—Alt., two- or more than two-ranked, half-elliptical. Bundle scar one, rather U-shaped. Stipular scars none. **Buds**—Reddish-brown, about six ciliate bud scales visible. **Bud Content**—Inner scales grade into ovate, serrate, pinnately veined lvs., the vernation straight but the lvs. wrapped around the inner mass. **Leaf Remnants**—Ovate to oblong, about six pairs of veins. **Fruit Remnants**—A compressed, one-seeded, winged nutlet. —\**E. ulmoides* Oliv.

Family PLATANACEAE

PLATANUS L. Buttonwood; Sycamore; Plane-tree

**Habit**—Deciduous trees, bark dark-brown, furrowed at the base of the trunk, the ridges with plate-like scales, higher on the trunk peeling off and exposing the conspicuous whitish to yellowish inner bark. **Twigs**—Moderate to slender, glabrous. Lenticels small, pale. Pith pale, rather large. Wood rays conspicuous. **Leaf Scars**—Alt., usually two-ranked, horseshoe-shaped, almost surrounding the bud. Bundle scars five to eight. Stipular scars as a ring encircling the entire twig. **Buds**—No terminal bud, laterals solitary, conical, brownish, glabrescent, covered by one bud scale. **Bud Content**—Rather resinous and sticky. Lvs. simple, tan-woolly, with plicate veneration. **Leaf Remnants**—Simple, palmately lobed and veined. **Fruit Remnants**—A globose syncarp about 2.5 cm. in diameter bearing nutlets.

—*P. occidentalis* L.

The two other species may be looked for in cultivation and are sold by nurseries, but no specimen examined was in proper condition for accurate identification.

Family ROSACEAE

PHYSOCARPUS Maxim.

**Habit**—Deciduous, loosely branching shrubs. **Twigs**—Rather slender, two- or three-ridged from below each leaf scar, the older twigs with bark shredding. Lenticels not conspicuous. Pith tan, moderate. **Leaf Scars**—Alt., two- or more than two-ranked, crescent to somewhat three-lobed in shape, raised, forming a shelf for the bud base. Bundle scars five, the lower larger. **Buds**—Solitary, appressed, rather small, about five to ten brownish scales visible in several ranks. **Bud Content**—Lvs. hairy-white, veneration conduplicate to plicate edged. **Leaf Remnants**—Broad-ovate, margins crenate, palmately veined and lobed. **Fruit Remnants**—Of three to five brown follicles.

1. Follicles glabrous; twigs and buds moderate in size, the twigs often 2 mm. in diameter; buds often over 3.5 mm. long. —*P. opulifolia* Maxim.

1. Follicles pubescent; twigs and buds slender and smaller —*P. intermedius* Schneid.

STEPHANANDRA Sieb. & Zucc.

**Habit**—Small, loosely branched, deciduous shrubs. **Twigs**—Slender, zigzag, glabrous, straw to light brown. Bark of twig somewhat fissured. Lenticels inconspicuous. Pith pale to light brown, small to moderate. **Leaf Scars**—Alt., two-ranked, triangular to crescent-



shaped, little raised. Bundle scars three. Stipular scars rather large. **Buds**—Small, commonly superimposed, the uppermost larger, brownish, ciliate, about four bud scales visible, the outer keeled. **Bud Content**—Lvs. ovate and lobed, vernation straight. Stipules at sides of leaves. **Leaf Remnants**—Simple, lobed, serrated margins. **Fruit Remnants**—Of follicles in terminal panicles. —\**S. incisa* Zabel.

SPIRAEA L. Spirea

**Habit**—Deciduous shrubs. **Twigs**—Usually slender and rather zig-zag, often ridged from the leaf scars. Lenticels inconspicuous. Pith pale to brown, moderate to large. **Leaf Scars**—Alt., more than two-ranked, half-round, often much raised, forming a shelf for the bud. Bundle scar one. No stipular scars. **Buds**—Small, solitary or occasionally collaterally branched, globose to lanceoloid. **Bud Content**—Scales grade into simple lvs. with straight vernation, the ends sometimes pinched together. **Leaf Remnants**—Simple, margins dentate, serrate or lobed. **Fruit Remnants**—Follicles in umbels, corymbs or panicles.

1. Twigs terete or two ridged for only a very short distance below the leaf scar; buds spreading; twigs glabrous.
2. Buds widest at or just below the middle; twigs sometimes with short ridges. —\**S. Vanhouttei* Zabel.
2. Buds broadest at or near base; twigs not at all ridged.
3. Twigs usually reddish brown to gray; lvs. if present sub-orbicular, obtuse and palmately veined. —\**S. trilobata* L.
3. Twigs deep reddish brown; lvs. if present rhombic-lanceolate, acute, pinnately veined. —\**S. catoriensis* Lour.
1. Twigs definitely two or three ridged for some distance below the leaf scar; buds appressed or spreading; twigs glabrous or pubescent.
4. Buds acuminate, the points bent toward the twig.
5. Twigs strongly three ridged from below each scar; buds large, often over 4 mm. long; fruits in an elongated panicle. —\**S. salicifolia* L.
5. Twigs moderately two ridged from below the scars, rarely faintly three ridged; buds shorter; fruits in a flat topped corymb. —\**S. bumalda* Burenich.
4. Buds acute to obtuse, tips not bent.
6. Buds heavily tomentose near end; young twigs heavily pubescent.
7. Branches reddish brown; accessory collateral buds common; fruits in a sessile umbel, usually not present. —\**S. prunifolia* Sieb. & Zucc.
7. Branches light brown to gray; accessory buds seldom present; fruit remnants usually present as an elongated panicle.
8. Twigs glabrous or nearly so; buds sparingly pubescent near tip. —\**S. alba* Dur.
8. Twigs definitely pubescent; buds pubescent.

9. Twigs rusty tomentulose; follicles hairy. —*S. tomentosa* L.  
 9. Twigs gray tomentose; follicles glabrous. —\**X S. Billiardii* Herinicq.  
 6. Buds glabrous or ciliate to puberulent; twigs glabrous to tomentose.  
 10. Young twigs heavily tomentose; lvs. when present linear. —\**S. Thunbergii* Sieb.  
 10. Young twigs glabrous to puberulent; lvs. not linear.  
 11. Follicles borne in a terminal panicle which generally persists.  
 12. Twigs reddish brown; pedicels of inflorescence glabrous. —\**S. latifolia* Borkh.  
 12. Twigs light brown to gray brown; pedicels of inflorescence pubescent.  
 13. Pith becoming orange brown; native as well as cult. —*S. salicifolia* L.  
 13. Pith pale; not native. —\**S. alba* Dur.  
 11. Follicles borne in a simple umbel or umbel-like raceme.  
 14. Twigs reddish brown on young growth, internodes often short. —\**S. hypericifolia* L.  
 14. Twigs straw to gray tan on young growth, internodes not usually short. —\**S. chamaedryfolia* L.

SORBARIA A. Br. Sorbaria

**Habit**—Deciduous shrubs. **Twigs**—Rather stout, often zigzag, straw-gray to brownish-gray. Lenticels large, conspicuous. Pith large, brown. **Leaf Scars**—Alt., obscurely two-ranked, half round, oval to triangular, large, little raised. Bundle scars three. Stipular scars none. **Buds**—Terminal bud lacking, laterals solitary or collaterally branched, ovoid, brownish to red, often green at tip, about four to six keeled bud scales visible. **Bud Content**—Lvs. pinnately compound, the lfts. serrate, with conduplicate vernation. Stipules broad. **Leaf Remnants**—About thirteen to twenty-three lfts. **Fruit Remnants**—Follicles in a panicle.

1. Twigs very zigzag; remains of inflorescence a panicle with spreading branches. —\**S. arborea* Schneid.  
 1. Twigs only moderately zigzag; remains of inflorescence with upright branches. —\**S. sorbifolia stellipila* Maxim.

EXOCHORDA Lindl.

**Habit**—Deciduous shrubs. **Twigs**—Rather slender, grayish-brown, glabrous. Lenticels pale, rather elongated. Pith white, moderate, sometimes slightly spongy. **Leaf Scars**—Alt., more than two-ranked, narrowly V-shaped. Bundle scars three. Stipular scars none. **Buds**—Solitary, brownish, edges of scales rather translucent, terminal bud with about eight to twelve somewhat keeled scales. **Bud Content**—Flower cluster in center of lvs. when present. Lvs. long-acuminate,

green, glabrous with straight veneration. **Leaf Remnants**—Simple, entire or serrulate, cuneate base, mucronate apex, pinnately veined with about four pair of veins. **Fruit Remnants**—Broad turbinate capsule 8 to 10 mm. long. —\**E. racemosa* Rehd.

COTONEASTER Med. Cotoneaster

**Habit**—Shrubs, commonly deciduous. **Twigs**—Slender to moderate, often ridged beneath the leaf scar, pubescent especially near ends, reddish-brown usually. Pith pale, sometimes becoming brown. **Leaf Scars**—Alt., more than two-ranked, half-round or half-oval, distinctly raised, forming a shelf on which the base of the bud rests. Bundle scar one. Stipules present at top of scar or often broken or partly broken off. **Buds**—Only two definite bud scales, these lateral, about three-fourths the length of the bud and sparingly hairy, exposing the woolly bud end. **Bud Content**—Stipules with lvs. between, these entire, woolly, pinnately veined, veneration conduplicate to somewhat convolute. **Leaf Remnants**—Rather small, to 3 cm. long, shiny above, entire. **Fruit Remnants**—A small pome in cymes.

1. Twigs two-ridged for some distance below each leaf scar; fruit red. —\**C. divaricata* Rehd. & Wils.
1. Twigs not ridged or ridged for a very short distance only; fruit red or black.
2. Twigs dark purplish-black beneath hairs; fruit purplish-black. —\**C. nitens* Rehd. & Wils.
2. Twigs reddish-brown beneath hairs; fruit reddish to black.
3. Fruit purplish-black; young twigs light reddish-brown; common. —\**C. acutifolia* Turcz.
3. Fruit reddish; young twigs dark reddish-brown; rare.
4. Lenticels pale, conspicuous. —\**C. multiflora* Bge.
4. Lenticels dark, not conspicuous. —\**C. racemiflora* K. Koch.

CRATAEGUS L. Haw

**Habit**—Deciduous trees or sometimes shrubs. **Twigs**—Moderate to stout, usually with smooth thorns at some of the nodes, usually glabrous. Pith white, moderate to rather large. **Leaf Scars**—Alt., more than two-ranked, narrow reniform to crescent shaped, somewhat raised. Bundle scars three. Stipular scars small if present. **Buds**—Solitary, lateral buds rounded at the tip, glabrous or very slightly ciliate, four to eight rather thick bud scales visible. **Bud Content**—Scales grade into lvs. which are between two stipules, veneration straight with edges often plicate or leaf lobed with conduplicate lobes. **Leaf Remnants**—Deeply serrate-dentate, usually lobulate. **Fruit Remnants**—A small pome with one to five bony carpels, usually borne in corymbs.

This genus has fairly well marked winter characteristics especially if the thorns are present. The species in this state are still in an uncertain position. A few like *C. mollis* Scheele., *C. crus-galli* L., *C. punctata* Jacq., and *C. macracantha* Lodd. are fairly definite among the native species. In the introduced group *C. Oxyacantha* L., *C. monogyna* Jacq., and *C. pinnatifida* Bge. have been located in the present study. However, the majority of our plants are almost impossible for anyone not a specialist in the group to name. For this reason no species key is attempted.

#### SORBUS L. Mountain-Ash

**Habit**—Deciduous trees, bark tending to remain smooth. **Twigs**—Moderate, lenticels large, elongated, conspicuous. Pith becoming brown, moderate. **Leaf Scars**—Alt., more than two-ranked, crescent-to linear-shaped, definitely raised. Bundle scars three to five or rarely seven. No stipular scars. **Buds**—Solitary, the terminal bud enlarged with about three to five bud scales visible. **Bud Content**—Bud scales grade into lvs. which are pubescent, pinnately compound or lobed, the lfts. conduplicate. Stipules present. **Leaf Remnants**—Pinnately compound at least near the base. **Fruit Remnants**—Small pomes borne in corymbs.

1. Buds distinctly gummy, not densely woolly, although somewhat pubescent.  
—? \**S. americana* Marsh.
1. Buds not gummy, densely woolly at least near the tip.
  2. Bundle scars three or, if five, with the second and fourth ones smaller; twigs often woolly near end; buds greenish at base. —\* X *S. hybrida* L.
  2. Bundle scars five, all equal; twigs seldom woolly; buds dark brown.  
—\**S. Aucuparia* L.

*S. americana* has been reported as native in Iowa but may have been an escape. *S. Aucuparia* is by far the most common species in cultivation in Iowa.

#### ARONIA Pers. Chokeberry

**Habit**—Deciduous shrubs. **Twigs**—Slender, brownish-red beneath a gray skin. Lenticels usually large. Pith whitish, moderate. **Leaf Scars**—Alt., two- or more than two-ranked, flattened U- or V-shaped. Bundle scars three. No stipular scars. **Buds**—At least the terminal bud elongated with acuminate tips, appressed, reddish to brown, glabrescent, about three to six bud scales visible, the outer with a scar at tip. **Bud Content**—Lvs. with straight vernation. Flowers in the axils of the lvs. **Leaf Remnants**—Elliptical to obovate, acute to acuminate, with dark glands along midrib above, margins crenate-serrate. **Fruit Remnants**—Red to blackish pome in corymbs.

1. Twigs and buds glabrous; fruits purple-black. —*A. melanocarpa* Elliott.
1. Twigs and often part of bud pubescent; fruit purple-black to red.
  2. Buds somewhat pubescent, especially near the base of scales, the first bud scale one-fourth to one-third the length of the bud; fruit red. —\**A. arbutifolia* Elliott.
  2. Buds quickly glabrous, the first bud scale often one-half the length of the bud; fruit purple to black. —\**A. floribunda* Spach.

## PHOTINIA Lindl.

**Habit**—Deciduous shrubs. **Twigs**—Slender, light brown to gray, glabrescent to puberulent. Lenticels large, orange-tan, conspicuous. Pith greenish to white, moderate to small. **Leaf Scars**—Alt., usually two-ranked, broadly V-shaped, slightly raised. Bundle scars three. No stipular scars. **Buds**—No terminal bud, laterals brown, somewhat hairy and ciliate, with four keeled and pointed bud scales visible in about two ranks. **Bud Content**—Lvs. appear entire, glabrous, with straight vernation. **Leaf Remnants**—Simple, finely serrate, pinnately veined. **Fruit Remnants**—Red pome about 8 mm. in diameter.

—\**P. villosa* DC.

## AMELANCHIER Med. Shadbush; Junberry

**Habit**—Deciduous shrubs or small trees with smooth gray bark. **Twigs**—Rather slender, reddish-brown to gray. Pith whitish, small to moderate, sometimes angled. **Leaf Scars**—Alt., two-ranked but often appearing more, spreading V-shaped. Bundle scars three. No stipular scars. **Buds**—Solitary, elongated, pointed. **Bud Content**—Lvs. with conduplicate vernation. Flower cluster when present, in center of a leaf cluster. **Leaf Remnants**—Simple, serrate, pinnately veined. **Fruit Remnants**—Small bluish-black pome in racemes.

1. Buds glabrous or only slightly pubescent or ciliate, usually over three times longer than wide.
  2. Buds usually under 10 mm. long; twigs slender, usually under 2 mm. in diameter; shrubs. —*A. oblongifolia* Roem.
  2. Buds usually over 10 mm. long; twigs usually 2 mm. or more in diameter; typically trees. —*A. canadensis* Med.
1. Buds white-woolly near ends and at edges of scales; buds never over three times longer than wide. —X *A. spicata* K. Koch.

## MALUS Mill. Apple

**Habit**—Deciduous trees or shrubs. **Twigs**—Slender to stout, dwarf twigs commonly present, often short tomentose, sometimes ending in a spine. Lenticels usually conspicuous. Pith small to moderate, white to brownish-tan or orange, often angled in section. **Leaf Scars**—Alt., more than two-ranked, shallowly U- to V- or crescent-shaped,

somewhat raised. Bundle scars three. Stipular scars none. **Buds**—Solitary, reddish-brown, usually tomentose, at least at base, usually appressed, about three to six bud scales visible which often have two stipular tips with a scar between, especially on the terminal bud. **Bud Content**—Scales grade into lvs. which are between two stipules, the lvs. usually pubescent, vernation rather indistinct, straight, conduplicate or convolute. **Leaf Remnants**—Simple, serrate, dentate, or lobed, pinnately veined. **Fruit Remnants**—Pome with papery carpels.

1. Buds and twigs at most very sparingly pubescent, often glabrous.
2. Pith and inner bark of older twigs orange in color; a shrub. —\**M. Sieboldii* Rehd.
2. Pith and inner bark not orange; typically trees. —\**M. baccata* Borkh.
1. Buds and ends of twigs woolly pubescent.
3. Twigs woolly only near the end; buds usually woolly near the end or at edges of scales.
4. Lenticels conspicuous, large, pale, elongated longitudinally; cortex and pith-border not orange in color. —\*X *M. micromalus* Mak.
4. Lenticels small, not very conspicuous, little elongated; cortex and pith-border of older twigs often becoming orange colored. —\**M. spectabilis* Borkh.
3. Young twigs entirely woolly; buds whitish-woolly all over, sometimes lacking at the very base.
5. Lenticels orange-colored; pith soon orange.
6. Shrub with horizontally spreading branches; first bud scales usually less than one-half the bud length. —\**M. Sargentii* Rehd.
6. Typically a small tree or large shrub with ascending branches; first bud scale usually over one-half the bud length. —\**M. angustifolia* Michx.
5. Lenticels pale, not orange; pith white or rarely tan.
7. End of twigs often ending in spines; a native tree, occasionally cult. —*M. ioensis* Brit.
7. End of twig rarely if ever ending in a spine; cult., rarely escaped, or native but very rare.
8. Lenticels conspicuous under hairs, very pale and elongated; common in cultivation. —\**M. pumila* Mill.
8. Lenticels not conspicuous, brown and little elongated; rarely seen in Iowa. —X *M. Soulardii* Brit.

This genus is rather uncertain and too much trust should not be placed in the species key. Fortunately only two species *M. pumila*, the common apple, and *M. ioensis*, the wild crab, are at all common.

#### CHAENOMELIS Lindl. Janapese Quince

**Habit**—Closely branched deciduous shrubs. **Twigs**—Slender, three-ridged from below each scar, thorns single at a node, the larger thorns often rough, brownish to gray twigs. Lenticels not conspicuous. Pith whitish, moderate. **Leaf Scars**—Alt., more than two-ranked, thin

crescent- or V-shaped. Bundle scars three. Stipular scars short at the ends of the leaf scars. **Buds**—No terminal bud, lateral rather small, brownish, hairy at end, three to four bud scales visible, the first one about one-half the bud length. **Bud Content**—Lvs. with stipules at sides, vernation straight. **Leaf Remnants**—Ovate, crenate-serrate, pinnately veined. Petiole winged. Stipules serrated, large. **Fruit Remnants**—Yellowish, many seeded pome.

—\**C. lagenaria* Koidz.

The distinction between this and *C. japonica* Lindl., a related species, is not very great, and it is possible that some of our plants may be *C. japonica*.

#### CYDONIA Mill. Quince

**Habit**—Deciduous shrubs. **Twigs**—Moderate to slender, deep red-brown under a thick gray tomentum. Lenticels orange, conspicuous under hairs. Pith pale, moderate. **Leaf Scars**—Alt., more than two-ranked, shallowly U-shaped, somewhat raised. Bundle scars three. Stipular scars small, elongated. **Buds**—No terminal bud, laterals reddish-brown, rather hairy, appressed, with two bud scales visible, the first three-fourths or more of the bud length. **Bud Content**—A pubescent leaf between two stipules, vernation straight. **Leaf Remnants**—Simple, ovate, entire, pinnately veined, densely villous beneath. **Fruit Remnants**—Solitary, pear-shaped, villous, yellow pome.

—\**C. oblonga* Mill.

#### PYRUS L. Pear

**Habit**—Deciduous trees, occasionally shrubs. Branches ascending. Bark becoming scaly-ridged. **Twigs**—Moderate, sometimes ending in a spine, glabrous. Lenticels pale. Pith pale, moderate, often rather angled. **Leaf Scars**—Alt., more than two-ranked, crescent to triangular, some raised. Bundle scars three. No stipular scars. **Buds**—Reddish-brown, nearly appressed, lateral buds rather flattened with about six bud scales visible, these glabrous or at most ciliate. **Bud Content**—Lvs. glabrescent, vernation involute. **Leaf Remnants**—Simple, elliptical to ovate, crenate-serrate margins, pinnately veined. **Fruit Remnants**—Pear-like pome, rarely remaining.

This genus includes the cultivated pears, the varieties of which are not keyed out here. The common pear, *P. communis* L. is distinguished from the Kieffer pear, X *P. Lecontei* Rehd., by its more slender twigs, its shorter buds (usually less than 5 mm. long) and its non-ciliated bud scales.

## KERRIA DC. Corchorus

**Habit**—Deciduous shrubs. **Twigs**—Slender, rather zigzag, definitely green, three-ridged from the leaf scars, glabrous. Lenticels inconspicuous. Pith white, rather large. **Leaf Scars**—Alt., obscurely two-ranked, crescent-shaped. Bundle scars three. Stipular scars very narrow. **Buds**—Solitary, greenish to brown, about six to eight bud scales visible. **Bud Content**—Lvs. acuminate, deeply serrated, with stipules at sides, vernation seems plicate. Flowers when present solitary in the center, with five parted perianth and numerous stamens. **Leaf Remnants**—Simple, doubly serrate, pinnately veined. **Fruit Remnants**—Carpels becoming achenes. —\**K. japonica* DC.

## RHODOTYPUS Sieb. &amp; Zucc.

**Habit**—Deciduous shrubs. **Twigs**—Slender, brown, glabrous, lenticels conspicuous. Pith pale, moderate. **Leaf Scars**—Opposite, crescent to triangular, little raised. Bundle scars three. Stipular scars narrow or a part of the stipules remaining. **Buds**—Sometimes collaterally branched, rather plump, brown to green, somewhat pubescent, about six to twelve bud scales visible. **Bud Content**—Lvs. long-acuminate, serrate, pinnately veined with straight vernation, edges seem a trifle plicate. Stipules present at sides of leaf. **Leaf Remnants**—Simple, elliptical-ovate. **Fruit Remnants**—Separating into four blackish drupes. —\**R. scandens* Mak.

## RUBUS L. Blackberry; Raspberry; Dewberry

**Habit**—Upright or trailing shrubs, ours deciduous. **Twigs**—Rather soft-wooded, usually armed with prickles or bristles, often somewhat angled. Pith brownish, large, often five-angled. **Leaf Scars**—Alt., more than two-ranked, usually not present because base of leaf petiole persists but when petiole is cut the scar is half-round, crescent- or U-shaped. Bundle scars three. Stipules remaining on petiole base. **Buds**—Moderate, often superimposed, the lower smaller, pubescent at least near the tip, three to six somewhat keeled bud scales visible. **Bud Content**—Scales grade into lvs., these are compound, lfts. with conduplicate vernation, the edges appearing plicate. **Leaf Remnants**—Edges of lfts. serrate. **Fruit Remnants**—A syncarp of drupelets, sometimes present as dried, partially developed structures, or in the raspberries the drupelets fall leaving a naked conical receptacle.

1. Trailing or mostly trailing—the dewberries belong here. The native one is *R. flagellaris* Willd. found in the eastern part of Iowa on sandy soil. A variety of this species is cultivated, but very rarely.



1. Erect, open or recurved branches.
3. Branches conspicuously glaucous.
4. Stems with numerous stiff bristles, hooked prickles present or absent.  
—*R. idaeus aculeatissimus* Reg. & Tiling.
4. Stems with stout, hooked prickles but no bristles.  
—*R. occidentalis* L.
3. Branches not glaucous.  
—*R. allegheniensis* Porter.

The genus *Rubus* is in a very unsatisfactory taxonomic condition. *R. flagellaris* is here considered as the same as *R. villosus* of Gray's Manual, seventh edition. *R. triflorus* Richards. and *R. cuneifolius* Pursh. have been reported from the eastern part of the state.

#### POTENTILLA L. Cinquefoil; Five-finger

**Habit**—Low deciduous shrubs. **Twigs**—Rather slender, gray to tan, short hairy, the older twigs with bark exfoliating. Lenticels not noticeable. Pith brown, rather small, sometimes spongy. **Leaf Scars**—Alt., usually more than two-ranked, round on a raised base. Bundle scars one. Stipules persist at sides of leaf scar. **Buds**—Solitary, moderate, brownish to gray, hairy, especially at end, appressed, with three to six striated, rather two-ranked bud scales visible, the outer often toothed at the apex. **Bud Content**—Lvs. compound, white silky-hairy, vernation of lfts. not distinct but appearing conduplicate. Stipules present at sides of leaf. **Leaf Remnants**—Pinnately compound, of three to seven lfts., the margins entire, pubescent. **Fruit Remnants**—Achenes on a conical receptacle. —*P. fruticosa* L.

A very low-growing species *P. tridentata* Ait. has been found very local in northeastern Iowa, but it is not included here because it is hardly woody, except at the very base.

#### ROSA L. Rose

**Habit**—Deciduous shrubs, with upright, trailing or climbing stems. **Twigs**—Moderate, not ridged, usually armed with prickles and often with bristles, usually reddish to green, glabrous. Pith pale, becoming in some cases brown, large. **Leaf Scars**—Alt., more than two-ranked, little raised, narrowly U to linear in shape. Bundle scars three. Stipular scars none. **Buds**—Rather small, solitary, seldom pubescent, with two to five bud scales visible. **Bud Content**—Lvs. with flat base, two stipules at sides, pinnately compound in our species, lfts., serrate with conduplicate vernation. **Leaf Remnants**—Compound, stipules present (in ours). **Fruit Remnants**—A hip becoming fleshy and enclosing bony achenes.

The species of this genus are very variable and very easily hybrid-

ized. This results in taxonomic confusion, especially in the cultivated forms. Some of the native species can be recognized in winter condition, but it is thought best not to include here a species key.

PRUNUS L. Plums; Peaches; Cherries; Apricots

**Habit**—Deciduous trees or shrubs. **Twigs**—Slender to moderate, bark of twig often bitter-tasting. Lenticles often prominent. Pith whitish to tan, round or somewhat angled. **Leaf Scars**—Alt., more than two-ranked, half-round or oval, definitely raised. Bundle scars three, sometimes indistinct. Stipular scars at top side of leaf scar or the stipules wholly or partly remaining. **Buds**—Terminal bud present or absent, lateral buds solitary or collaterally multiple, often in threes, the side buds being thicker, about three to ten bud scales visible, these in more than two ranks and often with teeth or scars at the tip of the scale. **Bud Content**—Lvs. simple, pinnately veined, the vernation various. Flowers with five sepals, five petals, many stamens and one style. **Leaf Remnants**—Serrated; raised glands often present at base of blade or top of the petiole. **Fruit Remnants**—Drupe.

1. Terminal bud lacking.
  2. Twigs short tomentose; buds pubescent; never tree-like.
 

—\**P. gracilis* Engelm. & Gr.
  2. Twigs glabrous; buds at most ciliate; often trees.
    3. Cultivated fruit trees; lateral buds commonly multiple.
      4. Buds dark brown, scales ciliate, the flower buds containing only one flower.
 

—\**P. Armeniaca* L.
      4. Buds light brown to gray green, scales little if at all ciliate, usually two or more flowers in the bud.
 

—\**P. domestica* L.
    3. Not cultivated for fruit, and seldom seen in cultivation; buds commonly solitary.
      5. Native, rather common; lenticels inconspicuous.
 

—*P. americana* Marsh.
      5. Not native, and rarely cultivated; lenticels conspicuous.
 

—\**P. sibirica* L.
1. Terminal bud present.
  6. Never tree-like.
    7. Twigs tomentose to finely puberulent.
      8. Twigs heavily tomentose; stipules if present setaceous.
 

—\**P. tomentosa* Thunb.
      8. Twigs puberulent; stipules if present fimbriate-serrate like a comb.
 

—\**P. triloba plena* Dipp.
    7. Twigs glabrous.
      8. Twigs two-ridged below each scar; lenticels conspicuous; buds blunt; native but rare in Iowa.
 

—*P. pumila* L.
      8. Twigs not ridged; lenticels not conspicuous; buds somewhat pointed; not native.

9. Over five bud scales visible on side lateral buds, which are short, ovoid; somewhat prostrate in habit. —\**P. Besseyi* Bailey
9. Bud scales five or less visible on the side lateral buds which are long-ovoid; upright in habit. —\**P. glandulosa* Thunb.
6. Typically trees.
10. Lateral buds tending to crowd out near the end of the twig, often extending out farther than the terminal bud. —\**P. pennsylvanica* L.
10. Lateral buds not clustered near the end of twig.
11. Twigs densely short hairy. —\**P. mahaleb* L.
11. Twigs glabrous or nearly so.
12. Twigs green or reddish, often with both colors on opposite sides of the twig; buds usually woolly. —\**P. Persica* Batsch.
12. Twigs gray to reddish-brown; buds glabrous.
13. Buds usually over 6 mm. long, appressed, bud scales light brown with a broad marginal band of gray.
14. Twigs grayish brown; lenticels of young twig strongly elongated longitudinally; native. —\**P. virginiana* L.
14. Twigs reddish-brown to light-brown; lenticels on young twig not or only slightly elongated; not native here. —\**P. Padus* L.
13. Buds under 6 mm. long, not appressed, bud scales reddish-brown, marginal band if present very narrow.
15. Twigs light-brown, lenticels on the second or third year's growth longitudinally elongated. —\**P. avium* L.
15. Twigs reddish-brown to gray, lenticels on second or third year's growth somewhat transversely elongated.
16. Young twigs slender, seldom over 2 mm. in diameter, bark of trunk in scales or plates; native. —\**P. serotina* Ehrh.
16. Young twigs moderate, usually over 2 mm. in diameter; bark of trunk not in scales or plates; a cultivated fruit tree. —\**P. Cerasus* L.

The species of this genus are rather difficult in winter and too much reliance should not be placed on any key. Many of the species listed in this key are very rare and will seldom be encountered. In addition to the list above two other species have been reported as being very rarely found native in Iowa, *P. nigra* Ait. and *P. hortulana* Bailey. An ornamental shrub or small tree with reddish-purple leaves is appearing in cultivation. It seems to be *P. cerasifera Pissartii* Bailey., or the hybrid X *P. cistena* N. E. Hansen.

#### PRINSEPIA Royle.

**Habit**—Deciduous shrubs. **Twigs**—Slender, rather zigzag, grayish to gray-brown, spiny with spines super-axillary, above the buds. Lenticels, dark, not very conspicuous. Pith pale, sometimes yellowish, moderate to large, finely chambered. **Leaf Scars**—Alt., more than two-ranked, half round to oval, some raised. Bundle scar one, indistinct. Stipules present at top of scar and covering part of bud.

**Buds**—Solitary, no scales distinct, the bud and stipule inside woolly hairy. **Bud Content**—Lvs. lanceolate, entire, glabrous, purple-tipped with two narrow stipules at sides, the vernation convolute. Flowers and lvs. in the same bud, flowers with five sepals, many stamens and one style. **Leaf Remnants**—Simple, pinnately veined, ovate-lanceolate. **Fruit Remnants**—Purple drupe 1.5 cm. long.

—\**P. sinensis* Oliver.

### Family LEGUMINOSAE

CERCIS L. Redbud; Judas-tree

**Habit**—Small, deciduous trees, bark becoming somewhat ridged and scaly. **Twigs**—Slender, rather zigzag, dark reddish-brown, glabrous. Lenticels numerous, small but conspicuous. Pith white to pinkish-streaked, moderate. **Leaf Scars**—Alt., two-ranked, rather triangular, fringed on top. Bundle scars three. Stipular scars none. **Buds**—Often superimposed, the flower buds stalked, brittle, dark brown, several ciliate often keeled bud scales visible. **Bud Content**—Lvs. entire, simple, glabrous with stipules present, vernation conduplicate, the midrib large. Flower buds containing several reddish, irregular flowers. **Leaf Remnants**—Broadly ovate, glabrous, palmately veined. **Fruit Remnants**—Often present, flat pods 6 to 8 cm. long-winged on one suture.

—*C. canadensis* L.

GLEDITSIA L. Honey-Locust

**Habit**—Deciduous trees with bark gray to darker, becoming roughened in broad ridges. **Twigs**—Slender, rather zigzag, shiny, thorns usually present at some of the nodes, the spines often branched, with reddish pith. Lenticels small. Pith rather large, whitish. **Leaf Scars**—Alt., more than two-ranked, rather V-shaped. Bundle scars three, not conspicuous. Stipular scars not noticeable. **Buds**—No terminal bud, lateral buds superimposed, wholly or partially concealed. **Bud Content**—Lvs. small but compound. **Leaf Remnants**—Pinnately or bipinnately compound, indistinctly crenate. **Fruit Remnants**—Reddish-brown twisted pod 30 to 45 cm. long.

—*G. triacanthos* L.

GYMNOCLADUS L. Kentucky Coffee-tree

**Habit**—Deciduous trees, bark roughened with recurved scale-like ridges. **Twigs**—Very stout, often contorted, with a gray skin. Lenticles large, paler, conspicuous. Pith large, salmon to reddish-brown. **Leaf Scars**—Alt., more than two-ranked, irregularly heart-shaped,

about parallel to twig. Bundle scars three to five, often individually U-shaped. Stipular scars lacking or extremely minute. **Buds**—Superimposed, partly concealed in a silky patch, scales indistinct. **Bud Content**—Lvs. small, compound. **Leaf Remnants**—Bipinnately compound, the lfts. entire. **Fruit Remnants**—Broad, oblong, flat pod, 15 to 25 cm. long, often remaining. —*G. dioica* K. Koch.

CLADRASTIS Raf. Yellow-wood

**Habit**—Rather small, deciduous trees, bark smooth and gray. **Twigs**—Rather slender and zigzag, reddish-brown beneath gray skin. Lenticels paler. Pith whitish, rather large. **Leaf Scars**—Alt., two or more than two-ranked, horseshoe-shaped, almost encircling the bud. Bundle scars usually seven, raised. Stipular scars none. **Buds**—Generally two to four superimposed, closely grouped and appearing as one, gray tan to yellow, very hairy and no definite bud scales. **Bud Content**—Inner structure very hairy and no detail apparent. **Leaf Remnants**—Pinnately compound of seven to nine entire lfts. **Fruit Remnants**—Thin pod 7 to 8 cm. long. —\**C. lutea* K. Koch.

SOPHORA L. Japan Pagoda-tree

**Habit**—Deciduous trees or rarely shrubby, bark furrowed. **Twigs**—Moderate, swollen at nodes, greenish, sparingly pubescent. Lenticels pale, large, few conspicuous. Pith pale, rather small, often angled. **Leaf Scars**—Alt., more than two-ranked, raised, becoming U- to horseshoe-shaped when the buds break through the top. Bundle scars three. Stipular scars or remnants very minute. **Buds**—Small, almost concealed, very hairy, massed, superimposed, indistinctly scaly. **Bud Content**—Too small to make out. **Leaf Remnants**—Pinnately compound, with seven to seventeen entire lfts. **Fruit Remnants**—A terete pod 5 to 8 cm. long. —\**S. japonica* L.

GENISTA L.

**Habit**—Deciduous or half evergreen shrubs. **Twigs**—Greenish, either winged or ridged. Pith white. **Leaf Scars**—Half-oval, when present. Bundle scar one. Stipules sometimes present. **Buds**—About two bud scales visible. **Leaf Remnants**—Entire, rather villous, pinnately veined. **Fruit Remnants**—A pod.

1. Twigs with two broad green wings; stems rather procumbent.

—\**G. sagittalis* L.

1. Twigs ridged but not winged; stems not procumbent.

—\**G. tinctoria* L.

CYTISUS L. Broom

**Habit**—Low, sometimes prostrate, deciduous shrubs. **Twigs**—Slender to moderate, often two-ridged from the leaf scar, greenish to gray, pubescent. Lenticels not conspicuous. Pith whitish, small. **Leaf Scars**—Alt., more than two-ranked, oval to half-round, small, raised, forming a shelf on which the bud rests. Bundle scar one, often indistinct. Stipular scars absent or very small. **Buds**—Solitary, small, seldom over 3 mm. in length, pubescent, ciliate, about four to eight bud scales visible which are often indistinct. **Bud Content**—Too small to make out detail. **Leaf Remnants**—Often present, simple or three foliate, entire, pubescent below. **Fruit Remnants**—A pod, long-villous, 2 to 3 cm. long.

1. Small, prostrate shrub seldom over 25 cm. high; buds very sparingly pubescent; lvs. simple. —\**C. decumbens* Spach.
1. Rather upright, larger, over 25 cm. high; buds pubescent, especially near the ends; lvs. three-foliolate.
  2. Twigs ridged beneath leaf scars. —\**C. nigricans* L.
  2. Twigs not at all ridged. —\**C. supinus* L.

AMORPHA L. Lead-plant; False-Indigo

**Habit**—Deciduous shrubs. **Twigs**—Rather slender, longitudinally ridged, light-brown to gray. Lenticels inconspicuous. Pith whitish or on older twigs becoming brownish, moderate. **Leaf Scars**—Alt., more than two-ranked, triangular to crescent-shaped, rather raised. Bundle scars three. Stipular scars small and very inconspicuous, at upper angles of leaf scar. **Buds**—Solitary or superimposed, gray to brown, hairy, with two to six bud scales visible. **Bud Content**—Lvs. small, pinnately compound. **Leaf Remnants**—Odd-pinnately compound. **Fruit Remnants**—Often present as a small, short, one-seeded pod in dense panicles or spikes.

1. Buds superimposed; moderately tall shrubs. —\**A. fruticosa* L.
1. Buds solitary, low shrubs.
  2. Twigs white woolly; pod villous. —\**A. canescens* Nutt.
  2. Twigs glabrate; pods glabrous. —\**A. microphylla* Pursh

WISTERIA Nutt. Wistaria

**Habit**—Deciduous, twiners. **Twigs**—No tendrils, three-angled from below the leaf scars, light to reddish-brown, often retrorsely hairy. Lenticels pale, not very conspicuous. Pith whitish, fairly large. **Leaf Scars**—Alt., two- or more than two-ranked, half-round, decidedly raised. Bundle scar one, large, in the center of the leaf scar and sometimes compound. Stipular scars lacking but on lower sides of the leaf scar are two wart-like "horns." **Buds**—Solitary, brownish,

pubescent at tip, short conical with about two scales visible, the first nearly covering the bud. **Bud Content**—Pinnately compound, vernation of lfts. conduplicate. **Leaf Remnants**—About nine entire lfts. **Fruit Remnants**—A pod, often large, up to 12 cm. long.

—\**W. macrostachya* Nutt.

Although the above species is the only one located in the present work others may be expected in cultivation. *W. frutescens* DC. and *W. sinensis* Sweet., should be found in this region.

#### ROBINIA L. Locust

**Habit**—Deciduous trees or shrubs. **Twigs**—Moderate, often zigzag, bristles or stipular spines often present. Lenticels not very conspicuous. Pith whitish to light-brown, moderate, often somewhat angled. Wood rather yellowish. **Leaf Scars**—Alt., more than two-ranked, broadly triangular or three-lobed but usually split from beneath by the developing buds, raised. Bundle scars three. Stipular scars if present spinescent. **Buds**—No terminal bud, the laterals usually partly concealed, superimposed and hairy, the scales indistinct. **Bud Content**—Hairy, the parts indistinct. **Leaf Remnants**—Pinnately compound, with odd numbers of entire lfts. **Fruit Remnants**—Flat pod.

1. Twigs beset with numerous long bristles; a shrub.

—\**R. hispida* L.

1. Twigs without bristles; usually trees.

—*R. pseudoacacia* L.

#### COLUTEA L. Bladder Senna

**Habit**—Deciduous shrubs. **Twigs**—Moderate, angled from leaf scars, greenish to gray. Lenticels brown, conspicuous. Pith white to greenish, moderate. **Leaf Scars**—Alt., more than two-ranked, half-oval. Bundle scars three or the middle one three-parted. Stipules persistent. **Buds**—Commonly superimposed, the upper usually developing into a branch, small, with two to four scales visible. **Bud Content**—Pinnately compound, whitish-brown woolly lvs. lying between stipules. **Leaf Remnants**—About nine to thirteen entire lfts. **Fruit Remnants**—Inflated pod, 6 to 8 cm. long. —\**C. arborescens* L.

#### CARAGANA Lam.

**Habit**—Deciduous shrubs or rarely small trees. **Twigs**—Rather slender, usually three-ridged from the leaf scar, spines often present as stipule remains or the end of the old leaf rachis. Pith whitish or greenish white, often angular in section. **Leaf Scars**—Alt., two-ranked or more than two-ranked, oval or half round, raised definitely but often absent due to the persistent leaf rachis. Bundle scar one. Stipules present. **Buds**—Solitary, with three to five visible bud scales,

some of these often with a scar at the tip and stipular-like appendages. **Bud Content**—Compound leaf with stipules, vernation of lfts. appearing conduplicate. **Leaf Remnants**—Pinnately even-compound, the lfts. entire, the leaf rachis weakly spinescent at ends. **Fruit Remnants**—Pod.

1. Leaf rachis soon falling, at least on the older wood.
  2. Stipules spinescent; lvs. if present with eight to eighteen lfts.
    3. Stipular spines about 4 mm. or less in length; young twigs only faintly ridged; low shrub, under 3 m. high. —\**C. microphylla* Lam.
    3. Stipular spines about 5 mm. long; twigs all three ridged; often over 3 m. tall. —\**C. arborescens* Lam.
  2. Stipules present but not spinescent; lvs. if present with four lfts. —\**C. frutex* K. Koch.
1. Leaf rachis remaining as a weak spine.
    4. The two pairs of lft. scars crowded close together on the leaf rachis.
      5. Lft. scars near end of leaf rachis. —\**C. grandiflora* DC.
      5. Lft. scars near middle or base of leaf rachis. —\**C. aurantiaca* Koehne.
    4. The two pairs of lft. scars separated on the leaf rachis, the first pair near the middle and the second near the end. —\**C. chamlagu* Lam.

#### Family RUTACEAE

##### ZANTHOXYLUM L. Prickly Ash; Toothache-tree

**Habit**—Deciduous shrubs or rarely small trees. **Twigs**—Moderate to stout, gray, usually two prickles at a node. Lenticels not conspicuous. Pith white, large. Wood rather aromatic. **Leaf Scars**—Alt., more than two-ranked, broadly triangular, sometimes torn at top, slightly raised. Bundle scars three, each a circle or C-shaped. Stipular scars lacking. **Buds**—Moderate, superimposed but often indistinctly so, globose, brownish-red, pubescent, indistinctly scaly, terminal bud larger. **Bud Content**—Reddish-woolly within. **Leaf Remnants**—Pinnately compound, of five to eleven crenate lfts. **Fruit Remnants**—Dehiscent follicles, the seeds shiny black.

—*Z. americanum* Mill.

##### PTELEA L. Hop-tree

**Habit**—Deciduous shrubs, rarely small trees. **Twigs**—Slender to moderate, brownish, glabrous. Lenticels brown, large, numerous and conspicuous. Pith large and white. **Leaf Scars**—Alt., more than two-ranked, horseshoe-shaped when torn in center by the developing buds, raised. Bundle scars three. Stipular scars none. **Buds**—Terminal bud absent, laterals small and appear partly concealed, densely tan or buff hairy, no distinct bud scales, probably superimposed. **Bud**



**Content**—Hairy and indistinct. **Leaf Remnants**—Palmately compound, of three elliptical to obovate lfts. **Fruit Remnants**—A winged hop-like samara. —*P. trifoliata* L.

**PHELLODENDRON** Rupr. Cork-tree

**Habit**—Small, deciduous trees, bark light gray, usually corky and deeply fissured. **Twigs**—Stout, somewhat flattened at nodes, orange-brown. Lenticels elongated and conspicuous. Pith pale but often becoming brownish, rather large. Bark of twig thick, outer part green, the inner part bright yellow. Wood rays prominent. **Leaf Scars**—Opposite, large, horseshoe-shaped, raised. Bundle scars in three groups, the middle one often compound. Stipular scars none. **Buds**—Solitary, flattened from end and appearing partly concealed, reddish-brown, hairy, with about two to four rather indistinct bud scales visible. **Bud Content**—Lvs. compound, pubescent, vernation of lfts. seems revolute. **Leaf Remnants**—About eleven lfts. **Fruit Remnants**—Blackish drupe, about 1 cm. in diameter. —\**P. amurense* Rupr.

#### Family SIMARUBACEAE

**AILANTHUS** Desf. Tree of Heaven

**Habit**—Deciduous, rapidly growing trees, with rather smooth bark. **Twigs**—Very stout, tan to reddish, glabrous. Lenticels raised, reddish. Pith light brown, large. **Leaf Scars**—Alt., more than two-ranked, shield-shaped. Bundle scars scattered in a row near the edge, numerous. Stipular scars none. **Buds**—No terminal bud, laterals solitary, reddish-brown, partly concealed, about two to four bud scales visible. **Bud Content**—Lvs. seem pinnately compound. **Leaf Remnants**—Lfts. entire except at very base, green above, lighter below. **Fruit Remnants**—Winged, 3 to 4 cm. long borne in panicles. —\**A. altissima* Swingle.

#### Family BUXACEAE

**BUXUS** L. Box

**Habit**—Evergreen, usually shrubs. **Twigs**—Rather slender, quadrangular with two ridges from each decurrent leaf, greenish to gray, pubescent, especially on the side above the leaf. Lenticels inconspicuous. Pith green, small, often angled in section. **Leaf Scars**—Opposite, half round. Bundle scar one. Stipular scars none. **Buds**—Small, the flower buds clustered, slightly pubescent, gray, usually about four keeled scales visible. **Bud Content**—Scales grade into lvs., ver-

nation straight. Flowers with rather definite parts. **Leaf Remnants**—Entire, oblong to elliptical, somewhat revolute. **Fruit Remnants**—Capsule, three horned, about 8 mm. long. —\**B. sempervirens* L.

Family ANACARDIACEAE

COTINUS Adans. Smoke-tree

**Habit**—Deciduous, large shrubs or small trees. **Twigs**—Moderate to stout, glabrous. Lenticels definite. Pith moderate, brown. Older wood rather yellowish, especially the heartwood, and exuding a gummy aromatic sap. **Leaf Scars**—Alt., more than two-ranked, half round to rather three lobed. Bundle scars usually three, sometimes more, often rather C-shaped. Stipular scars none. **Buds**—Terminal present, glabrous, about four bud scales visible. **Bud Content**—Inner scales ciliate, grading into the ovate, entire, pinnately veined lvs., vernation straight. Flowers in a cone-shaped cluster inside the lvs. **Leaf Remnants**—Glabrous, with eight to ten pairs of veins. **Fruit Remnants**—A drupe 3 to 4 mm. in diameter borne on a very long hairy panicle.

1. Leaf scars higher or at least as high as wide, often slightly three-lobed, definitely concave at the top; twigs light brown to tan. —\**C. americanus* Nutt.
1. Leaf scars wider than high, not three-lobed, usually but slightly concave at top; twigs brownish-red to gray. —\**C. coggygria* Scop.

This genus has rather well marked winter characters but the two species are hard to distinguish without the lvs.

RHUS L. Sumach

**Habit**—Deciduous vines, shrubs, or rarely small trees. **Twigs**—Slender to stout, often showing milky, sticky sap. Pith pale to yellow-brown, usually large. **Leaf Scars**—Alt., more than two-ranked, C-, horseshoe-, round-, or crescent-shaped. Bundle scars numerous, scattered, or in a U-shaped line, often broken into five to nine. Stipular scars none. **Buds**—Small to moderate, often partly concealed, indistinctly scaly, very hairy. **Bud Content**—Lvs. compound, very woolly. **Leaf Remnants**—Pinnately compound or of three lfts. **Fruit Remnants**—Drupes in panicles.

1. Leaf scars C- or horseshoe-shaped, nearly encircling the bud.
  2. Twigs glabrous. —*R. glabra* L.
  2. Twigs velvety hairy. —*R. typhina* L.
1. Leaf scars various, but not C- or horseshoe-shaped.
  3. Leaf scars round-elevated, almost or completely covering the bud.
  4. Twigs somewhat ridged from below the leaf scars, sparsely short-hairy toward the end; fragrant scented; staminate catkin 8 mm. or more long. —*R. canadensis* Marsh.

4. Twigs not ridged, short pubescent, especially near the ends; ill scented; staminate catkin less than 6 mm. long. —\**R. trilobata* Nutt.
3. Leaf scars not round-elevated.
5. Buds somewhat stalked, the end bud over 4 mm. long; lenticels not conspicuous; often climbing by aerial roots. —*R. Toxicodendron* L.
5. Buds sessile or partly concealed, under 4 mm. long; lenticels very conspicuous; never climbing. —? \**R. copallina* L.

This genus is very diverse in its winter characters and contains the poison ivy and poison sumach which affect susceptible people even in winter. The poison sumach, *R. vernix* L., apparently has no authenticated record in Iowa, although it is found in western Illinois, Minnesota, and Missouri, according to McNair(40).

### Family AQUIFOLIACEAE

#### ILEX L. Holly

**Habit**—Evergreen or deciduous shrubs, rarely trees. **Twigs**—Small to moderate. Lenticels not conspicuous. Pith pale, small to moderate, often angled. **Leaf Scars**—Alt., more than two-ranked, half round. Bundle scar one, often indistinct. Stipules usually present or leaving a scar. **Buds**—Small, with three to four rather indistinct bud scales visible. **Bud Content**—Small leaf between stipules. **Leaf Remnants**—Simple, pinnately veined. **Fruit Remnants**—Globose berry-like drupe.

1. Lvs. evergreen.
2. Lvs. with spiny teeth, over 3 cm. long. —\**I. opaca* Ait.
2. Lvs. crenate near tip, never spiny, less than 2 cm. long. —\* *I. crenata* Thunb.
1. Lvs. deciduous. —*I. verticillata* Gray.

### Family CELASTRACEAE

#### EVONYMUS L. Spindle-tree; Burning-bush

**Habit**—Usually deciduous shrubs, vines, or rarely small trees. **Twigs**—Greenish to rose-colored, four-ridged from below leaf scar, sometimes winged. Pith white to green, rather four-angled, often spongy or excavated. **Leaf Scars**—Opposite, half round, little raised. Bundle scar one, as a curved line. Stipular scars none or very minute. **Buds**—Greenish to brownish-red, glabrous, with six to ten opposite and four-ranked bud scales visible. **Bud Content**—Scales grade into lvs. which are simple, glabrous, and pinnately veined, vernation straight to involute. **Leaf Remnants**—Elliptical to ovate. **Fruit Remnants**—Capsule four-lobed and four-parted, dehiscent to expose a fleshy orange aril.

1. Stems climbing; evergreen. —\**E. radicans* Sieb.
1. Stems not climbing; deciduous.

2. Twigs corky winged; ten or more bud scales visible. —\**E. alata* Reg.
2. Twigs not corky winged; less than ten bud scales visible.
3. Bud scales appressed, margins dry, and reddish-brown; not native.  
—\**E. europaea* L.
3. Bud scales loose, margins not dry nor reddish-brown; native.  
—*E. atropurpurea* Jacq.

The corky wings on the twigs of *E. alata* were described in 1888 by Gregory (24).

CELASTRUS L. Staff-tree; Bittersweet

**Habit**—Deciduous twiners. **Twigs**—Rather slender, brown to gray, glabrous. Lenticels not very conspicuous. Pith white, rather large. **Leaf Scars**—Alt., more than two-ranked, half round. Bundle scar one. Stipular scars as a tuft of hairs. **Buds**—No terminal bud, laterals about 2 mm. long, light brown, glabrous, about five to eight bud scales visible, the outer somewhat keeled. **Bud Content**—Inner scales tan only near tip, about five to eight present. Lvs. entire, glabrous, pinnately veined with straight veneration. **Leaf Remnants**—Ovate to oblong-ovate, acuminate, cuneate, the margins crenate-serate. **Fruit Remnants**—Often present as orange-yellow, dehiscent capsules exposing a scarlet aril.

1. Fruit in axillary cymes; twigs slightly two-ridged from below the leaf scars; not native. —\**C. articulata* Thunb.
1. Fruit in terminal panicles; twigs not ridged; native but often in cult. —*C. scandens* L.

PACHISTIMA Raf.

**Habit**—Low spreading evergreen shrubs. **Twigs**—Slender, four-ridged reddish-green to brown, slightly pubescent. Lenticels not conspicuous. Pith pale to brownish, minute. **Leaf Scars**—Opposite, half round, slightly raised. Bundle scar one, indistinct. Stipular scars none. **Buds**—Very small, with two to four green scales visible. **Bud Content**—Lvs. entire, glabrous, veneration straight. **Leaf Remnants**—Elliptical, serrated near the end. **Fruit Remnants**—Leathery two-valved capsule. —\**P. myrsinites* Raf.

TRIPTYGIUM Hook.

**Habit**—Deciduous shrubs. **Twigs**—Moderate, angled to winged, three from a scar, the middle one smaller, very warty, zigzag, brown. Pith pale, moderate, sometimes with firmer cross plates. **Leaf Scars**—Alt., more than two-ranked, half round, raised. Bundle scar one, rather U-shaped. Stipular scars none. **Buds**—Moderate, solitary, brown, glabrescent, divergent at about sixty degree angle from the twig, about

four keeled bud scales visible. **Bud Content**—Scales grade into glabrous lvs. which have small narrow stipules at sides, the vernation straight. **Leaf Remnants**—Large, ovate to broad elliptical, crenate-serrate. **Fruit Remnants**—Nutlet, three-winged and one-seeded.

—\**T. Regelii* Sprague & Tak.

#### Family STAPHYLEACEAE

##### STAPHYLEA L. Bladdernut

**Habit**—Deciduous shrubs or small trees. **Twigs**—Moderate, greenish, thickly spotted with dark red or gray, glabrous, older twigs with light streaks. Lenticels inconspicuous. Pith white, large. **Leaf Scars**—Opposite, half round to broadly crescent-shaped, somewhat raised. Bundle scars three or sometimes up to seven. Stipular scars half round, not connected to the leaf scar. **Buds**—Solitary, reddish-brown, glabrous, ovoid, end bud lacking, about four bud scales visible. **Bud Content**—Lvs. ternately compound, vernation of lfts. involute. Flower cluster in center of lvs., five sepals, five petals, five stamens and three styles. **Leaf Remnants**—Lfts. finely serrate, the lateral two sessile. **Fruit Remnants**—Inflated capsule. —*S. trifolia* L.

#### Family ACERACEAE

##### ACER L. Maple

**Habit**—Deciduous, usually trees. **Twigs**—Usually moderate, varying from brown, red, to gray. Pith whitish to brown. **Leaf Scars**—Opposite, narrow U- or V-shaped. Bundle scars three. Stipular scars none but opposite leaf scars meeting or connected by a transverse ridge. **Buds**—Solitary or sometimes collaterally multiple, sometimes stalked, terminal bud present or absent in one species, often replaced, however, by a fruit remnant, bud scales four-ranked and opposite. **Bud Content**—Young lvs. compound or somewhat lobed. **Leaf Remnants**—Compound or palmately veined and lobed. **Fruit Remnants**—Samara with two winged nutlets.

1. End bud always lacking.

—\**A. palmatum* Thunb.

1. End bud present on some of twigs.

2. Lateral buds stalked, usually only two bud scales visible; pith becoming orange to brown.

3. Older twigs and young branches conspicuously white-streaked; twigs moderate, glabrous.

—\**A. pennsylvanicum* L.

3. Older twigs at most faintly striped; twigs slender, appressed hairy.

—*A. spicatum* Lam.

2. Lateral buds not stalked; more than two bud scales visible; pith usually whitish.
4. Buds densely woolly; twigs commonly covered with a glaucous bloom; lvs. in bud pinnately compound. —*A. Negundo* L.
4. Buds not densely woolly, although sometimes pubescent; twigs not glaucous; lvs. in bud lobed but not compound.
5. Edges of opposite leaf scars meeting in a slight projection; buds often milky when cut; two pairs of inner bud scales brownish silky hairy. —\**A. platanoides* L.
5. Edges of opposite scars not meeting but connected by a ridge; buds never milky; none of inner bud scales brown-hairy.
6. Terminal bud with more than four pairs of bud scales visible; buds conical and acute.
  7. Buds glabrous or somewhat pubescent at apex; bark of trunk dark gray. —*A. saccharum* Marsh.
  7. Buds short-pubescent over entire surface; bark dark, blackish. —*A. nigrum* Michx.
6. Terminal bud never with more than four pairs of bud scales visible; buds ovoid and blunt.
  8. Twigs brown to straw-colored; flower buds not clustered; six or less than six bud scales visible.
    9. Twigs and bud short-tomentose; lvs. in bud with edges plicate. —\**A. campestre* L.
    9. Twigs glabrous; buds at most ciliate; lvs. in the bud with edges only slightly if at all plicate. —\**A. ginnala* Maxim.
  8. Twigs bright reddish or brownish-red; flower buds in clusters; usually six to eight bud scales visible.
    10. Bark of large trunks becoming flaky; twigs with a rank odor when bruised; bud scales somewhat pointed at apex. —*A. saccharinum* L.
    10. Bark not becoming flaky; no rank odor when twigs are bruised; bud scales rounded at apex. —*A. rubrum* L.

*A. nigrum* is sometimes considered as a variety of *A. saccharum* and does resemble it closely. Rehder (46) following Bailey (2) considers them specifically distinct.

### Family HIPPOCASTANACEAE

AESCULUS L. Horse-chestnut; Buckeye

**Habit**—Deciduous round topped trees, bark dark, broken into scaly plates. **Twigs**—Stout, brown to gray, glabrous or nearly so. Lenticels rather conspicuous. Pith whitish, moderate to large. **Leaf Scars**—Opposite, shield-shaped, triangular to round. Bundle scars usually six or seven, often in three groups. Stipular scars none. **Buds**—Solitary, very large, especially the terminal, often resinous, brownish, scales in four ranks, the outer pair woody and keeled. **Bud Content**—Lvs. compound, densely woolly, vernaltion of lfts. conduplicate, the

edges slightly plicate. Flower cluster in center of lvs. and very woolly. **Leaf Remnants**—Lfts. five to seven, palmate. **Fruit Remnants**—Dehiscent, one seeded, usually spiny, often remaining.

1. Buds more or less gummy or resinous, the inner scales not rosy red at base; terminal bud often over 2.5 cm. long; fruit with spines.

2. Buds heavily resinous; fruit very spiny; commonly planted.

—\**A. Hippocastanum* L.

2. Buds becoming rather dry and thinly resinous; fruit with a few, weak spines; very uncommon.

—\*X *A. carnea* Hayne.

1. Buds not at all resinous, the inner scales rosy red at base; terminal bud less than 2.5 cm. long; fruit without spines.

—*A. glabra* Willd.

Two other species of *Aesculus*, *A. octandra* Marsh. and *A. arguta* Buckl., the latter often considered merely as a shrubby form of *A. glabra*, have been reported in Iowa but are rarely found.

### Family SAPINDACEAE

#### XANTHOCERAS Bge.

**Habit**—Deciduous shrubs or small trees. **Twigs**—Rather stout, buff to tan, the older twigs gray, glabrescent. Lenticels fairly conspicuous. Pith light brownish, rather large, often irregularly round. **Leaf Scars**—Alt., more than two-ranked, crescent to half elliptical in shape, somewhat raised. Bundle scars three. Stipular scars none. **Buds**—Solitary, reddish-brown to brown, slightly pubescent, laterals appressed with about four to six bud scales visible, terminal bud with filiform tips. **Bud Content**—Scales whitish hairy on inside, and by lobing on sides grade into the pinnately compound leaf, which has a large rachis and very small lfts. **Leaf Remnants**—About nine to seventeen lfts. **Fruit Remnants**—Loculicidal three-valved capsule, the seeds dark brown.

—\**X. sorbifolia* Bge.

### Family RHAMNACEAE

#### RHAMNUS L. Buckthorn

**Habit**—Deciduous shrubs or small trees. **Twigs**—Slender to moderate, usually gray or brownish. Pith whitish, small to moderate, often rather angled. **Leaf Scars**—Opposite or alt. and more than two-ranked. Bundle scars three or fused as a line. Stipular scars small or part of stipule remaining. **Buds**—Solitary, naked or scaly, brown to gray, appressed or almost so. **Bud Content**—Lvs. simple, pinnately veined with stipules at sides, vernation various, the opposite-leaved species involute. **Leaf Remnants**—Margins entire or serrate. **Fruit Remnants**—Blackish drupe with nutlets.

1. Leaf scars opposite, rarely obscurely so; end of twig often forming a spine.
2. Spines at end of twigs much longer than the last pair of lateral buds.  
—\**R. japonica* Maxim.
2. Spines shorter or very slightly longer than the last lateral buds.
3. Buds and twigs very dark brown under a gray skin; bud scales conspicuously gray or tan at margins.
4. Buds glabrous; twigs glabrous or slightly downy pubescent.  
—\**R. cathartica* L.
4. Buds and young twigs definitely scurfy pubescent.  
—\**R. saxatilis* Jacq.
3. Buds and twigs light brown; bud scales uniform in color.  
—\**R. davurica* Pall.
1. Leaf scars alt.; twigs spineless.
5. Buds naked, no definite bud scales, very tomentose; end bud present.  
—\**R. Frangula* L.
5. Buds with evident bud scales, at most puberulent to ciliate; end bud lacking.
6. Twigs gray, scurfy pubescent near the end; tall shrubs or small trees.  
—*R. lanceolata* Pursh.
6. Twigs brownish to gray-brown, glabrous or very short hairy; low shrubs; rare.  
—*R. alnifolia* L'Herit.

CEANOTHUS L. New Jersey Tea

**Habit**—Low, deciduous shrubs. **Twigs**—Greenish to brownish gray, short pubescent. Lenticels inconspicuous. Pith white, rather large. **Leaf Scars**—Alt., more than two-ranked, half oval. Bundle scars rather irregular, one, or broken into three. Stipular scars narrow and small. **Buds**—Solitary, no definite terminal bud, gray to brown, very hairy, about two to four bud scales visible, the first pair at least three-fourths the bud length. **Bud Content**—Stipules present at sides of lvs., vernation straight to conduplicate. **Leaf Remnants**—Simple, pinnately veined, crenate-serrate, pubescent beneath. **Fruit Remnants**—Nutlets usually fallen leaving a three-lobed saucer-shaped receptacle in corymbose panicles.

1. Remains of the flower cluster on a long stalk; fruit 5 to 6 mm. in diameter, the seeds usually smooth; stems usually clustered, sometimes over 60 cm. high.  
—*C. americanus* L.
1. Remains of the flower cluster on a short stalk, the fruit 4 to 5 mm. long with seeds usually pitted; stems usually single, seldom over 60 cm. high.
2. Twigs sparingly hairy; rather rare.  
—*C. ovatus* Deaf.
2. Twigs densely pubescent; more common.  
—*C. ovatus pubescens* Torr. & Gray.

Family VITACEAE

VITIS L. Grape

**Habit**—Deciduous climbers. **Twigs**—Tendrils opposite some of the leaf scars, brownish, striate or somewhat angled, becoming flaky



barked. Lenticels not conspicuous. Pith moderate to large, tan to brown, with solid partitions at the nodes (in ours). Tracheal tubes and wood rays large. **Leaf Scars**—Alt., two-ranked or somewhat obscurely so, oval, half-round to crescent-shaped. Bundle scars several in a C-shaped series. Stipular scars rather large. **Buds**—Solitary or collaterally branched, brownish, conical, obtuse, with two to four scales. **Bud Content**—Lvs. usually woolly on the back, ovate, serrate, vernation straight but edges appear plicate. **Leaf Remnants**—Broadly ovate, often three lobed, palmately veined. **Fruit Remnants**—Purple or blue black berry.

1. Twigs woolly pubescent; strongly angled. —*V. cinerea* Engelm.
1. Twigs glabrous or sparingly puberulent, terete or very weakly angled.
  2. Diaphragm at the node thin, under 1 mm. thick; very common. —*V. vulpina* L.
  2. Diaphragm over 1.5 mm. thick; rare except in cultivation.
  3. Either a tendril or flower cluster remains at every node; cult., not native here; lvs. tomentose beneath. —\**V. labrusca* L.
  3. Tendrils and flower remnants absent from every third node; native but rare in Iowa. Lvs. glaucous beneath. —*V. Leconteana* House.

The genus *Vitis* needs more study in this state. *V. aestivalis* Michx. and *V. rubra* Michx. have been reported as occurring in this state, and other species may occur.

#### AMPELOPSIS Michx.

**Habit**—Deciduous twiners. **Twigs**—Soft-wooded, tendrils opposite some of the leaf scars; twigs glabrous, straw-colored. Lenticels brown. Pith white, sometimes slightly angled, developing ingrowing partitions from sides. **Leaf Scars**—Alt., round. Bundle scars many, in a ring. Stipular scars long and narrow. **Buds**—Small, often lacking. **Leaf Remnants**—Large, three-lobed, palmately veined. **Fruit Remnants**—Berry, changing from pale to blue, borne in cymes.

—\**A. brevipedunculata* Koehne.

#### PARTHENOCISSUS Planch. Virginia Creeper; Boston Ivy

**Habit**—Deciduous, usually climbing. **Twigs**—Climbing by tendrils bearing at the tip flat adhesive discs, twigs slender to moderate, often twisted with shortened internodes, brownish to gray, glabrous. Lenticels elongated, very conspicuous. Pith greenish, rather large, somewhat firmer at the nodes. **Leaf Scars**—Alt., usually two-ranked, rather large, half-round to round, about parallel to the twig. Bundle scars rather indistinct but about ten to twelve. Stipular scars long and narrow. Tendrils usually absent from every third node. **Buds**—Usually solitary, short conical, brownish, with two to four bud scales visible.

**Bud Content**—Lvs. simple, leaf with plicate edges or palmately compound with conduplicate lfts., glabrous. **Leaf Remnants**—Simple or compound. **Fruit Remnants**—Blue-black drupe in cymes.

1. Lvs. in the bud simple but mostly 3-lobed; tendrils usually under 3 cm. in length; not native. —\**P. tricuspidata* Planch.

1. Lvs. in the bud palmately compound, of 5 lfts.; tendrils often over 3 cm. long; native as well as cultivated.

2. Tendrils with 3 to 5 branches, rarely with adhesive discs.

—*P. vitacea* Hitchc.

2. Tendrils with 5 to 12 branches, adhesive discs present.

—*P. quinquefolia* Planch.

Another member of the family Vitaceae, *Cissus Ampelopsis* Pers., has been reported in southern Iowa but it is very infrequent.

### Family TILIACEAE

TILIA L. Basswood; Linden

**Habit**—Deciduous trees, bark of young stems smooth and dark-gray, becoming fissured in long, rather narrowed ridges. **Twigs**—Rather slender to moderate, somewhat zigzag. Lenticels rather large but not very conspicuous. Pith at first pale, becoming tan or light-brown, small to moderate, often somewhat angled. Bark with a circle of triangles in section. **Leaf Scars**—Alt., two-ranked, half-round to half-elliptical. Bundle scars three or in three groups but sometimes scattered. Stipular scars unequal, one much longer. **Buds**—Usually solitary, the end bud lacking, obliquely unsymmetrical, with two to four obtuse, thick bud scales visible. **Bud Content**—Lvs. hairy, oblique, serrate, the inner scales probably stipules. **Leaf Remnants**—Broad, cordate at base, palmately veined. **Fruit Remnants**—Rather small, nut-like, in cymes from a leaf-like bract.

1. Twigs rather stout, usually over 3 mm. in diameter.

2. Buds reddish or reddish-green, glabrous; native and commonly planted.

—*T. glabra* Vent.

2. Buds reddish-brown, sparingly pubescent near apex, sometimes stellate; not native.

—\**T. heterophylla* Vent.

1. Twigs rather slender, rarely over 3 mm. in diameter, except on shoots.

3. Twigs and buds with scattered hairs; lvs. in bud whitish hairy.

—\**T. platyphyllos* Scop.

3. Twigs and buds glabrous; lvs. in bud brown or tan, hairy.

—\**T. cordata* Mill.

GREWIA L.

**Habit**—Deciduous shrubs. **Twigs**—Rather slender, gray or olive, densely stellate. Lenticels light, rather conspicuous. Pith white, mod-

erate. **Leaf Scars**—Alt., two-ranked, oval. Bundle scars many, as an oval ring. Stipules remaining. **Buds**—Solitary, small, no definite scales visible, densely pubescent, the end bud absent. **Bud Content**—Lvs. whitish hairy with stipules at sides, vernation conduplicate near tip. Flower cluster often present near end as an umbel. **Leaf Remnants**—Simple, ovate, doubly serrate or dentate, appearing palmately veined, stellate-hairy beneath. **Fruit Remnants**—Orange to red, one seeded sub-globose drupe. —\**G. parviflora* Bge.

#### Family MALVACEAE

HIBISCUS L. Shrubby Althaea

**Habit**—Deciduous shrubs. **Twigs**—Moderate, enlarged near the end and at node, somewhat two-ridged from leaf scars, gray to gray-green. Lenticels raised, pale, fairly conspicuous. Pith whitish with a greenish border, moderate to small. **Leaf Scars**—Alt., more than two-ranked, often clustered near the end of the twig, half oval, raised. Bundle scars about four. Stipular scars or thread-like stipules at sides of scars. **Buds**—Usually replaced by scars of inflorescence. **Leaf Remnants**—Ovate to rhombic, rather three-lobed, palmately veined. **Fruit Remnants**—A five-celled capsule. —\**H. syriacus* L.

#### Family GUTTIFERAE

HYPERICUM L. St. John's-wort

**Habit**—Deciduous shrubs, narrow, partly developed lvs. often present. **Twigs**—Rather slender, four-ridged from below the leaf scars, two from the center of the scar and two from a point between scars, bark of older twigs shreddy. Lenticels not conspicuous. Pith greenish to brown, small to moderate, spongy to excavated. **Leaf Scars**—Opposite, triangular, little raised. Bundle scar one. Stipular scars none but opposite leaf scars connected by a transverse ridge. **Buds**—Seldom present but replaced by a cluster of lvs. or a branch. **Bud Content**—Partly developed buds have linear to lanceolate lvs. covered with small punctate dots. **Leaf Remnants**—Linear-oblong to lanceolate, the margins entire. **Fruit Remnants**—Septicidal capsules in corymbs or cymes.

This is a hard genus in which to separate the species in winter condition as well as at any other time. Only one, *H. prolificum* L., is found native and it differs from the cultivated forms studied by having longer capsules, often 11 mm. long.

Family TAMARICACEAE

TAMARIX L. Tamarisk

**Habit**—Deciduous shrubs or small trees. **Twigs**—Slender, the ends usually drying, glabrous, reddish-brown to light-brown. Lenticels on older wood fairly conspicuous. Pith greenish to white, small and not central. **Leaf Scars**—Lacking because of the persistent leaf bases, these are alt., and more than two-ranked. **Buds**—Small, light-brown to reddish-brown, glabrous, solitary or multiple, obtuse with about three to four bud scales visible. **Bud Content**—Too small for detail. **Leaf Remnants**—Small, scale-like, decurrent. **Fruit Remnants**—A three to five valved capsule. —\**T. odessana* Stev.

This seems to be the common species in this region. Two other species *T. parviflora* DC. and *T. gallica* L. have been reported and might be expected in Iowa.

Family THYMELAEACEAE

DAPHNE L.

**Habit**—Small, evergreen or deciduous shrubs. **Twigs**—Moderate, gray to brown, puberulent. Pith greenish, small. Wood rather soft. **Leaf Scars**—Alt. to opposite, more than two-ranked, half-round to crescent-shaped. Bundle scar one. Stipular scars none. **Buds**—Solitary or mostly so, slightly pubescent, with six to eight bud scales visible on the terminal bud. **Bud Content**—Scales grade into ciliate, entire, pinnately veined lvs., vernation straight. Flowers in center of bracts or lvs. in parts of four. **Leaf Remnants**—Entire, glabrous. **Fruit Remnants**—A one-seeded drupe.

- 1. Deciduous.
- 1. Evergreen.

—\**D. Mezereum* L.  
—\**D. Cneorum* L.

DIRCA L. Leatherwood

**Habit**—Small deciduous shrubs. **Twigs**—Rather slender, the upper nodes swollen, rubbery when bent, light brown, glabrous. Lenticels rather conspicuous. Pith whitish, very small, spongy. Wood with prominent rays and thick, tough bark. **Leaf Scars**—Alt., typically two-ranked, annular, almost encircling the bud. Bundle scars five or more. Stipular scars none. **Buds**—Appear solitary, no terminal bud, brown silky-hairy with indistinct scales. **Bud Content**—Lvs. glabrous but ciliate, simple, entire, pinnately veined with straight vernation. Flowers with lvs. **Leaf Remnants**—Elliptical to obovate, entire. **Fruit Remnants**—Drupe about 8 mm. long. —*D. palustris* L.

## Family ELAEAGNACEAE

## SHEPHERDIA Nutt. Buffalo Berry

**Habit**—Deciduous shrubs or small trees. **Twigs**—Moderate, silvery or brown because of small peltate scales, the twig often ending in a spine. Lenticels inconspicuous. Pith brown, small to moderate. **Leaf Scars**—Opposite, half-round, somewhat raised. Bundle scar one. Stipular scars none. **Buds**—Solitary or multiple through branching, usually appressed and covered with silvery or brown scales like the twig, stalked, with about four valvate bud scales visible, the first two the length of the bud. **Bud Content**—Lvs. simple, entire, scaly, with straight vernation. Flowers not in bud scales but closed with four sepals, no petals, and seven or eight stamens. **Leaf Remnants**—Pinnately veined, rather small, covered with peltate scales on one or both sides. **Fruit Remnants**—Reddish drupe.

1. Some of scales reddish-brown.

—\**S. canadensis* Nutt.

1. Scales all silvery, none reddish-brown.

—*S. argentea* Nutt.

## ELAEAGNUS L. Oleaster; Russian Olive

**Habit**—Deciduous shrubs or trees. **Twigs**—Slender to moderate, with silvery or brown peltate scales, especially near the end. Lateral thorns often present. Lenticels inconspicuous. Pith pale to brown, moderate, sometimes irregular in section. **Leaf Scars**—Alt., more than two-ranked, half round, somewhat raised. Bundle scar one. Stipular scars none. **Buds**—Silvery or brown from peltate scales, about two to six bud scales visible, the first scale at least one-half the bud length. **Bud Content**—Scales grade into the peltate, scaly lvs., vernation straight. **Leaf Remnants**—Simple, entire, rather small, pinnately veined, covered at least below with scales. **Fruit Remnants**—Drupe-like with scales.

1. Scales never brownish; often thorny and tree-like.

—\**E. angustifolia* L.

1. Some of scales on twig or bud brownish; thornless shrubs.

2. Terminal bud with some silvery scales, especially at the tip; high shrubs, often over 3 m. tall.

—\**E. argentea* Pursh.

2. Terminal bud with brownish scales throughout; usually a low shrub, less than 3 m. tall.

—\**E. multiflora* Thunb.

## Family ARALIACEAE

## ACANTHOPANAX Miq.

**Habit**—Deciduous, small trees with trunks often spiny, or shrubs. **Twigs**—Gray to brown, glabrescent, spiny. Lenticels conspicuous. Pith white, often very large. **Leaf Scars**—Alt., more than two-ranked,

narrowly crescent- to V-shaped. Bundle scars mostly five to twelve. Stipular scars none. **Buds**—Solitary, gray-tan, conical to ovoid, about two or three bud scales visible, the first about the length of bud. **Bud Content**—Lvs. compound or lobed. **Leaf Remnants**—Palmately lobed or compound. **Fruit Remnants**—Berries borne in panicles.

1. Spines scattered on the internodes; typically tree-like. —\**A. riciniifolius* Seem.

1. Spines limited to nodes; shrubs. —\**A. Sieboldianus* Mak.

#### ARALIA L. Hercules Club

**Habit**—Deciduous, large shrubs or small trees, bark of trunk very spiny. **Twigs**—Very stout, straw-colored, spiny, especially just below the nodes. Lenticels brown, elongated and rather conspicuous. Pith white, very large. Twigs exuding a translucent liquid when cut, which quickly hardens. **Leaf Scars**—Alt., more than two-ranked, U-shaped, almost encircling the twig. Bundle scars many. Stipular scars none. **Buds**—Solitary, placed at some distance below the scar, light brown, glabrous, almost appressed, scales few. **Bud Content**—Inner scales and lvs. with transverse narrow red stripes, lvs. decomposed, mostly rachis. **Leaf Remnants**—Doubly pinnately compound, very large, with large, usually prickly petiole. **Fruit Remnants**—Black and berry-like, about 6 mm. in diameter, in panicles. —\**A. spinosa* L.

### Family CORNACEAE

#### CORNUS L. Dogwoods

**Habit**—Deciduous shrubs or rarely small trees. **Twigs**—Slender to moderate. Pith whitish to brown, moderate to large, sometimes angled in section, sometimes spongy. **Leaf Scars**—Alt. and more than two-ranked or opposite, crescent- or flattened U-shaped. Bundle scars three. Stipular scars none but opposite leaf scars connected by a transverse ridge. **Buds**—Terminal bud present, and often swollen at the base or along its entire length by the flower cluster inside, solitary, often stalked, the first two bud scales the length of the bud and often covering it. **Bud Content**—Lvs. simple, entire, at least the outer pubescent, pinnately veined, the vernation various, usually involute near the ends. Flowers in a globose cluster. **Leaf Remnants**—Entire, ovate to elliptical. **Fruit Remnants**—Drupes, usually in flat topped cymes.

1. Leaf scars alt., usually crowded out near the end of the twig.

—*C. alternifolia* L.

1. Leaf scars opposite, not crowded near the twig end.

2. Lateral buds of young twigs covered by raised leaf scar base; enlarged flower buds biscuit-shaped, rather flattened from end. —\**C. florida* L.
2. Lateral buds not concealed; none of buds flattened biscuit-shaped.
3. Lateral buds divergent at about a twenty degree angle to the twig; some of buds much enlarged, obtuse at end. —\**C. mas* L.
3. Lateral buds appressed; none of the buds greatly enlarged, the flower buds rather pointed.
4. Twigs bright greenish-yellow in color. —\**C. stolonifera flaviramea* Rehd.
4. Twigs not greenish-yellow.
5. Twigs bright coral red. —\**C. alba sibirica* Loud.
5. Twigs dark red to grey in color.
6. Twigs gray to brownish-gray; fruit remains in an elongated panicle-like cyme. —*C. racemosa* Lam.
6. Twigs not grayish; cymes flat (rest of key only approximate).
7. Pith soon becoming tan or brown.
8. Twigs sparingly puberulent; leaf remnants not scabrous above; fruit light blue. —*C. Amomum* Mill.
8. Twigs heavily appressed-pubescent; leaf remnants scabrous above, fruit white. —*C. asperifolia* Michx.
7. Pith pale, not tan or brown.
9. Buds dark brown, silky with no shade of gray. —\**C. sanguinea* L.
9. Buds gray to brownish.
10. Twigs deep blood-red, the lenticels pale, rather conspicuous; leaf remnants elliptical with four to five pairs of veins. —*C. stolonifera* Michx.
10. Twigs reddish to greenish-red, lenticels inconspicuous; leaf remnants broadly ovate to sub-orbicular with about eight pairs of veins. —*C. rugosa* Lam.

This genus has a few well marked species, but many are hard to separate in any condition. The last part of the key is only an approximation and should be used with caution.

### Family CLETHRACEAE

#### CLETHRA L. White Alder

**Habit**—Deciduous shrubs. **Twigs**—Slender, yellowish to tan, scurfy pubescent. Pith white to green, rather large, sometimes obscurely angled. **Leaf Scars**—Alt., more than two-ranked, somewhat triangular. Bundle scar one and raised. Stipular scars none. **Buds**—Terminal bud large, densely yellowish pubescent, with about three bud scales visible on the terminal bud, these scarred at tip. **Bud Content**—Lvs. long-ovate, acuminate, entire, densely hairy outside, pinnately veined, vernation straight, except as wrapped around the inner mass. **Leaf Remnants**—Obovate to oblong, sharply serrate, pubescent be-

neath. **Fruit Remnants**—Sub-globose capsule about 3 mm. in diameter borne in upright racemes. —\**C. alnifolia* L.

Family ERICACEAE

RHODODENDRON L.

**Habit**—Evergreen or deciduous shrubs. **Twigs**—Slender to stout, pubescent. Lenticels inconspicuous. Pith pale to green, sometimes angled. **Leaf Scars**—Alt., more than two-ranked, crescent- or shield-shaped. Bundle scars one or broken into more. Stipular scars none. **Buds**—Solitary, often minute, terminal flower buds often much enlarged and with many scales, although sometimes partly hidden in the lvs. **Bud Content**—Vernation revolute. **Leaf Remnants**—Simple, entire, pinnately veined. **Fruit Remnants**—Septicidal capsule.

This genus is not native here and is rarely planted in Iowa. The species have been extensively hybridized and are difficult. Those located fall into two groups, one with small leaves with flat appressed hairs such as *R. Simsii* Planch. and *R. yedoense* Maxim., and the other with large leaves, the hairs not flattened such as *R. catawbiense* Michx. and *R. maximum* L.

KALMIA L. Mountain Laurel

**Habit**—Evergreen to deciduous shrubs. **Twigs**—Rather small to moderate. Lenticels inconspicuous. Pith greenish to brown, moderate to large. **Leaf Scars**—Often whorled and clustered near the end of the twig, but sometimes alt. and more than two-ranked. Bundle scar one. Stipular scars none. **Buds**—Very small, puberulent, appressed, with about two bud scales visible. **Bud Content**—Lvs. very small, the vernation straight. **Leaf Remnants**—Lanceolate to elliptical, entire, pinnately veined. **Fruit Remnants**—A sub-globose, five-valved capsule.

1. Lvs. entire to acuminate, 8 to 10 cm. long, usually alt., but sometimes opposite or whorled; fruit in terminal corymbs. —\**K. latifolia* L.
1. Lvs. mostly obtuse, smaller, usually less than 6 cm. long, usually whorled; fruits in lateral corymbs. —\**K. angustifolia* L.

PIERIS D. Don.

**Habit**—Evergreen shrubs. **Twigs**—Slender to moderate, rather appressed hairy and scurfy. Lenticels not conspicuous. Pith rather small, pale, round to triangular. **Leaf Scars**—Alt., more than two-ranked, half round, little raised. Bundle scar one. Stipular scars none. **Buds**—Small, slightly ciliate, the end bud not ordinarily pres-



ent, about two to four somewhat keeled and long pointed bud scales visible. **Bud Content**—Scales grade into entire, glabrous, pinnately veined lvs., the vernation straight but with the long leaf tips rather pinched together. **Leaf Remnants**—Oblong, acute, crenate-serrulate. **Fruit Remnants**—Often present as a globose five-valved capsule, or sometimes an unopened flower cluster. —\**P. floribunda* Benth. & Hook.

ARCTOSTAPHYLOS Adans. Bearberry

**Habit**—Prostrate evergreen shrubs with rooting branches. **Twigs**—Slender, slightly three angled, short hairy, brownish to gray. Lenticels inconspicuous. Pith pale, moderate, often somewhat angled. **Leaf Scars**—Alt., more than two-ranked, half elliptical. Bundle scar one. Stipular scars none. **Buds**—Terminal bud slightly larger, ovoid, blunt, puberulent, brownish, with five to seven bud scales visible. **Bud Content**—Lvs. glabrous with straight vernation. **Leaf Remnants**—Obovate to oblong, entire, cuneate at base, obtuse at tip, glabrous except for ciliation. **Fruit Remnants**—Red drupe about 6 to 8 mm. in diameter. Very rare. —*A. uva-ursi* Spreng.

GAYLUSSACIA HBK. Huckleberry

**Habit**—Rather low, deciduous shrubs. **Twigs**—Slender, twiggy, light brown, short tomentose. Lenticels not conspicuous. Pith pale, rather small. **Leaf Scars**—Alt., more than two-ranked, crescent-shaped. Bundle scar one. Stipular scars none. **Buds**—No terminal bud, the laterals light brown to reddish, the edges often gray, with yellow resin dots near the tip. **Bud Content**—Scales grade into simple, entire, pinnately veined lvs., which are covered with yellow dots, vernation straight. Flowers in leaf axils, with five sepals, ten stamens and one style. **Leaf Remnants**—Elliptical, with small yellow resin dots beneath. **Fruit Remnants**—Lustrous, edible, black berry about 6 to 8 mm. in diameter. —*G. baccata* K. Koch.

VACCINIUM L. Blueberry; Deerberry

**Habit**—Low, deciduous shrubs. **Twigs**—Slender, reddish brown, with raised white dots covering the twig. Pith pale, moderate. **Leaf Scars**—Alt., more than two-ranked, half-round to elliptical, little raised. Bundle scar one. Stipular scars none. **Buds**—No end bud, laterals reddish-brown, with lighter margins, glabrescent, with about seven to ten somewhat keeled bud scales visible. **Bud Content**—Scales grade into entire lvs., vernation straight and imbricate. Flowers in the bud with lvs. and with five sepals, five petals, ten stamens and with

a capitate stigma. **Leaf Remnants**—Simple, small, entire, pinnately veined. **Fruit Remnants**—A berry.

1. Twigs pubescent; some of bud scales attenuated at tip, the buds rather appressed. —*V. stamineum* L.

1. Twigs glabrous; bud scales keeled but not attenuated, the buds rather divergent. —*V. vacillans* Soland.

Another species *V. pennsylvanicum* Lam. has been reported for eastern Iowa.

#### Family EBENACEAE

DIOSPYROS L. Persimmon

**Habit**—Deciduous tree, with dark bark tending to separate into square, thick plates. **Twigs**—Moderate, light brown, glabrous and often somewhat glaucous. Lenticels lighter, fairly conspicuous. Pith whitish, often becoming spongy or chambered in older twigs. **Leaf Scars**—Alt., two- or more than two-ranked, half-round, raised as a shelf for the base of the bud. Bundle scar one, rather C-shaped. Stipular scars none. **Buds**—Solitary, appressed, brown, obtuse, with about two bud scales visible, the first the length of the bud. **Bud Content**—Lvs. entire, hairy outside on the rib, vernation straight. **Leaf Remnants**—Simple, pinnately veined, glabrous. **Fruit Remnants**—Large, globose berry, yellowish to pale orange in color, about 2 to 3.5 cm. in diameter. —\**D. virginiana* L.

#### Family SYMPLOCACEAE

SYMPLOCOS Jacq. Sweetleaf

**Habit**—Deciduous shrubs or small trees. **Twigs**—Moderate to slender, gray, scurfy, somewhat two-ridged from leaf scars. Lenticels not conspicuous. Pith becoming brown, moderate, chambered. **Leaf Scars**—Alt., two-ranked, broadly crescent-shaped, somewhat raised. Bundle scars usually as one transverse line but sometimes may be broken into more. Stipular scars none. **Buds**—Solitary or superimposed, short-ovoid, brownish to gray, sparingly pubescent, about six to eight obtuse bud scales visible. **Bud Content**—Scales grade into somewhat pubescent lvs., vernation straight, but cupped around the inner mass. **Leaf Remnants**—Simple, sharply serrate, elliptical to obovate, pinnately veined. **Fruit Remnants**—A drupe.

—\**S. paniculata* Wall.

#### Family STYRACACEAE

HALESIA Ellis. Silver Bell-tree

**Habit**—Deciduous trees, bark separating into appressed scales.

**Twigs**—Rather slender, somewhat zigzag, older twigs with silky-shreddy bark. Lenticels pale, transversely elongated on older twigs. Pith whitish, rather small, inclined to be chambered on older twigs or at least spongy. **Buds**—Often superimposed, lower one smaller, brownish, somewhat puberulent, with about four somewhat keeled bud scales visible. **Bud Content**—Vernation straight but cupped around inner mass. Flower buds separate with about three flowers, with a four parted perianth, ten stamens, and one style. **Leaf Remnants**—Simple, serrulate, rather stellate-hairy beneath, elliptical to oblong-ovate, pinnately veined. **Fruit Remnants**—Dry, four winged oblong drupe.

—\**H. carolina* L.

### Family OLEACEAE

#### FRAXINUS L. Ash

**Habit**—Deciduous trees. **Twigs**—Stout, often rather square in section. Pith whitish. **Leaf Scars**—Opposite, half round, sub-elliptical to crescentic. Bundle scars as a C-shaped line. Stipular scars lacking or very indistinct. **Buds**—Solitary or superimposed, the lower smaller, lateral buds rounded at the tip, with two to three pairs of scurfy bud scales visible. **Bud Content**—Scales with leaf vestiges at tip that grade into pinnately compound rather woolly lvs., vernation of lfts. conduplicate. **Leaf Remnants**—About five to eleven lfts. **Fruit Remnants**—A one-sided winged nutlet.

1. Twigs four-angled, rather square in section; buds dark gray in color.  
—*F. quadrangulata* Michx.
1. Twigs not angled; buds brownish or blue-black.
  2. Buds blue-black, the bud scales of terminal bud apiculate; first pair of lateral buds usually remote from the end of the twig.
    3. Leaf scars definitely half-round; buds very dark blue-black; not native; branches often pendulous. —\**F. excelsior pendula* Ait.
    3. Leaf scars usually somewhat vertically elliptical; buds more brownish-black; native; branches not drooping. —*F. nigra* Marsh.
  2. Buds brown, bud scales of terminal bud not strongly apiculate; first pair of lateral buds often crowded out near the end of the twig.
    4. Twigs typically downy-pubescent. —*F. pennsylvanica* Marsh.
    4. Twigs glabrous.
      5. Leaf scars usually deeply concave on the top; often rather U-shaped. —*F. americana* L.
      5. Leaf scars typically straight across on the top or but slightly concave. —*F. pennsylvanica lanceolata* Sarg.

#### FORSYTHIA Vahl. Golden-bell

**Habit**—Deciduous, rather loosely spreading shrubs. **Twigs**—Mod-

erate, greenish to yellow-brown, glabrous, two-ridged from each leaf scar. Lenticels raised and conspicuous. Pith white to tan, either chambered or excavated. **Leaf Scars**—Opposite, half-round to shield-shaped, slightly raised. Bundle scar one as a short transverse line. Stipular scars none. **Buds**—Solitary or becoming multiple, elongated fusiform or lanceoloid, with twelve to eighteen opposite, four-ranked, somewhat keeled bud scales visible. **Bud Content**—Vernation straight or nearly so. Flower buds separate, one flower to a bud, four sepals, four petals, two stamens, and a two lobed stigma. **Leaf Remnants**—Simple, pinnately veined. **Fruit Remnants**—An ovoid, two celled capsule.

1. Pith solid at the nodes.
2. Pith of internode chambered. —\*X *F. intermedia* Zabel.
2. Pith of internodes excavated. —\**F. auspensa* Vahl.
1. Pith of nodes not solid, usually chambered throughout or rarely hollow throughout. —\**F. viridissima* Lindl.

SYRINGA L. Lilac

**Habit**—Tall, deciduous shrubs or rarely trees. **Twigs**—Slender to stout, often four-ridged. Lenticels usually conspicuous. Pith whitish, moderate to large. **Leaf Scars**—Opposite, crescent, shield-shaped or half-round, rather small, definitely raised, forming a sort of shelf on which the bud rests. Bundle scars as a transverse line. Stipular scars none. **Buds**—Solitary or rarely collateral with about six to eight bud scales visible in four ranks, occasionally more, terminal bud present or absent. **Bud Content**—Lvs. ovate, entire, at most ciliate, pinnately veined, vernation straight but leaf keeled. **Leaf Remnants**—Simple. **Fruit Remnants**—An oblong, loculicidal capsule borne in panicles.

1. Typically shrubs, rarely if ever trees.
2. Terminal bud normally present, often containing the flower cluster of next year, fruit panicle terminal and grading into an ordinary twig.
3. Twigs and bud scales glabrous.
4. Twigs terete, not longitudinally ridged. —\**S. amurensis* Rupr.
4. Twigs ridged from the leaf scars.
5. Twigs gray to olive; bud scales rather fleshy and not strongly keeled. —\**S. yunnanensis* Franch.
5. Twigs brown to gray; bud scales becoming rather dry and strongly keeled, boat-shaped. —\**S. persica* L.
3. Twigs and bud scales pubescent or puberulent.
6. Bud scales definitely keeled; buds ovoid.
7. Outer bud scales of terminal bud keeled and boat-shaped, long pointed; twigs gray to olive-green, about 5 mm. in diameter or over; fruit often over 1.2 mm. long. —\**S. villosa* Wahl.

7. Outer bud scales of terminal bud somewhat keeled but not strongly boat-shaped, not long pointed; twigs gray to brown, rarely up to 5 mm. in diameter; fruit seldom up to 1.2 mm. long. —\**S. Josikaea* Jacq.
6. Bud scales not or only slightly keeled; buds short and conical.  
—\**S. Wolfii* Schneid.
2. Terminal bud normally absent or very small, the lateral buds often containing a flower cluster; fruit panicle not gradually grading into a twig.
8. Scales of lateral bud dry, laterally compressed, the outer spreading, terminal bud occasionally present. —\**S. persica* L.
8. Scales of lateral buds fleshy, not strongly compressed laterally, nor spreading; terminal bud rarely present.
9. Bud scales dark brown with tan-colored, scarios margins.  
—\**S. oblata dilatata* Rehd.
9. Bud scales uniform in color, edges not conspicuously lighter.
10. Twigs conspicuously four ridged, the lenticels rarely present on the side of the twig just above the bud. —\**S. chinensis* Willd.
10. Twigs at most very slightly ridged, the lenticels often above the bud.
11. Buds puberulent. —\**S. microphylla* Diels
11. Buds glabrous or nearly so.
12. Twigs slender; buds seldom over 5 mm. long; not common. —\**S. amurensis* Rupr.
12. Twigs moderate; buds larger; our most common species of lilac. —\**S. vulgaris* L.  
—*S japonica* Decne.
1. Typically a tree.

#### FORESTIERA Poir.

**Habit**—Deciduous shrubs. **Twigs**—Many short, divergent, almost spine-like slender twigs, gray, puberulent near the tip. Lenticels light, rather conspicuous. Pith pale or sometimes becoming tan, moderate. **Leaf Scars**—Opposite, half-round, only slightly raised. Bundle scar one. Stipular scars none. **Buds**—Superimposed, the upper larger, gray-brown, ten to fourteen somewhat ciliate bud scales visible in four ranks. **Bud Content**—Inner scales green at base and purplish-red near tip grading into simple, entire, ovate, pinnately veined lvs., the veneration straight but the tips of the leaf somewhat pinched together. **Leaf Remnants**—Oblong-obovate to oblanceolate, crenate-serrulate, the petiole very short. **Fruit Remnants**—A black one- to two-seeded drupe, about 4 to 5 mm. long. —\**F. neo-mexicana* Gray.

#### CHIONANTHUS L. Fringe-tree

**Habit**—Deciduous small trees or large shrubs. **Twigs**—Moderate to stout, rather four-sided, greenish-gray to brown, pubescent. Lenticels large, oval, longitudinally elongated with acute ends, conspicuous. Pith white, moderate to large. **Leaf Scars**—Opposite, oval, flattened at the top to half round, almost parallel to the twig. Bundle scars

one in a C-shaped line. Stipular scars none. **Buds**—Often superimposed, the upper one larger, gray to brown, sparingly pubescent, rather four-sided, with six to eight keeled and pointed bud scales visible in four ranks. **Bud Content**—Inner scales dark-brown below and lighter above often rosy-colored, but the line between sharp. Lvs. white-downy at tip of larger ones, vernation straight. Flower cluster in center of bracts or lvs. **Leaf Remnants**—Oblong, entire, pinnately veined. **Fruit Remnants**—Dark blue drupes 1.5 to 2 cm. long, borne in loose panicles on the pistillate tree. —\**C. virginica* L.

LIGUSTRUM L. Privet

**Habit**—Shrubs, deciduous but sometimes holding their foliage. **Twigs**—Rather slender, gray to olive, at least somewhat pubescent. Pith whitish, moderate, often slightly angled. **Leaf Scars**—Opposite, half-round, definitely raised, small. Bundle scar one. Stipular scars none. **Buds**—Usually solitary, somewhat pubescent, with opposite, four-ranked bud scales. **Bud Content**—Lvs. simple, entire, pinnately veined, with straight vernation. **Leaf Remnants**—Petiole short, 1 to 3 mm. long. **Fruit Remnants**—Black, berry-like drupe often present.

1. Twigs only minutely puberulent; bud scales keeled, and at most ciliate; lvs. glabrous below; common. —\**L. vulgare* L.
1. Twigs definitely pubescent but scales slightly if at all keeled, definitely pubescent; lvs. pubescent on veins beneath; not common.
  2. Lenticels rather conspicuous; outer bud scales not at all keeled. —\**L. amurense* Carr.
  2. Lenticels inconspicuous; outer bud scales usually slightly keeled. —\**L. obtusifolium* Sieb. & Zucc.

Family LOGANIACEAE

BUDDLEIA. Butterfly-bush

**Habit**—Shrubs, ours deciduous. **Twigs**—Slender, light brown to straw-colored. Lenticels not conspicuous. Pith whitish, small to moderate. **Leaf Scars**—Opposite, or alt. and more than two-ranked, oval to crescent-shaped, often definitely raised. Bundle scar one. Stipular scars none. **Buds**—Solitary, sometimes superimposed, the upper commonly developing into a branch, small, with two to four bud scales visible, the first two about the length of the bud. **Leaf Remnants**—Simple, oblong to lanceolate, pinnately veined, rather tomentulose beneath. **Fruit Remnants**—Oblong to ovoid capsules.

1. Lvs. opposite. —\**B. Davidi* Franch.
1. Lvs. alternate. —\**B. alternifolia* Maxim.

## Family VERBENACEAE

## VITEX L.

**Habit**—Deciduous shrubs or sub-shrubs. **Twigs**—Soft-wooded, peppery aromatic, square in section with obtuse or sharp angles, light brown to tan, puberulent. Lenticels not conspicuous. Pith moderate, white, four-sided. **Leaf Scars**—Opposite, U-shaped, little raised. Bundle scar one as a transverse line. Stipular scars none but opposite leaf scars often connected by a transverse ridge. **Buds**—No terminal bud, the laterals often superimposed, the upper commonly developing the first year, tan or light brown, tomentose, two to four scales indistinctly visible. **Bud Content**—No detail but lvs. appear compound. **Leaf Remnants**—Palmately compound of three to seven lfts. **Fruit Remnants**—Small drupes with a pungent flavor, borne in panicles.

1. Inflorescence remains as a loose panicle; fruit or calyx remains over 2 mm. wide; twigs rounded at the angles. —\**V. agnus-castus* L.
1. Inflorescence remains a narrow panicle; fruit or calyx remains less than 2 mm. wide; twigs with acute angles. —\**V. Negundo* L.

## Family SOLANACEAE

## SOLANUM L. Nightshade

**Habit**—Deciduous twiners. **Twigs**—Soft-wooded, rather two-ridged from the leaf scars, green, slightly pubescent. Lenticels on older wood raised, rather conspicuous. Pith pale to greenish, rather large, often spongy to excavated. **Leaf Scars**—Alt., more than two-ranked, round but flattened on the top, raised. Bundle scar one. Stipular scars none. **Buds**—Solitary, small, rather globose, hairy, with about three to six indistinct scales. **Bud Content**—Scales grade into thick, entire lvs., vernation straight. **Leaf Remnants**—Ovate, entire, often lobed at base. **Fruit Remnants**—Red berries borne in cymes.

—\**S. Dulcamara* L.

## LYCIUM L. Box-thorn; Matrimony-vine

**Habit**—Deciduous, scrambling or often vine-like. **Twigs**—Slender to moderate, often ridged from below the leaf scars, gray, glabrescent. Lenticels inconspicuous. Pith greenish to white, moderate to large, somewhat spongy. **Leaf Scars**—Alt., more than two-ranked, half-round to crescent-shaped. Bundle scar one. Stipular scars none. **Buds**—Often multiple in collateral aggregates, short-globose and small, seeming partly concealed. **Bud Content**—Scales grade into simple, entire, pinnately veined, somewhat ciliate lvs., vernation straight. **Leaf Remnants**—Glabrous, light green, sessile or short petioled. **Fruit Remnants**—Reddish, many-seeded berry.

1. Internodes short, twigs very zigzag and tortuous. —\**L. pallidum* Miers.
1. Internodes rather long, twigs only slightly zigzag.
  2. Typically scrambling; twigs straw to light-gray in color. —\**L. chinense* Mill.
  2. Typically shrubby; twigs straw to dark-gray in color. —\**L. halimifolium* Mill.

Family BIGNONIACEAE

CAMPSIS Lour. Trumpet-creeper

**Habit**—Deciduous, sometimes shrubby but usually climbing by aerial rootlets. **Twigs**—Stout to moderate, glabrous, straw-gray. Lenticels conspicuous. Pith large, pale to light-brown. **Leaf Scars**—Opposite, shield to elliptical in shape. Bundle scars as a C-shaped structure. Stipular scars none but opposite leaf scars usually connected by a transverse ridge. **Buds**—No terminal bud, laterals glabrous, about four to five bud scales visible in four ranks, the first pair about the length of the bud. **Bud Content**—Lvs. small but seem to be compound. **Leaf Remnants**—Pinnately compound of nine to eleven lfts. **Fruit Remnants**—Pod-like capsule, keeled on two sutures, about 16 cm. long and containing winged seeds. —*C. radicans* Seem.

CATALPA L.

**Habit**—Deciduous small to large trees, with bark separating into scales. **Twigs**—Stout. Lenticels rather large, pale. Pith large, pale. **Leaf Scars**—Whorled, oval to round, parallel to the twig. Bundle scars many in a circle. Stipular scars none. **Buds**—Solitary, small, about four to eight somewhat keeled bud scales visible. **Bud Content**—About eight to ten inner scales. Lvs. simple, entire, vernation straight. **Leaf Remnants**—Large, broadly ovate, entire, cordate, palmately veined. **Fruit Remnants**—Long pod-like capsules.

(Key based on persistent capsules)

1. Crown of tree umbrella shaped. —\**C. bignonioides nana* Bur.
1. Crown spreading.
  2. Capsules and twigs slender, under 5 mm. in diameter. —\**C. ovata* Don.
  2. Capsules and twigs stouter.
    3. Capsules usually over 8 mm. in diameter, seeds rounded at ends; bark of trunk thick and rough. —\**C. speciosa* Warder.
    3. Capsules usually less than 8 mm. in diameter, seeds rather pointed at the ends; bark of trunk thin and flaky-scaled. —\**C. bignonioides* Walt.

Family RUBIACEAE

CEPHALANTHUS L. Buttonbush

**Habit**—Deciduous shrubs. **Twigs**—Moderate, light brown to gray, glabrous. Lenticels raised, elongated, fairly conspicuous. Pith light



brown, fairly large. **Leaf Scars**—Opposite but often whorled, half-round. Bundle scar one as a crescent-shaped line. Stipular scars narrow, often completely connecting opposite leaf scars. **Buds**—Very small, usually solitary, appearing partly concealed, remote from the leaf scar, often in a depressed area. **Bud Content**—Lvs. ovate, entire and acute, the vernation straight. Stipules often present. **Leaf Remnants**—Rather serrate-dentate near the tip. **Fruit Remnants**—Nutlets in a globose head, often present. —*C. occidentalis* L.

#### Family CAPRIFOLIACEAE

##### SAMBUCUS L. Elder

**Habit**—Deciduous shrubs. **Twigs**—Stout, soft-wooded, obscurely angled, straw- to gray-brown, glabrous. Lenticels conspicuous. Pith white or brown, very large. **Leaf Scars**—Opposite, broadly triangular to crescent-shaped, little raised. Bundle scars three to seven. Stipular scars none. **Buds**—Solitary or superimposed, the lower ones smaller, sometimes stalked, with four to eight opposite bud scales visible. **Bud Content**—Scales grade into pinnately compound lvs. with involute lfts. **Leaf Remnants**—Odd pinnate, the lfts. serrate. **Fruit Remnants**—Drupes in flat topped cymes or ovoid panicles.

1. Pith brown; buds ovoid, narrowing in at the base, often stalked, not superimposed. —*S. pubens* Michx.
1. Pith white; buds short, less than 5 mm. long, often superimposed.
  2. Twigs with very large and very conspicuous lenticels; not native. —\**S. nigra aurea* Sweet.
  2. Twigs with small, only fairly conspicuous lenticels; native and common. —*S. canadensis* L.

##### VIBURNUM L.

**Habit**—Shrubs or rarely small trees, our species deciduous. **Twigs**—Slender to moderate, often somewhat angled, sometimes stellate-pubescent. Pith whitish to tan, moderate to large, often angled in section. **Leaf Scars**—Opposite, crescent- to triangular- or V-shaped. Bundle scars three. Stipular scars none but opposite leaf scars connected by a transverse ridge. **Buds**—Solitary, ovoid to oblong, often stalked, the end bud often swollen at the base from the flower cluster, sometimes naked, glabrous, scurfy or stellate-hairy. **Bud Content**—Lvs. simple, vernation plicate or involute. Flowers in center of lvs., usually in the terminal bud. **Leaf Remnants**—Dentate or lobed. **Fruit Remnants**—Drupe with a one-seeded compressed stone, borne in umbel-like or paniculate cymes.

1. End bud present and naked with no evident bud scales, the flower cluster exposed.
  2. Twigs slender, seldom over 2 mm. in diameter; low shrubs; involucre bracts of unopened flower cluster not curving over the top. —\**V. Carlesii* Hemsl.
  2. Twigs stouter; tall shrub; involucre bracts curving over and meeting above the flower cluster. —\**V. Lantana* L.
1. End bud with evident bud scales visible, or absent entirely.
  3. Buds conspicuously rusty-red scurfy. —\**V. rufidulum* Raf.
  3. Buds either not scurfy or the scurf not rusty-red.
    4. Lateral buds oblong-elongated, the terminal bud with a long tip and swollen at the base, hence "flask" shaped, buds scurfy but not stellate-hairy.
      5. Buds definitely brown-scurfy. —\**V. cassinoides* L.
      5. Buds becoming gray-scurfy.
        6. Terminal flask-shaped bud often over 16 mm. long, the tip long-extended; often over 8 mm. from the swollen base; twigs long and flexuous. —*V. Lentago* L.
        6. Terminal flask-shaped bud shorter, the tip shorter; twigs usually short and rigid. —*V. prunifolium* L.
    4. Lateral buds not oblong-elongated, ovoid or sub-ovoid in shape, terminal bud not flask-shaped, buds glabrous or stellate-hairy.
      7. Twigs pubescent, usually stellate.
        8. Only two bud scales visible on the bud; twigs heavily stellate-tomentose. —\**V. tomentosum* Thunb.
        8. More than two bud scales visible; twigs sparingly short stellate-scurfy.
          9. Lateral buds appressed, the ends somewhat curved in toward the twig. —?\**V. pubescens* Pursh.
          9. Lateral buds spreading at an angle of ten degrees or more from the twig, not curving in toward the twig. —\**V. acerifolium* L.
7. Twigs glabrous.
  10. Fruit persistent and reddish; buds sub-globose. —\**V. Opulus* L.
  10. Fruit either never present or, if so, blue in color; buds ovoid.
    11. Twigs six-angled; usually only two bud scales visible, these in front and back; never fruiting. —\**V. Opulus roseum* L.
    11. Twigs slightly if at all angled; more than two bud scales visible, the first pair lateral; fruit often present.
      12. Bark of older twigs exfoliating. —?\**V. molle* Michx.
      12. Bark of older twigs not exfoliating. —*V. dentatum* L.

SYMPHORICARPUS L. Wolfberry; Coralberry; Snowberry; Buckbrush

**Habit**—Small, deciduous shrubs. **Twigs**—Slender. Lenticels inconspicuous. Pith brown, spongy or excavated. **Leaf Scars**—Opposite, small, half-round to crescent-shaped, raised as a shelf for the bud. Bundle scars none, but opposite leaf scars connected by a transverse

ridge. **Buds**—Small, solitary or collateral with about four to eight keeled, four-ranked bud scales visible. **Bud Content**—Lvs. small, glabrous, vernation straight to involute. **Leaf Remnants**—Simple, entire or sinuate margins. Pinnately veined. **Fruit Remnants**—Berries borne in clusters, reddish or white.

1. Twigs glabrous; pith excavated on the older twigs. —\**S. albus* Blake.
1. Twigs puberulent to pubescent; pith solid to excavated.
  2. Pith of older twigs excavated between the nodes. —*S. occidentalis* Hook.
  2. Pith of older twigs sometimes spongy but not excavated.
    3. Buds rather large, up to 2 mm. long; young twigs usually silky-shreddy; sparingly pubescent. —\**S. vaccinioides* Rydb.
    3. Buds smaller, seldom over 1 mm. long; young twigs not silky-shreddy, definitely pubescent. —*S. orbiculatus* Moench.

#### KOLKWITZIA Graebn. Beautybush

**Habit**—Upright, deciduous shrub. **Twigs**—Rather slender, older twigs with shreddy bark, brown to straw-colored, short-villous. Lenticels not conspicuous. Pith whitish, moderate. **Leaf Scars**—Opposite, triangular to crescent-shaped, raised. Bundle scars three. Stipular scars none, but opposite leaf scars connected by a transverse ridge. **Buds**—Small, solitary, brown to straw-colored, short-pubescent, about six to eight bud scales visible, the first two at least keeled. **Bud Content**—Scales grade into simple, ovate, entire, pinnately veined lvs. with straight vernation. **Leaf Remnants**—Acuminate apex, entire or obscurely toothed, the petiole very short. **Fruit Remnants**—Dry, hispid achenes. —\**K. amabilis* Graebn.

#### DIERVILLA Adans. Bush Honeysuckle

**Habit**—Deciduous shrubs. **Twigs**—Slender to stout, straw to brown, ridged longitudinally, some of the ridges from a point between leaf scars. Pith white, moderate to large. **Leaf Scars**—Opposite, crescent- to V-shaped, little raised. Bundle scars three. Stipular scars none, but opposite leaf scars connected by a transverse ridge. **Buds**—Solitary or sometimes superimposed, brownish to gray, with about eight to ten keeled, acute to attenuated bud scales visible, these opposite and in four ranks. **Bud Content**—Scales grade into simple, rather long lvs. the vernation becoming involute. **Leaf Remnants**—Pinnately veined, serrated. **Fruit Remnants**—Long capsule with sepal remains usually at top.

This is a well marked genus in its winter characters, but the species are almost impossible to distinguish in any condition. However, our native species *D. Lonicera* Mill. differs from the cultivated forms very

clearly by not having hairs on the much fainter longitudinally-running ridges. The cultivated forms have been collectively called *D. hybrida* Voss.

LONICERA L. Honeysuckle

**Habit**—Upright shrubs or twiners, deciduous or exceptionally partly evergreen. **Twigs**—Sometimes ridged or angled. Pith moderate to large, white or brown, continuous or excavated between the nodes. **Leaf Scars**—Opposite, triangular, crescentic to half-round, somewhat raised. Bundle scars three. Stipular scars none, but opposite leaf scars connected by transverse ridges. **Buds**—Often superimposed, the lower one larger, with two to many opposite four-ranked bud scales visible. **Bud Content**—Lvs. simple, entire, pinnately veined, vernation straight. **Leaf Remnants**—Entire, sometimes connate. **Fruit Remnants**—A black or red berry.

1. Vines, with climbing stems.
  2. Stems pubescent, light brown; none of lvs. connate, hence none of leaf scars meeting and continuous with the opposite one. —\**L. japonica* Thunb.
  2. Stems glabrous, straw-colored; upper lvs. connate, hence upper leaf scars as a ring encircling the twig.
  3. Fruit clusters in rather remote whorls; bud scales close; lvs. white to somewhat glaucous beneath. *L. sempervirens* L.
  3. Fruit clusters in crowded whorls; bud scales usually somewhat spreading at tip; lvs. heavily glaucous beneath.
  4. Remnants of connate lvs. rhombic or oblong, acute, not glaucous above; usually less than ten bud scales visible. —\**L. dioica* L.
  4. Connate lvs. orbicular, obtuse or emarginate, glaucous on both sides; often over ten bud scales visible. —\**L. prolifera* Rehd.
1. Upright shrubs, not climbing.
  5. Pith white, spongy but not excavated between the nodes. —\**L. fragrantissima* Lindl. & Paxt.
  5. Pith brownish, excavated between the nodes.
    6. Buds fusiform or lancoid, often over 6 mm. long. —\**L. Xylosteum* L.
    6. Buds conical to ovoid, shorter.
      7. Buds not strongly divergent, forming less than a forty-five degree angle to the twig, short ovoid to conical. —\**L. Ruprechtiana* Reg.
      7. Buds more strongly divergent, ovoid.
        8. Twigs glabrous; our most common species. —\**L. tatarica* L.
        8. Twigs pubescent, at least near the ends; rarely planted here.
          9. Bark of older twigs peeling in scales or plates, not silky shreddy; fruit pedicel long, over 6 mm. —\**L. Maackii* Maxim.
          9. Bark of older twigs becoming silky shreddy; fruit pedicels shorter.

10. Buds definitely pubescent; twigs pubescent and shredding very soon; lenticels gray. —\**L. Korolkowii* Stapf.  
 10. Buds glabrous; twigs slightly pubescent near the end, shredding only on older twigs; lenticels dark. —\**L. Morrowii* A. Gray.

Two other species have been reported as native to the state, *L. glaucescens* Rydb. and *L. canadensis* Marsh., but if they are present here they must be very rare and local.

#### Family COMPOSITÆ

ARTEMISIA L. Worm-wood; Sage-brush

**Habit**—Deciduous sub-shrubs with an aromatic odor. **Twigs**—Moderate to stout, puberulent with small whitish dots. Lenticels inconspicuous. Pith white, moderate. **Leaf Scars**—Alt., more than two-ranked, wide V- or U-shaped. Bundle scars three. Stipular scars none. **Buds**—Solitary, pubescent, ovoid, obtuse, bud scales often numerous, keeled. **Bud Content**—Inner scales grade into lvs. which are flat at base and lobed or dissected. **Leaf Remnants**—Often present in winter, twice pinnate and finely dissected, margins entire. **Fruit Remnants**—Achenes borne in heads, no pappus. —\**A. Abrotanum* L.

In addition to this cultivated species, a native one, *A. frigida* Willd. is known as rare locally in Monona and Lyon counties in northwestern Iowa. It has not been found in the course of the present study.

## NOTES ON THE GENUS KEY

1. Often the pairs of leaf scars are not exactly opposite each other, but they can still be recognized as members of a pair. Sometimes the leaf scars of alternate-leaved twigs may crowd together and resemble an opposite condition. These conditions are not generally found and specimens taken for identification should not be collected from these oddities. Figs. 1, 12.
2. Many plants are either vine-like or upright, depending on habitat, or cultural or varietal differences. If there is a question, it is best to run the specimen through both groups. Fig. 14.
3. An evergreen is here meant as a plant whose leaves remain in a normal condition over the winter, ready to begin activity in the spring. Leaves that remain on the twig in a dried condition until late in the spring, as in many of the oaks, are not considered as evergreen.
4. The longitudinally-running ridges may be on the edges of square twigs, but are usually present on round ones. They usually run down the twig from the sides or the middle of the leaf scars. Figs. 4, 9, 15, 18.
5. Spines or thorns are definitely outgrowths from the twig and are considered as modified twigs. They may be found to contain central pith in some cases. Sometimes they are the sharp ends of actual short twigs, on which may be found leaf scars and buds. Prickles are distinguished from spines by being smaller, and rather superficial so that they can be easily broken off. Figs. 2, 21.
6. The number and shape of the bundle scars is usually very constant. In some cases, however, they are variable and when such cases are known, the genus appears in more than one category; therefore, in doubtful cases it is best to try more than one path. Often the bundle scars are obscure, especially in those genera where the leaf scars are small and raised. If a dead leaf or leaf-petiole remains, pulling this off will give a fresh, unweathered leaf scar in which the bundle scars are more easily seen. A thin slice removed from the surface of the leaf scar will usually make the bundle scars more apparent. If the cut is too deep

- the number may be more than at the surface of the scar. Figs. 1, 2, 10, 15, 22.
7. The pith furnishes relatively constant characters. But always examine several twigs in several places and use some of the older, more mature twigs. It is best to make at least two sections, one diagonally across the twig and one longitudinally along it. The color is sometimes uncertain in diseased twigs so that normally white pith may turn an unhealthy brown. Excavated or partitioned pith can usually be seen more definitely on the older twigs. Spongy pith is harder to see and a good plan in doubtful cases is to cut off the end of a mature twig diagonally and let it dry for fifteen or twenty minutes. Then under the hand lens the spongy character can usually be seen. Figs. 2, 8, 11, 13, 17, 20.
  8. The shape of the leaf scar is usually very characteristic, but often rather hard to describe. In species where the bud is formed beneath the broad leaf scar and through development ruptures it at the top, the resulting scar may be rather U-shaped. In some cases the base of the leaf petiole is hollow in the center and the bud develops within it. This leaves a definitely horseshoe-shaped leaf scar open at the top. Figs. 1, 6, 7, 11.
  9. This transverse connecting ridge is sometimes obscure, except near the end of the twig. It extends from the top of one leaf scar to the top of the opposite scar. In such cases stipular scars are rarely present. Figs. 1, 5, 9, 16, 20.
  10. The size of the pith is figured somewhat in relation to its actual diameter, but mostly in comparison with the size of the twig. A pith one-half or more of the diameter of the twig would be considered large. In such a case, since the pith is not a mechanical tissue, the twig would be weak and easily broken. A pith from one-fourth to one-half of the diameter of the twig would be moderate in size while below one-fourth the pith would be definitely small. Figs. 2, 15.
  11. On the leaf buds or lateral buds only two bud scales are visible. Sometimes on the terminal buds the two outer scales are parted in the middle and expose two more scales. Figs. 5, 16.
  12. This bud has been compared to a flask with a swollen globose base and a long narrow neck. A dissection of the bud reveals next year's flowers in the enlarged basal end. Fig. 16.
  13. The presence or absence of a true terminal bud is a constant

character but one that may cause confusion if not understood. The end of the twig often withers and drops off just above a lateral bud. Therefore, this lateral bud may appear to be a terminal bud, especially since it often becomes larger and tends to stand parallel to the twig. Close examination will show the twig end scar on the opposite side of the end bud from its own leaf scar. This branch scar is usually smaller and differs in appearance from the leaf scars. The absence of a true terminal bud is usually found in twigs with alternate, two-ranked leaf scars. Figs. 12, 23, 24.

14. These soft-wooded suffruticose plants usually die back to the roots every winter and are hardly considered truly woody. Sometimes the very young, rapidly growing shoots of woody plants may have rather soft wood; therefore, it is always advisable to collect from the older branches.
15. Superimposed buds are buds in which more than one are present at a node, one above the other. Sometimes these buds are separated from each other, but usually they are crowded. The lower or the upper one may be the larger. The smaller bud may be overlooked very easily. Figs. 10, 11, 20.
16. These tendrils come out opposite the leaf scars and may be considered as modified leaves. The adhesive discs at the tips of some of them allow the plant to climb a smooth wall. In those cases where tendrils are lacking the twisting and coiling of the twig serves to anchor and lift the plant. Fig. 14.
17. In some cases the leaf rachis remains and since it may be spiny tipped it serves as a spine after the fall of the leaflets. The scars of the leaflets will be found somewhere on such a spine and the true leaf scar will, of course, be absent. Fig. 18.
18. The grouping of trees as opposed to shrubs has a great practical value, but it sometimes causes difficulty. If the specimen is taken from a definite tree, there is little doubt, since a shrub can not be tree-like. But a seedling tree or one closely pruned back may resemble a shrub. A tree can be defined as a woody plant with one central stem of reasonable diameter, say over three inches. A plant with many smaller stems would be clearly a shrub. But a plant with several large stems growing together from the ground would still be considered a tree, and a plant with one stem less than three inches in diameter would certainly



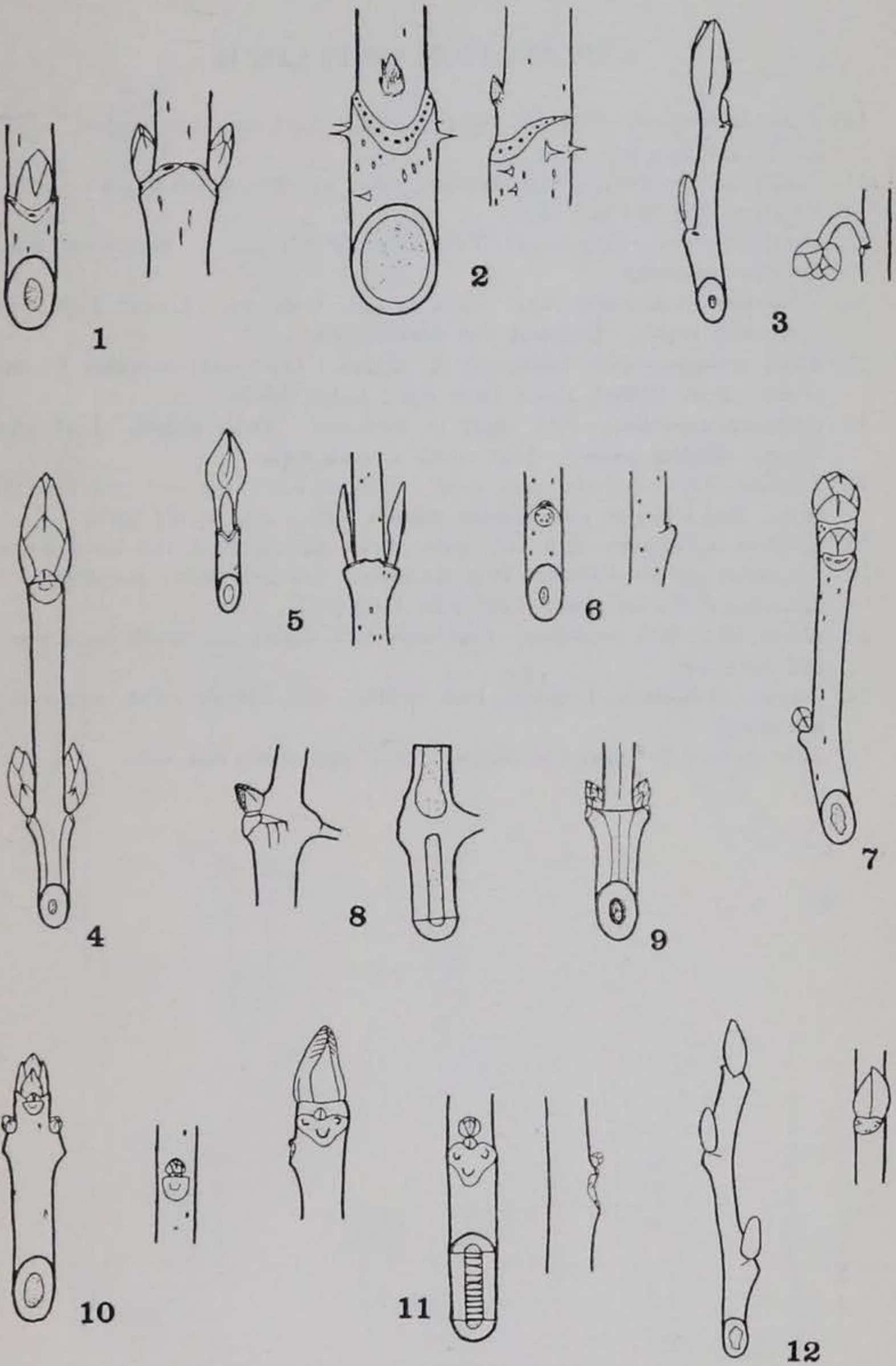
be tree-like and might in fact be a young tree. All doubtful forms known to the writer are put in both groups.

19. These short wart-like twigs are obtuse from the blunt terminal bud, and leaf scars without accompanying buds are closely crowded on them. These twigs increase in length every year and are, therefore, longer on the older twigs. Many plants, like our common apple, have short spur-like twigs, but in these the leaf scars are not densely crowded, and some of them have buds above them.
20. Buds may be partly or completely concealed by the leaf scar or the surface of the twig. In some cases the bud is so short and flattened from the end that it appears concealed. Splitting the bud longitudinally into the twig or leaf scar and removing one-half of it with part of the base beneath will give a good idea of how much of the bud is really concealed. Fig. 6.
21. A slender twig may be regarded as one with an average diameter of less than 3 mm. A moderately-sized twig ranges between 3 mm. and 6 mm., while above 6 mm. would be large or stout twigs. The twig size can be of great value but is very variable in certain limits. Always avoid basal, suckering shoots as they are usually greatly enlarged.
22. The stipule in such cases is a bud scale and when it falls it leaves a narrow ring which extends from the side of a leaf scar clear around the twig to the other side of the same scar. Fig. 19.
23. Buds are called naked when no definite bud scales are present, and the outer enveloping structures are no different than the leaves within. In practically all such cases the bud is densely hairy.
24. In a two-ranked twig the buds and the leaf scars are arranged rather roughly in two rows at the sides of the twigs. Sometimes on sprouts or on twisted twigs this two-ranked condition may be obscure. It is best to examine a mature but fairly elongated shoot and remember that this two-ranked condition need not be absolutely exact. Fig. 12.
25. In some plants the leaf scars and their accompanying buds tend to crowd out near the end of the twig. In such cases some of the lateral buds often project out farther than the terminal bud. Usually at least three leaf scars are crowded out in this manner. Basal shoots may not show this.

26. This sticky sap may harden on the cut twig-ends in time and a fresh cut should be made in testing for it.
27. The stipular scars are reasonably constant, but they are often very small and apt to escape a casual examination. They are found at the upper side of the leaf scars. Sometimes the whole or part of the stipule remains. Figs. 3, 8, 12, 14, 15, 18, 19, 22.
28. A leaf includes all that part from the tip to the bud in the axil. A simple leaf is one with its blade definitely in one piece, no matter how deeply lobed. Leaflets of a compound leaf may sometimes be confused and considered as leaves, but a bud is never found in the axil of a leaflet. Sometimes the bud is concealed in the base of the petiole.

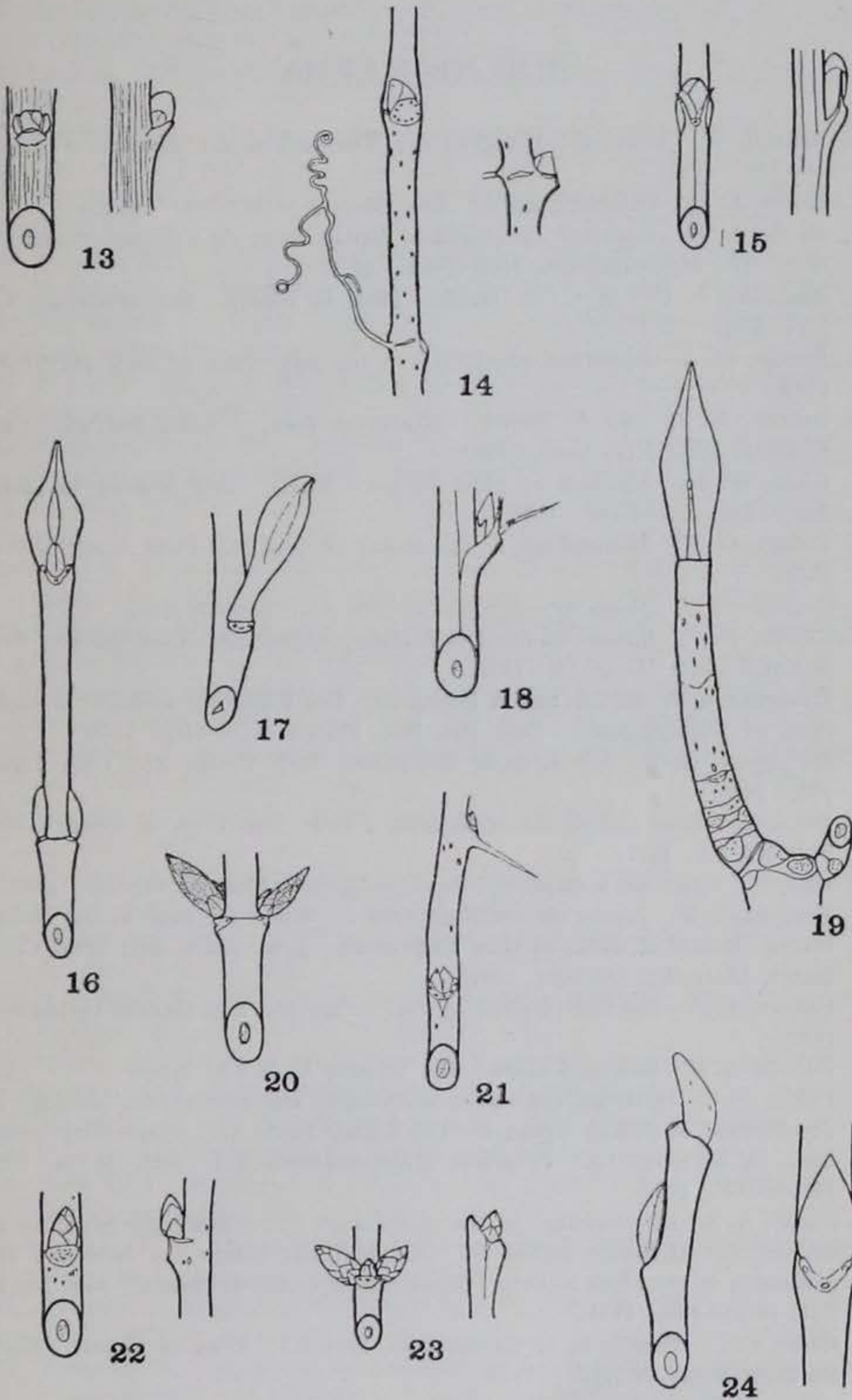
## EXPLANATION OF PLATE I

1. *Acer campestre*—Pith moderate, continuous. Lenticels rather prominent. Leaf scars opposite, V-shaped, almost meeting. Bud scales somewhat keeled.
2. *Aralia spinosa*—Twigs large, with large prickles. Pith very large. Lenticels prominent. Leaf scars narrowly U-shaped, with numerous bundle scars. Bud remote from the leaf scar.
3. *Hamamelis vernalis*—Pith small. Leaf scars about two-ranked. Stipular scars small. Buds often with two stipules simulating bud scales, otherwise naked. Incipient flowers present.
4. *Evonymus europaea*—Pith small to moderate. Leaf scars opposite, half round. Bud scales opposite, somewhat keeled.
5. *Cornus alba sibirica*—Pith moderate. Leaf scars narrowly V-shaped, opposite ones connected by a transverse ridge. Buds often stalked, the first two scales the length of the bud.
6. *Rhus trilobata*—Pith small to moderate. Leaf scars round, with about five bundle scars. Buds partly concealed by the leaf scar.
7. *Crataegus pinnatifida*—Pith moderate to large, rather irregular in section. Leaf scars reniform to crescent-shaped. Bud scales somewhat keeled.
8. *Vitis Lecontiana*—Pith with a firm diaphragm at the node. Tendrils present.
9. *Symphoricarpos occidentalis*—Pith excavated. Twig with longitudinal ridges. Leaf scars definitely raised.
10. *Chionanthus virginica*—Pith moderate to large. Leaf scars half round, the bundle scars as a U-shaped line.
11. *Juglans regia*—Pith chambered. Leaf scars heart-shaped. Buds superimposed.
12. *Castanea mollissima*—Pith moderate to large, five pointed in section. Leaf scars two-ranked. Stipular scars narrow.



## EXPLANATION OF PLATE II

13. *Tamarix odessana*—Pith not central, small. Leaf scars not evident, a part of the leaf base remaining.
14. *Parthenocissus quinquefolia*—Tendrils with adhesive terminal discs. Stipular scars long and narrow.
15. *Caragana frutex*—Pith small. Twig longitudinally ridged. Leaf scars raised. Stipules remaining.
16. *Viburnum prunifolium*—Leaf scars narrow V-shaped. Lateral buds with two scales visible. Terminal bud flask-shaped.
17. *Alnus glutinosa*—Pith triangular in section. Leaf scars reniform to half round. Buds stalked, about three equal scales visible.
18. *Caragana aurantiaca*—Pith small to moderate. Twigs ridged. Leaf scars raised. Stipules present. Leaf rachis a weak spine.
19. *Magnolia Fraseri*—Twigs very stout. Stipular scars as a ring encircling the twig. Bud scales of two connate stipules with a scar at the back.
20. *Lonicera Xylosteum*—Pith excavated. Buds superimposed, the lower larger.
21. *Acanthopanax Sieboldianus*—Pith moderate. Lenticels rather prominent. A spine below the leaf scar. Leaf scars U-shaped.
22. *Morus alba*—Pith moderate. Leaf scars half round, the bundle scars many and scattered.
23. *Prunus Armeniaca*—Terminal bud lacking, the laterals often collaterally multiple.
24. *Salix caprea*—Terminal bud lacking. Only one visible bud scale.



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