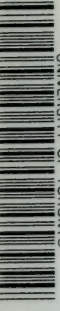
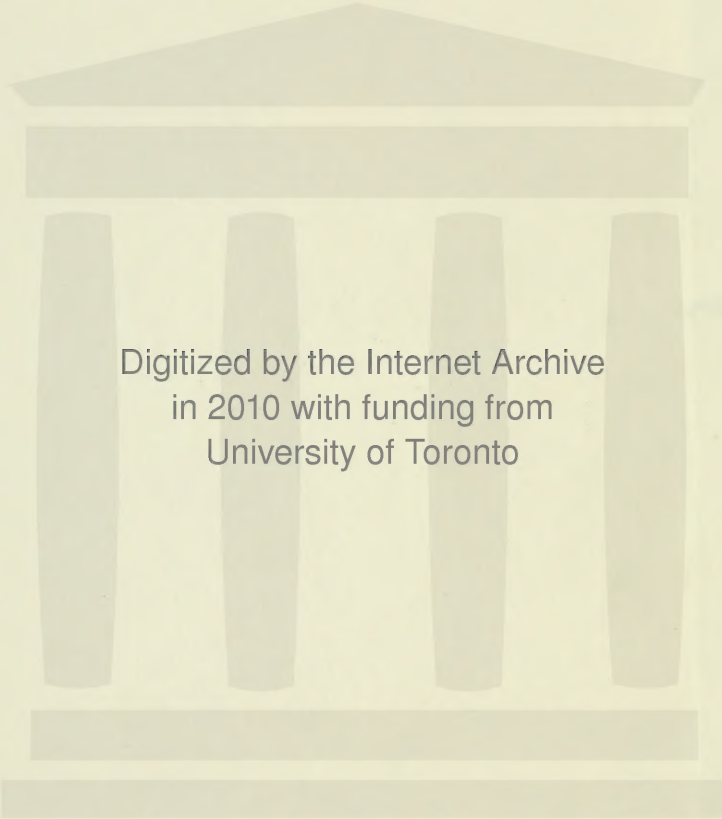


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Trees of Ohio and Surrounding Territory

Including the Area Westward to the Limits of
the Prairie and South to the Thirty-
Seventh Parallel.

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WILLIAM R. LAZENBY,
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Trustees.

PREFACE.

This manual is intended to aid the amateur botanist and nature student in identifying the trees of Ohio and surrounding territory. There are many books which treat entertainingly of the trees of our region, and these may be of great profit to such as know the plants described. Without such knowledge the reading of popular or scientific descriptions can not be of very much value. The real student desires more especially a first hand acquaintance, and it is hoped that the present volume will be of service to those who wish a direct contact with nature.

The keys have been made very complete so that no difficulty should be encountered in identification except in the case of closely related species. No elaborate technical descriptions have been given but a few brief notes are added in connection with each species, calling attention to economic, ecological, or other data of general interest. Characters given in the keys are usually not repeated in the descriptions.

A single English name is given for each species. These names have been taken mainly from Sudworth's "Check List of the Forest Trees of the United States," which on the whole seems to be a very satisfactory basis for an appropriate list. Synonyms will be found in the index. The nomenclature used is essentially that of Britton's Manual.

Most of our common, cultivated, exotic trees have been included, since these form an integral part of the landscape, in many places more conspicuous than the native species. No attention has been paid to the recent effusive treatment of *Crataegus*. All the trees known to occur in Ohio have been especially mentioned as such.

The study of trees may be made a pleasant and profitable pastime at any season of the year for all who have an interest in nature. When the tree has once been identified its peculiarities should be learned by direct observation until its individuality be-

comes perfectly familiar. In winter one can usually find dry leaves or fruit on the trees, which will make it possible to tell most of the species at a time when many think botanical study out of season.

J. H. S.

INTRODUCTION.

A tree may be defined as — a woody plant of any size which produces naturally one main, erect stem with a definite crown of branches. A shrub is a woody plant which produces small irregular or slanting stems usually in tufts. In attempting to separate "trees" from the larger "shrubs," one must necessarily be somewhat arbitrary as nature draws no definite division line.

A tree has three main parts, the root system, the stem or trunk, and the crown of branches. The root system is for support in the soil and for taking up water and various mineral substances. This is accomplished by delicate organs called root hairs developed near the root tips. Although largely dependent on their environment the roots still have considerable selective power in taking up the salts dissolved in the soil water. The root system may have a main or tap-root extending deep into the ground with smaller lateral roots; or the tap-root may be only slightly developed or entirely absent, in which case a number of larger branch roots may extend downward from the base of the trunk. The roots which extend laterally near the surface sometimes run to a great distance. Such roots are called tracing roots.

The trunk or bole is a supporting and conducting organ. The water with dissolved mineral substances taken up by the roots passes up through the young wood or xylem while the food material from the young twigs and leaves passes up or down through the phloem cells of the inner bark. There are no real vessels for carrying food and water like the blood vessels of animals, but the sap passes through by osmosis from one cell to another or from one set of cells to another as it frequently happens when some of the cross walls are broken down in a vertical series of cells. The large cells in the wood, however, are called wood vessels. Just how the water is able to pass up to the tops

of high trees is not fully understood. In early spring, as in the sugar maple, the water accumulates in the sap wood since there are no leaves from which it can be thrown off above.

The crown is a system of branches on which the leaves are developed and exposed to the light. In the leaves most of the food is manufactured which the tree uses for its growth and nourishment. This production of organic food is carried on through the agency of sunlight and chlorophyll, as the green coloring matter is called. Another important function of the leaves is the transpiration of the surplus water brought up from below. The water transpired by a large tree in a single day is often very great in amount. The leaves are also important breathing organs, although not exclusively so; for all the living cells in the entire plant carry on the process of respiration.

The system of branching in the crown may be of various types. If the main trunk of a tree extends upward through the crown to the tip it is said to be excurrent, as in the larch and Austrian pine. When the terminal bud has no pre-eminence over others and the main trunk is soon lost, the tree is round-topped or spreading and is said to be deliquescent, as in the apple. Excurrent trees are often spire-shaped like the Norway spruce; while deliquescent stems commonly give rise to dome-shaped crowns, as in the white elm. If the terminal bud withers or is self-pruned, as in the linden, the branching is sympodial. If the leaves are opposite and the two lateral end buds develop, the terminal bud being self-pruned, the result is a sympodial dichotomy, as in the bladdernut. Trees in which the terminal buds are persistent and functional are said to have a monopodial system of branching.

The trunk or any branch of a coniferous or dicotylous tree consists of four main parts, the pith, the wood, the cambium or growing layer, and the bark. The wood consists of a series of annual rings, since if normal growth takes place only a single ring is produced each year. Each ring usually consists of two layers called early wood and late wood. During special seasons or if growth is checked at times during the growing period more than one ring may be produced, although this is never perfect and

can usually be detected by careful examination. In most trees the inner part of the wood and the pith are dead and this is called the heart wood or duramen, while the outer wood is lighter in color with living cells next the cambium layer, and is called the sap-wood or alburnum. Sometimes there is a striking difference in the color of the two parts. Strands of cells pass from the pith or annual rings through the wood to the bark. These are called medullary rays. The peculiar qualities of wood are due to the character of its cells which have their walls lignified or thickened by a deposit of a chemical substance called lignin.

The bark usually consists of two main layers called inner bark and outer bark. The inner bark is often in very thin layers and is hence called liber. The outer bark is very diverse in character. Usually it consists mainly of layers of cork cells which are very impervious to water. Since the outer bark usually does not increase in diameter as rapidly as the wood it is finally torn into strips and peels off on the outside. Trees have many interesting ways of developing and getting rid of their outer bark.

More commonly the outer bark is developed as follows: In a young main stem or twig there is a tissue between the outer layer of cells or epidermis and the circle of vascular bundles which is called the cortex. While the stem is developing and hardening, the outermost layer of cortical cells just below the epidermis is modified and begins to grow. This layer is the cork cambium or phellogen. The layer of tissue thus formed by the repeated divisions of the cells of the phellogen is called the periderm or cork. On the inner side of the phellogen another layer of tissue is produced which is called the phellogen or secondary cortex. The phellogen may continue to produce periderm until the outer bark becomes very thick; and finally new cork cambiums may develop farther in in the cortex or even in the phloem of the inner bark. In some plants the cork cambium originates from the epidermis and in some from the deeper layers of the cortex.

Some trees have no special means of shedding their leaves while others shed them only after a year or more. Most of our indigenous species are "deciduous," that is they cast their leaves

at the end of each growing season by the formation of a cleavage plane or separation layer through the base of the petiole. They also prepare for winter by developing elaborate winter buds. The function of the winter buds is mainly to check evaporation from the delicate stem tips during the periods of freezing and thawing.

Many of the smaller branches and twigs of a tree especially when growing in a dense forest are continually dying off. But the tree rids itself of these dead branches by forming a collar of tissue from the cambium layer around the base of the dead branch, which finally covers over the wound when the dead member falls off. This process is known as natural pruning. By the formation of a similar callus other wounds are covered up. There is still a more remarkable process present in many trees by which surplus living branches are cut off in one way or another. Terminal and lateral buds are also commonly cut off. This process is known as self-pruning. The most common method is by the formation of a cleavage plane in a basal joint or in the annual nodes of growth. In some genera brittle zones are produced. The self-pruning process is very highly developed in the cottonwood, white oak, white elm, and silver maple.

Trees grow in height only at the tips of the main stem or branches. Some trees are naturally shortlived; others attain an enormous size and age, but from the very nature of their upright development their life must sooner or later come to an end. In some cases the individual organism may continue by a new development from sprouts growing out of the stump or the roots.

All of our trees bear flowers and seeds. After arriving at a certain age depending on the species, the tips of some twigs or the axillary buds will develop flowers. In the more highly developed and typical flowers four sets of organs are present; the calyx composed of sepals, the corolla composed of petals, the androecium composed of stamens, and the gynoecium composed of carpels. The two essential sets of organs in the flower are the stamens and the carpels. These may both be in the same flower, when the flower is said to be bisporangiate or in separate flowers, when the flower is monosporangiate. If the two kinds of flowers are on one individual the plant is monoecious, if on

two distinct individuals the plant is dioecious. The stamens produce microsporangia and the carpels megasporangia or ovules. In the angiosperms the carpel usually has three parts called stigma, style, and ovulary, the ovules being completely inclosed in the ovulary. Commonly all the carpels of the gynoecium are grown together and in such cases a compound ovulary is produced with one or more cavities.

Following a peculiar process known as reduction, which takes place in the cells inside of the microsporangium, a considerable number of microspores are developed, four for each original cell. In nearly the same way, four megaspores one of which survives, are usually produced in each ovule. The flowers are thus modified spore-bearing branches or shoots producing two kinds of nonsexual spores. The flowers are nonsexual organs and the tree itself is always a nonsexual plant called the sporophyte. The microspores germinate and develop into the pollen grains and the megaspores into the so-called embryo sacs, or minute, parasitic, male and female gametophytes respectively. After pollination has taken place, which is simply the transfer of the pollen to the ovules or the stigmas, a tube grows from the pollen grain into the embryo sac. The two sperm cells produced in the pollen grain or in the pollen tube pass down the tube and one unites with the egg cell of the female gametophyte. This union of sperm and egg is called fertilization. The resulting cell which is the oospore germinates and gives rise to an embryo inside of the ovule, the whole finally constituting the body called the seed. This embryo in the seed is the sporophyte and after sprouting develops into the tree. The seed is produced inside of or in connection with the modified carpels and other contiguous parts, the whole being called the fruit. The fruits of our trees are of many types usually with some adaptation for seed distribution, so that the seed with its little embryonic tree inside may be carried away from the parent plants to some other and perhaps more favorable environment. Here, if conditions are proper, it sprouts and begins its life as an independent individual. The whole process of flower, seed, and fruit production is exceedingly complex and requires close study and observation if one would know the more obscure activities going on during the life cycle of a tree.

KEY TO THE GENERA OF TREES IN THE SUMMER
CONDITION.

Based mainly on leaf and twig characters. The number following the generic name refers to the list number.

1. Foliage leaves with expanded blades, netted-veined. 8.
1. Foliage leaves needle-shaped, narrowly linear, subulate, or scale-like; conifers. 2.
1. Foliage leaves fan-shaped with dichotomous venation, a number on thick, wart-like, persistent dwarf branches. **Ginkgo.** (1).
2. With typical dwarf branches, persistent for more than 1 year. 3.
2. With feather-like dwarf branches, deciduous each year, the linear leaves spreading into 2 ranks. **Taxodium.** (7).
2. Without dwarf branches. 4.
3. Dwarf branches small, self-pruned, with 2-5 foliage leaves. **Pinus.** (2).
3. Dwarf branches thick, wart-like, persistent, with numerous deciduous leaves. **Larix.** (3).
4. Leaf buds scaly; leaves scattered. 5.
4. Leaf buds not scaly, naked; leaves opposite or whorled. 7.
5. Leaf scar on a sterigma, the twigs covered with scales representing the leaf bases. 6.
5. Leaf scar on the bark; twigs without scales; leaves flat. **Abies.** (6).
6. Leaves flat, those on the upper side of the twig much shorter than the lateral ones; trees. **Tsuga.** (5).
6. Leaves more or less 4-sided, spreading in all directions. **Picea.** (4).
7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, closely covering the twigs which are decidedly flattened and fan-like; leaves of two shapes, the dorsal and ventral broader and less acute than the lateral ones; scales of the carpellate cone not peltate. **Thuja.** (8).

7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, closely covering the slightly flattened twigs which are not very fan-like; leaves nearly or quite similar; scales of the carpellate cone peltate.

Chamaecyparis. (9).

7. Foliage leaves of two types, scale-like and subulate, opposite or in threes; the scale-like leaves 4-ranked, appressed, causing the twigs to appear quadrangular, the subulate leaves spreading; one or both types of leaves on a plant; carpellate cone developing into a bluish-black berry-like fruit. **Juniperus.** (10).

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8. Leaves alternate. 9.
8. Leaves opposite or whorled. 74.
9. Leaves simple. 10.
9. Leaves compound. 62.
10. Leaves pinnately veined or with a simple midrib. 11.
10. Leaves palmately veined or at least with 2 or more prominent side ribs coming from near the base of the blade. 53.
11. Leaves truncate or broadly emarginate; with complete stipular rings at the nodes. **Lirodendron.** (33).
11. Leaves entire. 12.
11. Leaves serrate, dentate, crenate, pinnatifid, or variously lobed. 25.
12. With stipular rings at each leaf node; leaves large. **Magnolia.** (32).
12. Not with stipular rings. 13.
13. With thorns and milky sap. 14.
13. Without thorns; sap not milky. 15.
14. With thorns beside the axillary buds; leaves not tapering at the base, acute or even heart-shaped. **Toxylon.** (27).
14. With terminal thorns and some axillary thorns; leaves tapering to the base; narrow or slender-cuneate. **Bumelia.** (65).

15. Leaves evergreen, coriaceous, some on wood of the previous season. 16.
15. No leaves on wood of the previous season. 17.
16. Leaves green on both sides, thick, coriaceous, oblong to oblanceolate, 5-10 in. long; winter buds very scaly.
Rhododendron. (62).
16. Leaves green on both sides, or glaucous beneath, coriaceous, 2-5 in. long; oval or oval-lanceolate, winter buds naked. **Kalmia.** (63).
17. Pith with prominent diaphragms but solid; vascular bundles in base of petiole 3-7. 18.
17. Pith not both diaphragmed and solid, but sometimes with lenticular cavities. 19.
18. Leaves 2-ranked; bark with fetid odor; vascular bundles in base of petiole 5-7. **Asimina.** (31).
18. Leaves not 2-ranked; vascular bundles in base of petiole 3. **Nyssa.** (76).
19. Leaves resin-dotted, waxy-dotted or punctate, oblong-lanceolate, spatulate, or oblanceolate, short-pointed, narrowed at the base. **Myrica.** (13).
19. Leaves not dotted nor punctate. 20.
20. Pith prominently 5-angled; leaves with deciduous stipules and with bristle tips. **Quercus.** (22).
20. Pith cylindrical or nearly so; leaves not bristle-tipped. 21.
21. Leaves with the upper 2 lateral veins more or less parallel with the midrib. **Cornus.** (75).
21. Leaves pinnately veined to the tip. 22.
22. Bundle scar central; pith sometimes diaphragmed with lenticular cavities. 23.
22. Bundle scars 2 or more; pith without lenticular cavities. 24.
23. Leaves truncate or short-pointed at the base, usually widest below the middle or somewhat oblong, glabrous when mature; fruit a large pulpy berry, very astringent when green. **Diospyros.** (66).

23. Leaves pointed at the base, widest above the middle, lower surface pubescent; fruit a nut-like drupe. **Symplocos.** (67).
24. With prominent deciduous stipules; bark not resinous. **Cydonia.** (39).
24. Without stipules; bark resinous, aromatic. **Cotinus.** (53).
- 25—
25. Lateral veins from the midrib straight and parallel or nearly so; some or all lateral veins usually ending in the serrations, teeth or lobes. 26.
25. Lateral veins not straight and parallel. 37.
26. Leaves not 2-ranked. 27.
26. Leaves quite regularly 2-ranked, that is with the third leaf over the first. 30.
27. Pith 3-angled, buds stalked. **Alnus.** (19).
27. Pith 5-angled, buds not stalked. 28.
27. Pith cylindrical or nearly so. 29.
28. Leaves or their lobes bristle-tipped, or if not bristle-tipped then the teeth or lobes not sharply acuminate; buds clustered at the tip of the twig; nut in a cup-like involucre of numerous scales. **Quercus.** (22).
28. Leaves with sharply acuminate teeth; buds not clustered at the tip; nuts with a prickly or spiny involucre. **Castanea.** (21).
29. Usually with prominent and typical lateral thorns; carpels of the pome bony. **Crataegus.** (41).
29. Without thorns but sometimes with thorn-like stunted branches; leaves irregularly dentate, serrate, or crenate-dentate; sometimes lobed; pome fleshy without grit cells; carpels papery or leathery. **Malus.** (38).
29. Without thorns; leaves serrate or serrate-dentate; pome berry-like, carpels not bony. **Amelanchier.** (40).
30. Leaves decidedly inequilateral at the base. 31.
30. Leaves not inequilateral or only very slightly so. 32.
31. Axillary buds prominently stalked; leaves repand-dentate. **Hamamelis.** (29).

31. Buds sessile; leaves doubly serrate; bark not scaling off in plates. **Ulmus.** (23).
31. Buds sessile; leaves serrate; bark scaling off in plates like in the Sycamore. **Planera.** (24).
32. Lateral veins ending in the large dentations or serrations which are always simple (a vein for each). 33.
32. Leaves doubly serrate or sometimes simply serrate, the lateral veins ending in the main serrations or teeth but not in the smaller ones, or the veins not ending in the serrations. 34.
33. Leaves ovate or ovate-oblong, short acuminate; teeth not with slender points; bark smooth, light-gray.
Fagus. (20).
33. Leaves oblong-lanceolate, acuminate, with slender often inwardly curved points on the serrations; bark rough.
Castanea. (21).
34. Lateral veins not ending in the serrations or teeth.
Amelanchier. (40).
34. Lateral veins ending in some of the serrations, teeth or lobes. 35.
35. Bark smooth, the trunk and larger branches with fluted or projecting ridges; leaves acute or acuminate, sharply doubly serrate; nuts small, in a large-bracted catkin.
Carpinus. (16).
35. Trunk and larger branches not with fluted or projecting ridges. 36.
36. Bark of trunk and larger branches separating into papery or leathery sheets; trees or shrubs with glabrous, pubescent, or glandular-warty twigs. **Betula.** (18).
36. Bark of trunk scaly, fine furrowed; twigs pubescent; carpellate catkin in fruit appearing like that of the hop.
Ostrya. (17).
36. Bark scaling off in plates like in the Sycamore; fruit coriaceous, nut-like. **Planera.** (24).

37. Leaves 2-ranked. 38.
37. Leaves not 2-ranked. 39.

38. Bark of trunk and larger branches separating into papery or leathery sheets; leaves doubly serrate, the lateral veins ending in the main serrations, teeth or lobes. **Betula.** (18).
38. Bark not in papery or leathery sheets; leaves not doubly serrate, the lateral veins not ending directly in the serrations or teeth. **Amelanchier.** (40).
39. Leaves not with spines. 40.
39. Leaves evergreen, with spine-tipped lobes. **Ilex.** (54).
40. Pith not solid, diaphragmed, with lenticular cavities. 41.
40. Pith solid but with prominent diaphragms; vascular bundles 3 in the base of the petiole. **Nyssa.** (76).
40. Pith solid, without diaphragms. 42.
41. Leaves oval or obovate, serrate or denticulate, abruptly acuminate, wedge-shaped at the base, more or less stellate pubescent beneath; bark of twigs peeling off in slender shreds; fruit 4-winged. **Mohrodendron.** (68).
41. Leaves oblong or slightly obovate, acute or acuminate at both ends, crenate-serrate or repand, short petioled; twigs of the season and lower surface of leaves pubescent, not stellate; fruit a nut-like drupe. **Symplocos.** (67).
42. Leaves with peltate scales, or resin-dotted, oblanceolate or wedge-lanceolate. **Myrica.** (13).
42. Leaves not peltate scaly, nor resin-dotted. 43.
43. Outer bud scales of winter buds more than 1. 44.
43. Outer bud scale 1; twigs with brittle zones, hence easily detached and leaving peculiar self-pruning scars; terminal bud of ripe branches absent; bundle scars or vascular bundles in base of petiole. 3. **Salix.** (12).
44. Pith decidedly 5-angled. 45.
44. Pith cylindrical or nearly so. 46.
45. Bundle scars 3; leaves with gland-tipped teeth, usually broad-based, usually with 2 prominent glands at the base of the blade. **Populus.** (11).
45. Bundle scars several, scattered; leaves without glands; buds clustered at the tip of the twig. **Quercus.** (22).

46. With stipules or stipular scars. 47.
46. Without stipules or stipular scars; leaves sour, with prominent scattered hairs on the midrib beneath; trees; fruit a capsule. **Oxydendrum.** (64).
47. With typical lateral thorns; fruit a drupe-like pome with bony ripe carpels. **Crataegus.** (41).
47. Not with typical lateral thorns, but some may have thorn-like stunted branches. 48.
48. Leaves with 1 or more disc-like, wart-like, or tooth-like glands on the petiole or at the base of the blade. 49.
48. Leaves not with distinct glands on the top of the petiole nor at the base of the blade, but they may be glandular-hairy. 50.
49. Twigs green, red, or red and green; nectar glands disc-like, usually 2-4 near the base at the edge of the blade; terminal bud present; fruit a velvety drupe.
Amygdalus. (43).
49. Glands various; twigs not red and green, some with cleavage planes in basal joints; terminal bud present or absent, fruit a smooth drupe. **Prunus.** (42).
50. Axillary buds usually superposed; leaves lanceolate or oblong-lanceolate, tapering towards the short petiole; fruit a berry-like drupe. **Ilex.** (54).
50. Axillary buds not superposed. 51.
51. Leaves with gland-tipped serrations; terminal bud absent on ripe twigs or if present then the lateral veins prominent and nearly parallel and curving upward at the margin of the leaf; fruit a berry-like drupe.
Rhamnus. (60).
51. Leaves not with gland-tipped serrations, or if so then not as above; terminal bud present; fruit a pome. 52.
52. Leaves sharply and regularly serrate, glabrous when mature, petioles long; pome with grit cells.
Pyrus. (37).
52. Leaves irregularly dentate or serrate, or more or less lobed; pome without grit cells. **Malus.** (38).

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- 53. Base of petiole covering the axillary bud; twigs with stipular rings. **Platanus.** (31).
- 53. Axillary buds usually evident; twigs without stipular rings. 54.
- 54. Leaves 2-ranked. 55.
- 54. Leaves not 2-ranked. 60.
- 55. Leaves entire, round-heart-shaped. **Cercis.** (44).
- 55. Leaves serrate, dentate, or lobed. 56.
- 56. Pith usually in transverse plates; leaves ovate-lanceolate, inequilateral, taper-pointed. **Celtis.** (25).
- 56. Pith solid, not diaphragmed. 57.
- 57. With milky sap. 58.
- 57. Without milky sap. 59.
- 58. Twigs gray or brown, glabrous or nearly so; leaves pubescent or glabrous beneath. **Morus.** (26).
- 58. Twigs grayish-green, downy; leaves tomentose beneath. **Broussonetia.** (28).
- 59. Leaves not inequilateral; vascular bundles in base of petiole 3. **Betula.** (18).
- 59. Leaves inequilateral at the base; vascular bundles in base of petiole several, scattered. **Tilia.** (61).
- 60. Leaves more or less star-shaped, with 3-7 long pointed serrate lobes, strongly aromatic when crushed; pith 5-angled. **Liquidambar.** (30).
- 60. Leaves entire or three-lobed, bark spicy-aromatic; internodes very unequal. **Sassafras.** (35).
- 60. Leaves crenate, serrate, dentate, or lobed, not star-shaped and not spicy-aromatic. 61.
- 61. Pith 5-angled; trees usually with resinous buds; leaves usually broad based. **Populus.** (11).
- 61. Pith cylindrical or nearly so; usually with prominent typical thorns. **Crataegus.** (41).

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- 62. Pith diaphragmed, with cavities; large trees with pinnate leaves. **Juglans.** (14).

62. Pith not diaphragmed. 63.
63. Leaves trifoliolate or odd-pinnate. 64.
63. Leaves evenly pinnate or bipinnate; axillary buds superposed. 73.
63. Leaves odd-bipinnate, serrate; twigs and leaves usually prickly. **Aralia.** (74).
64. Lobes or teeth at the base of the leaflets with prominent green glands beneath; leaves pinnate, very large with disagreeable odor. **Ailanthus.** (51).
64. Lobes or teeth if present without green glands. 65.
65. With stipular spines a pair for each leaf; leaflets mostly entire. 66.
65. Without stipular spines, but some may have thorns or prickles. 67.
66. Leaflets oval or ovate, not pointed, usually mucronate, not punctate. **Robinia.** (48).
66. Leaflets ovate, pointed, glandular-punctate.
Xanthoxylum. (49).
67. Base of petiole covering the axillary buds; not prickly. 68.
67. Base of petiole not covering the axillary buds. 70.
68. Leaves 3-foliolate, leaflets crenulate, glandular punctate; bark with disagreeable odor; axillary buds superposed. **Ptelea.** (50).
68. Leaves pinnate, not punctate. 69.
69. Leaflets serrate; pith very large; bark resinous or milky.
Rhus. (52).
69. Leaflets entire; pith small, bark not resinous or milky.
Cladrastis. (47).
70. Leaflets entire or if occasionally few-toothed then the rachis prominently winged. 71.
70. Leaflets serrate or dentate, the rachis not winged. 72.
71. Leaflets decidedly inequilateral, obliquely lanceolate or falcate, acuminate. **Sapindus.** (59).
71. Leaflets not inequilateral or only slightly so, not slender falcate, sometimes poisonous to the touch.
Rhus. (52).

72. Pith 5-angled; stipules none, base of petiole with numerous vascular bundles, scattered or in 3 areas. **Hicoria.** (15).
72. Pith cylindrical or nearly so; leaves with stipules; vascular bundles in base of petiole 3-5. **Sorbus.** (36).
73. Pith small; base of petiole covering the axillary buds; usually with prominent thorns. **Gleditsia.** (45).
73. Pith very large, base of petiole not covering the axillary buds; without thorns. **Gymnocladus.** (46).

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74. Leaves simple. 78.
74. Leaves compound. 75.
75. Leaves digitate with 5 or more leaflets. **Aesculus.** (58).
75. Leaves trifoliolate or pinnate. 76.
76. Base of petiole covering the axillary buds; leaflets dentate, lobed, or nearly entire. **Acer.** (57).
76. Base of petiole not covering the axillary buds. 77.
77. Leaves trifoliolate; bark with strong odor; terminal bud self-pruned. **Staphylea.** (56).
77. Leaflets 5-13; terminal bud present. **Fraxinus.** (69).
78. Leaves pinnately veined. 82.
78. Leaves palmately veined or at least with 2 prominent side ribs from the base. 79.
79. Leaves entire or if somewhat 3-lobed with entire margin. 80.
79. Leaves serrate, crenate, dentate or variously lobed. 81.
80. Pith diaphragmed, or with large cavities; petioles usually hollow; axillary buds superposed. **Paulownia.** (72).
80. Pith and petioles solid; axillary buds not superposed; under side of leaves with glands in the axils of the larger veins. **Catalpa.** (73).
81. Leaves more or less lobed; fruit a 2-winged samara. **Acer.** (57).
81. Leaves not lobed; fruit a drupe. **Rhamnus.** (60).
82. Leaves serrate, dentate, crenate, or variously lobed. 83.
82. Leaves entire. 85.

83. Bark of ripe twigs green, bundles scar or vascular bundle in base of petiole 1; pith rhombic. **Euonymus.** (55).
83. Bark of ripe twigs gray, brown, or red; pith cylindrical or nearly so. 84.
84. Axillary buds sometimes superposed; leaves finely denticulate; twigs light brown, sometimes thorny; drupe narrowly oblong. **Adelia.** (70).
84. Axillary buds not superposed; twigs not 4-angled, brown; flowers epigynous; fruit a fleshy drupe; vascular bundles in the base of the petiole 3. **Viburnum.** (77).
84. Axillary buds not superposed; leaves serrate with stipules, small; bundle scar central; twigs brown, sometimes with thorns; shrub-like trees with drupe-like berries. **Rhamnus.** (60).
85. Leaves coriaceous, evergreen, hence on wood of the previous season. **Kalmia.** (63).
85. Leaves deciduous each year. 86.
86. Leaves with the two outer lateral veins more or less parallel with the midrib; fruit a drupe. **Cornus.** (75).
86. Leaves pinnately veined to the tip, 3-6 in. long, fruit an oblong drupe. **Chionanthus.** (71).

KEY TO THE GENERA OF TREES IN THE WINTER
CONDITION.

Based mainly on twig and stem characters. The number following the generic name refers to the list number.

1. Foliage leaves persistent and usually evergreen. 2.
1. Foliage leaves deciduous each year. II.
2. Foliage leaves needle-shaped, subulate, narrowly linear, or scale-like; conifers. 3.
2. Foliage leaves with expanded blades, netted veined. 8.
3. With dwarf branches, each bearing 2-5 foliage leaves.
Pinus. (2).
3. Without true dwarf branches. 4.
4. Leaf buds scaly. 5.
4. Leaf buds not scaly, naked. 7.
5. Leaf scar not on a sterigma, prominent, circular; leaves flat. **Abies.** (6).
5. Leaf scar on a sterigma, the base of the leaf remaining as a scale on the twig. 6.
6. Leaves flat, those on the upper side of the twig much shorter than the lateral ones. **Tsuga.** (5).
6. Leaves more or less 4-sided, spreading in all directions.
Picea. (4).
7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, closely covering the twigs which are decidedly flattened and fan-like; leaves of two shapes, the dorsal and ventral broader and less acute than the lateral ones; scales of the carpellate cone not peltate.
Thuja. (8).
7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, closely covering the slightly flattened twigs which are not very fan-like; leaves nearly or quite similar; scales of the carpellate cone peltate.
Chamaecyparis. (9).
7. Foliage leaves of two types, scale-like and subulate, opposite or in threes; the scale-like leaves 4-ranked, appressed, causing the twigs to appear quadrangular, the

- subulate leaves spreading; one or both types of leaves on a plant; carpellate cone developing into a bluish-black berry-like fruit. **Juniperus.** (10).
8. Leaves with spine-tipped lobes or teeth. **Ilex.** (54).
8. Leaves without spines. 9.
9. Leaves pubescent at least below, lanceolate, mucronate, not evergreen; buds clustered at the tip of the twig; trees with 5-angled pith. **Quercus.** (22).
9. Leaves glabrous. 10.
10. Leaves green on both sides, thick, coriaceous, oblong to oblanceolate, 5-10 in. long; winter buds very scaly. **Rhododendron.** (62).
10. Leaves green on both sides or glaucous beneath, coriaceous, 2-5 in. long, oval to oval-lanceolate; winter buds naked; erect shrubs. **Kalmia.** (63).

—11—

11. Twigs with thick wart-like dwarf branches; conifers. 12.
11. Twigs without true dwarf branches. 13.
12. Young twigs covered with scales. **Larix.** (3).
12. Twigs without scales. **Ginkgo.** (1).
13. Twigs with numerous small scattered self-pruning scars, without apparent leaf scars but with minute dry scale leaves, with feather-like dwarf branches, some usually remaining in winter; foliage leaves spreading into two ranks; roots often with knees; a conifer. **Taxodium.** (7).
13. Twigs with evident leaf scars and lateral winter buds. 14.
14. Leaf scars alternate. 15.
14. Leaf scars opposite or whorled. 72.
15. Twigs with distinct and complete stipular ridges or rings at the leaf nodes. 16.
15. Twigs without complete stipular rings. 18.
16. Leaf scar surrounding the axillary bud, terminal bud self-pruned; wood with prominent medullary rays. **Platanus.** (31).

16. Leaf scar not surrounding the axillary bud, terminal bud not self-pruned; buds enclosed in the large connate stipules. 17.
17. Buds glabrous; twigs brown; pith diaphragmed; leaf scars oval or circular; bark spicy-aromatic.

Liriodendron. (33).

17. Buds downy, or if glabrous then the twigs red; pith with or without diaphragms; leaf scars U-shaped, oval, or circular; bark usually aromatic. **Magnolia.** (32).
18. With thorns, prickles, or spines; or with spur-like branches ending in thorns. 19.
18. Without thorns, prickles or spines, but some may have thorn-like stunted branches. 26.
19. With stipular spines, a pair for each leaf scar. 20.
19. Twigs with typical lateral thorns, without terminal thorns. 21.
19. With thorns at the ends of branches or with spur-like branches ending in thorns, and in addition axillary thorns may be present. 22.
19. Stems or twigs with prickles; leaf scar extending nearly around the stem, with about 20 bundle scars; pith large. **Aralia.** (74).
20. Leaf scar covering the two or more superposed axillary buds. **Robinia.** (48).
20. Leaf scar below the axillary buds; buds reddish, pubescent. **Xanthoxylum.** (49).
21. With thorns beside the axillary buds; normally one for each leaf axil, becoming gradually smaller toward the tip of the twig, terminal bud absent. **Toxylon.** (27).
21. Thorns axillary, large, rarely branched except on the main trunk; usually with two lateral buds at the base which may develop as twigs; numerous axils without thorns. **Cratægus.** (41).
21. Thorns commonly branched, situated above the axil of the leaf; leaf scar covering the two or more superposed axillary buds; twigs polished, often zigzag.

Gleditsia. (45).

- 22. Not with three distinct bundle scars. 23.
- 22. With three bundle scars. 24.
- 23. Buds and twigs glabrous or nearly so; with few thorns.
Rhamnus. (60).
- 23. Buds and sometimes twigs pubescent or downy; thorns
prominent. **Bumelia.** (65).
- 24. Terminal bud self-pruned; twigs some shade of black,
brown, or reddish. **Prunus.** (42).
- 24. Terminal bud present. 25.
- 25. Buds conical, pungent, pubescent, twigs glabrous or
nearly so, mostly yellow-olive; trees with erect growth,
the branches not spreading as in most of the apples.
Pyrus. (37).
- 25. Buds downy or pubescent, twigs usually pubescent, if
glabrous then dark reddish-brown; trees with rounded
crowns and spreading branches. **Malus.** (38).

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- 26. Leaf scars quite regularly 2-ranked, that is with the third
scar over the first. 27.
- 26. Leaf scars not 2-ranked. 38.
- 27. Bundle scar 1; visible bud scales 2; twigs brown; pith
sometimes with cavities. **Diospyros.** (66).
- 27. Bundle scars 3. 32.
- 27. Bundle scars more than 3, usually scattered. 28.
- 28. Pith diaphragmed, solid; bundle scars 5-7; bark with
fetid odor; terminal bud elongated, naked, silky;
stipular scars none. **Asimina.** (31).
- 28. Pith not diaphragmed; bark not with fetid odor. 29.
- 29. Buds very long-pointed, with 10-20 visible scales;
medullary rays very prominent; stipular scars narrow,
extending some distance around the twig.
Fagus. (20).
- 29. Visible bud scales less than 10; terminal bud self-
pruned. 30.
- 30. Visible bud scales 1-3. 31.
- 30. Visible bud scales more than 3; pith white, rather large.
Morus. (26).

31. Twigs grayish-brown or reddish, usually zigzag; bark mucilaginous fibrous; buds rather fleshy, usually bright red; medullary rays prominent when the bark is removed; the winged fruiting panicle often persistent. **Tilia.** (61).
31. Twigs glabrous or pubescent, reddish or yellowish-brown; pith 5-angled. **Castanea.** (21).
31. Twigs downy, grayish-green; pith white, cylindrical, large; bark very fibrous. **Broussonetia.** (28).
32. Pith interruptedly diaphragmed, with cavities, small, greenish-white. **Celtis.** (25).
32. Pith solid. 33.
33. Terminal bud naked, elongated, tomentose; buds prominently stalked, light gray; twigs zigzag.
Hamamelis. (29).
33. Terminal bud absent, the twig showing a terminal self-pruning scar at the morphological tip; or if present then with scales; buds not stalked. 34.
34. Terminal bud present, long pointed; leaf scar narrow contracted between the bundle scars.
Amelanchier. (40).
34. Terminal bud absent, or if present then the leaf scar oval or semicircular. 35.
35. Twigs dark reddish-brown, speckled, often zigzag; buds reddish-violet, often superposed or clustered; leaf scars not oblique but below the lateral bud.
Cercis. (44).
35. Twigs dark brown, not speckled; buds not superposed; leaf scars oblique. 36.
36. Bark smooth, trunk and large branches with peculiar fluted or projecting ridges; bud scales brown, finely pubescent; staminate catkins in the bud in winter.
Carpinus. (16).
36. Trunk not with fluted or projecting ridges. 37.
37. Bark of trunk scaling off like in the Sycamore; twigs very slender; no catkins. **Planera.** (24).
37. Bark in rough ridges; no catkins; twigs and buds in

most cases pubescent; some species with characteristic transverse self-pruning scars on the twigs, others with corky ridges. **Ulmus.** (23).

37. Bark scaly, fine-furrowed, the furrows usually somewhat spiral; bud scales green with brown tips, nearly glabrous; staminate catkins exposed in winter.

Ostrya. (17).

37. Bark of trunk and larger branches separating into papery or leathery sheets; catkins in winter. **Betula.** (18).

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38. With 2 or more superposed axillary buds; all except 1 may be very small. 39.

38. Axillary buds single or 2 or more side by side; not superposed. 46.

39. Pith diaphragmed, with air cavities. 40.

39. Pith diaphragmed but solid; bundle scars 3; stipular scars none. **Nyssa.** (76).

39. Pith not diaphragmed, solid. 41.

40. Pith large, brown; twigs thick, with large leaf scars and 3 prominent bundle scars. **Juglans.** (14).

40. Pith rather small, white or greenish; leaf scars semi-circular; outer bud scales about 2.

Mohrodendron. (68).

41. Buds partly sunken, hardly projecting beyond the surface; terminal bud self-pruned or tips of branches withering. 42.

41. Buds not sunken in the epidermis. 43.

42. Leaf scar not surrounding the axillary buds; pith large, chocolate-colored; twigs robust, polished, mottled white and purplish-brown. **Gymnocladus.** (46).

42. Leaf scar surrounding the Axillary buds, quadrangular U-shaped; bark with pungent odor; pith white.

Ptelea. (50).

42. Leaf scar covering the axillary buds; pith small; twigs brown, polished, often zigzag. **Gleditsia.** (45).

43. Pith cylindrical or nearly so. 44.

43. Pith more or less 5-angled, yellowish or brownish; terminal bud large; bundle scars scattered; trees with tough twigs. **Hicoria.** (15).
44. Leaf scar surrounding the hairy axillary buds; bundle scars 5-9; terminal bud self-pruned. **Cladrastis.** (47).
44. Leaf scar not surrounding the axillary buds. 45.
45. Bundle scars 3; buds spherical, bark light gray; leaf scars heart-shaped; stipular scars none.
Sapindus. (59).
45. Bundle scar usually 1; buds rounded or somewhat pointed; stipular scars or minute stipules present.
Ilex. (54).
- 46—
46. Terminal and lateral buds stalked; pith 3-angled; both staminate and carpellate catkins present all winter.
Alnus. (19).
46. Buds sessile or nearly so; pith not 3-angled. 47.
47. Leaf scars surrounding the axillary buds which are usually sunken; terminal bud self-pruned; bark resinous; pith large. **Rhus.** (52).
47. Leaf scars not surrounding the axillary buds. 48.
48. Bundle scar 1, or if several then closely crowded and confluent, appearing as 1. 49.
48. Bundle scars more than 1. 54.
49. Stipular scars and stipules present. 50.
49. Stipular scars and stipules none. 51.
50. Terminal bud absent; bud scales dark brown or black.
Rhamnus. (60).
50. Terminal bud present; stipules minute, usually persistent. **Ilex.** (54).
51. Terminal bud present. 52.
51. Terminal bud absent. 53.
52. Pith diaphragmed, with cavities; bark reddish; outer bud scales several, short. **Symplocos.** (67).
52. Pith not diaphragmed; bark green, very spicy aromatic; internodes very unequal. **Sassafras.** (35).

53. With polished, greenish-brown, grayish-yellow, or red twigs; bark sour; leaf scar prominent, semi-oval, with a dark central scar usually in the form of a ring; buds small, not projecting much beyond the epidermis; the large terminal paniced raceme with capsules persisting all winter. **Oxydendrum.** (64).
53. With 2 visible scales in the triangular flattened bud; pith sometimes with lenticular cavities; twigs pubescent, zigzag at the tip. **Diospyros.** (66).

—54—

54. Outer bud scales more than 1. 55.
54. Outer bud scale 1; twigs usually with brittle zones and hence very easily detached; stipular scars present; bundle scars 3. **Salix.** (12).
55. Pith diaphragmed but solid; bundle scars 3; no stipular scars. **Nyssa.** (76).
55. Pith not diaphragmed. 56.
56. Pith more or less 5-angled. 57.
56. Pith cylindrical or nearly so. 61.
57. Buds clustered at the tip of the twig; bundle scars numerous, scattered. **Quercus.** (22).
57. Buds not clustered at the tip. 58.
58. Bundle scars numerous usually scattered. 59.
58. Bundle scars 3. 60.
59. Buds small with about 3 outer scales; twigs reddish or yellowish-brown, glabrous or pubescent; terminal bud present or absent; stipular scars prominent.
Castanea. (21).
59. Terminal bud large with 4 or more visible scales, hairy or peltate pubescent; lateral buds usually superposed; twigs tough. **Hicoria.** (15).
60. Without stipular or self-pruning scars; crushed buds fragrant, aromatic, not resinous, glabrous.
Liquidambar. (30).
60. Stipular and self-pruning scars present; crushed buds not fragrant though they may have a resinous odor,

- resinous or if only slightly so then the twigs pubescent or tomentose. **Populus.** (11).
61. Pith very large, light brown, bark not resinous, ill-smelling; buds spherical or flattened at the apex, often clustered at the tip of the twig, brown and pubescent; bundle scars about 9 along the lower edge of the very large leaf scar; large trees. **Ailanthus.** (51).
61. Pith small, or if large and brown then the bark resinous. 62.
62. Bark with a resinous or sticky milky sap; pith usually large, if rather small then the bark aromatic. 63.
62. Bark not resinous. 64.
63. Buds clustered at the tip of the twig; bark spicy-fragrant to the smell; base of petiole prominent with several bundle scars; fruiting panicles plumose.
Cotinus. (53).
63. Buds not clustered at the tip; bark sometimes aromatic, often very poisonous to the touch; leaf scar partly surrounding the bud or the bud covered; small trees or shrubs. **Rhus.** (52).
64. Terminal bud absent. 65.
64. Terminal bud present. 68.
65. Stipules or stipular scars absent or indistinct. 66.
65. Stipules or stipular scars present. 67.
66. Buds clustered at the tip of the twig; young twigs glandular dotted. **Myrica.** (13).
66. Buds not clustered at the tip; twigs not glandular.
Prunus. (42).
67. Buds and twigs very downy, twigs dark brown or black.
Cydonia. (39).
67. Buds downy or pubescent; twigs glabrous or pubescent, gray or brown. **Rhamnus.** (60).
68. Twigs green or yellowish-green, glabrous; internodes very unequal; lateral buds minute; small trees.
Cornus. (75).
68. Twigs normally red above and green beneath, glabrous;

- bark very bitter; some axils with 2 or 3 hairy buds of nearly equal size; trees. **Amygdalus.** (43).
68. Twigs not green or red and green unless the plants are low shrubs, but gray, brown, black, or reddish. 69.
69. Bundle scars 5 or more in the broad U-shaped leaf scar; tips of the buds quite downy; small trees.
Sorbus. (36).
69. Bundle scars 3. 70.
70. Buds rounded at the apex, often clustered at the tip of the twig; twigs glandular dotted. **Myrica.** (13).
70. Buds rounded at the apex; scales thick; twigs often zigzag; plant usually with some thorns, not glandular dotted. **Cratægus.** (41).
70. Buds pointed; plants sometimes with thorn-like stunted branches, not glandular dotted. 71.
71. Buds glabrous or slightly pubescent; twigs usually glabrous and slender, some shade of black, brown, or reddish, often with 2 or 3 axillary buds; some with self-pruning scars. **Prunus.** (42).
71. Buds downy or strongly pubescent, conical, pungent; twigs glabrous, mostly yellow-olive; trees with erect growth, the branches not spreading as in most of the apples. **Pyrus.** (37).
71. Buds downy or strongly pubescent; twigs strongly pubescent or if glabrous then dark reddish-brown; trees with rounded or spreading crowns.
Malus. (38).
71. Buds and twigs very pubescent; terminal bud with long spreading scales; shrubs or small trees with globose berry-like drupes containing 2-4 stones.
Rhamnus. (60).

72. Bundle scars 1, or several closely united in a curved line, appearing as 1. 74.
72. Bundle scars more than 1 but not in an ellipse or ring. 78.
72. Bundle scars numerous, in an ellipse or ring; buds small and flat or superposed. 73.

73. Pith with cavities or more or less diaphragmed; axillary buds superposed. **Paulowina.** (72).
73. Pith solid; axillary buds small and flat, not superposed, leaf scars often in trees. **Catalpa.** (73).
74. Twigs very green, more or less 4-angled; pith diamond-shaped or rhomboidal. **Euonymus.** (55).
74. Twigs not green when ripe but gray, brown or red, sometimes 4-angled; pith cylindrical or nearly so. 75.
75. Terminal bud absent, the twig usually ending in a thorn. **Rhamnus.** (60).
75. Terminal bud present. 76.
76. Axillary buds often superposed; twigs often with thorns; leaf scars small. **Adelia.** (70).
76. Axillary buds not superposed; no thorns on the twigs; leaf scars rather large. 77.
77. Twigs and buds pubescent; lateral buds cylindrical or hemispherical; bud scales dry; leaf scar concave, on the short petiole base; lenticels large and conspicuous; fruit a drupe. **Chionanthus.** (71).
77. Buds rough or pubescent; twigs glabrous or pubescent, sometimes 4-angled; lateral buds somewhat flattened, obtuse; bud scales rather dry; leaf scar close to the bark; lenticels not large; fruit a samara. **Fraxinus.** (69).
78. With 4 distinct stipular scars; terminal bud self-pruned; twigs green with strong odor. **Staphylea.** (56).
78. Without definite stipular scars; twigs not green or if so then the terminal bud present. 79.
79. Trees or shrubs with numerous bundle scars, sometimes in 3 areas, in a large heart-shaped leaf scar; pith rather large; terminal bud large, with numerous scales. **Æsculus.** (58).
79. Bundle scars 3 or sometimes 5. 80.
80. Terminal bud with 2 long acuminate pubescent outer scales; line connecting the uppermost leaf scars notched. **Cornus.** (75).

- 80. Terminal bud with one main pair of visible scales and a smaller pair at the base. **Viburnum.** (77).
- 80. Terminal bud with several pairs of visible scales; bundle scars 3-5; twigs sometimes green. **Acer.** (57).

GENERAL KEY TO THE FAMILIES AND GENERA.

Based on the flower and other characters. The number following the generic name refers to the list number.

SPERMATOPHYTA.

1. Ovules naked on an open carpel; pollen falling directly on the ovule; trees or shrubs; ours usually evergreen with narrow leaves, or with fan-shaped leaves and dichotomous venation; monoecious, rarely dioecious. 2.
1. Ovules in a closed carpel or set of carpels; provided with a stigma for the reception of the pollen; flowers more commonly showy. 4.

2. GYMNOSPERMAE.

2. Carpellate flowers developing as woody cones, the carpels arranged in spirals or opposite, each usually with 1-2 ovules; or by coalescence forming a black or blue berry-like fruit. 3.
2. Carpellate flowers developing large plum-like fleshy seeds; dioecious trees with fan-shaped leaves dichotomously veined. GINKGOACEAE.

a. **Ginkgo.** (1).

3. Leaf-buds scaly; carpels usually numerous; leaves spirally arranged, the foliage leaves often situated on dwarf branches. PINACEAE.
 - a. Ovuliferous scales woody; leaves needle-shaped, 2-5 on a dwarf branch. **Pinus.** (2).
 - a. Ovuliferous scales thin; leaves linear or filiform, scattered or on thick wart-like dwarf branches. b.
 - b. Leaves deciduous on wart-like dwarf branches. **Larix.** (3).
 - b. Leaves scattered, persistent. c.
 - c. Cones pendulous. d.

- c. Cones erect. **Abies.** (6).
- d. Leaves more or less 4-angled or tetragonal, sessile.
Picea. (4).
- d. Leaves flat, short-petioled. **Tsuga.** (5).
- 3. Leaf buds naked; carpels few, spiral; leaves on feather-like dwarf branches which are deciduous. TAXODIACEAE.
 - a. **Taxodium.** (7).
- 3. Leaf-buds naked; carpels few, opposite, sometimes forming a black or blue berry-like fruit; leaves opposite or whorled, rarely scattered, persistent. JUNIPERACEAE.
 - a. Cones oblong, ovuliferous scales not peltate.
Thuja. (8).
 - a. Cones globose, ovuliferous scales peltate. **Chamaecyparis.** (9).
 - a. Cones becoming fleshy, berry-like. **Juniperus.** (10).

4. ANGIOSPERMAE.

- 4. Leaves mostly parallel-veined, sometimes netted-veined; parts of the flower very often in threes (trimerous); cotyledon 1; vascular bundles scattered through the pith, usually not in a circle; no annual rings of growth. No trees in our region. MONOCOTYLAE.
- 4. Leaves usually netted-veined; parts of the flower more commonly in fives (pentamerous) or fours (tetramerous); cotyledons usually 2; vascular bundles usually in a circle around a central pith, forming annual rings of growth in perennial stems, with bark on the outside. 5.

5. DICOTYLAE.

- 5. Perianth none or of similar segments or divided into calyx and corolla; corolla when present choripetalous (petals distinct). 6.
- 5. Perianth composed of calyx and corolla, calyx may be minute or suppressed; corolla sympetalous (petals more or less united). 36.

6. Perianth none; sometimes a minute border, cup, or gland may represent the calyx. 7.
6. Only the calyx present, sepals distinct or united, green or colored. 9.
6. Calyx and corolla both present, calyx may be minute. 16.
7. Leaves alternate, simple. 8.
7. Leaves opposite, compound; flowers in crowded panicles or racemes. OLEACEAE.

a. **Fraxinus.** (69).

8. Both staminate and carpellate flowers in aments; ovulary uni-locular many-seeded; seeds with a tuft of cottony hairs. SALICACEAE.
 - a. Stamens numerous, bracts fimbriate or incised; buds with several scales; pith 5-angled. **Populus.** (11).
 - a. Stamens 2-10, bracts entire; buds with one outer scale. **Salix.** (12).
8. Both staminate and carpellate flowers in aments, ovulary uni-locular with 1 erect ovule; carpellate flowers single in each bract of the ament. MYRICACEAE.

a. **Myrica.** (13).

8. Both staminate and carpellate flowers in aments, ovulary bi-locular; carpellate flowers 2 or more in each bract of the ament, or capitate. BETULACEAE.

See 11 below.

8. Flowers monoecious in dense heads; base of petiole covering the axillary bud. PLATANACEAE.

a. **Platanus.** (31).

8. Flowers imperfectly bisporangiate or monoecious, crowded into catkin-like heads; ovules 1-several in each cavity; stamens 4-many. HAMAMELIDACEAE.

a. **Liquidambar.** (30).

9. Flowers, at least the staminate ones in aments or ament-like spikes. 10.

- 9. Flowers not in aments but variously clustered, sometimes solitary. 12.
- 10. Leaves simple. 11.
- 10. Leaves odd-pinnate; fruit a nut inclosed in a husk. JUGLANDACEAE.
 - a. Pith of twigs in transverse plates; husk indehiscent; nut rugose. **Juglans.** (14).
 - a. Pith solid; husk at length splitting into segments, nut smooth or angled. **Hicoria.** (15).
- 11. Both staminate and carpellate flowers in aments; sap not milky. BETULACEAE.
 - a. Staminate flowers solitary in the axil of each bract, without a calyx; carpellate flowers with a calyx. b.
 - a. Staminate flowers 3-6 in the axil of each bract, with a calyx; carpellate flowers without a calyx. c.
 - b. Fruiting bractlet flat, 3-cleft and incised; nut small. **Carpinus.** (16).
 - b. Fruiting bractlet bladder-like, closed, membranous; nut small. **Ostrya.** (17).
 - c. Stamens 2; fruiting bracts 3-lobed or entire, deciduous. **Betula.** (18).
 - c. Stamens 4; fruiting bracts woody, persistent; pith 3-angled. **Alnus.** (19).
- 11. Carpellate flowers subtended by an involucre which becomes a bur or cup in fruit; staminate flowers in aments, or capitate. FAGACEAE.
 - a. Staminate flowers capitate; nut triangular. **Fagus.** (20).
 - a. Staminate flowers in slender aments; nut rounded. b.
 - b. Carpellate flowers 2-5 in each involucre, which becomes prickly in fruit. **Castanea.** (21).
 - b. Carpellate flower 1 in each involucre, which consists of numerous scales. **Quercus.** (22).
- 11. Trees with alternate leaves and milky sap; ovules pendulous. MORACEAE.

See 15 below.

12. Leaves opposite or whorled. 13.
12. Leaves alternate. 14.
13. Trees or shrubs with pinnate leaves and fruit a samara with 1 wing; or leaves simple and fruit a drupe. OLEACEAE.
 - a. Leaves compound; fruit a samara; flowers mostly dioecious. **Fraxinus**. (69).
 - a. Leaves simple; fruit a drupe; flowers dioecious, from catkin-like scaly buds. **Adelia**. (70).
13. Fruit a 2-winged, 2-seeded samara; leaves palmately veined or if pinnately compound then the petioles covering the axillary buds. ACERACEAE.
 - a. **Acer**. (57).
14. Base of petiole covering the axillary bud; the flowers in dense spherical heads, the carpellate on a long slender peduncle; twigs with stipular rings. PLATANACEAE.
 - a. **Platanus**. (31).
14. Base of petiole not covering the axillary bud, and inflorescence and twigs not as above. 15.
15. Trees or shrubs with compound punctate leaves. RUTACEAE.
 - a. **Xanthoxylum**. (49).
15. Trees usually with serrate pinnately-veined sometimes palmately-veined leaves with fugaceous stipules; ovulary unilocular, 1-2-ovuled; fruit a samara, drupe or nut. ULMACEAE.
 - a. Flowers in clusters on twigs of the previous season; fruit a samara or nut-like. b.
 - a. Flowers on twigs of the season, fruit a drupe. **Celtis**. (25).
 - b. Flowers expanding before the leaves; fruit a samara. **Ulmus**. (23).
 - b. Flowers expanding with the leaves; fruit nut-like. **Planera**. (24).
15. Trees with milky sap; stipules fugaceous; fruit aggregate. MORACEAE.

- a. Staminate flowers racemose or spicate, the carpellate capitate. b.
 - a. Staminate and carpellate flowers in ament-like spikes.
Morus. (26).
 - b. Carpellate perianth deeply 4-cleft; twigs with thorns.
Toxylon. (27).
 - b. Carpellate perianth 3-4 toothed; twigs not thorny.
Broussonetia. (28).
15. Trees with alternate, palmately lobed, fragrant leaves; the flowers in dense heads, the carpellate ones long-peduncled.
HAMAMELIDACEAE.
- a. **Liquidambar.** (30).
15. Shrubs or trees with 9 or 12 stamens in 3 or 4 cycles; anthers opening by valves; aromatic; fruit a 1-seeded drupe or berry. LAURACEAE.
- a. **Sassafras.** (35).
15. Shrubs or trees with simple leaves, with 4-5 perigynous stamens alternate with the sepals; ovulary 2-5-locular, ovules solitary in each cavity, stigmas 2-5; fruit a drupe. RHAMNACEAE.
- a. **Rhamnus.** (60).
15. Trees with simple alternate leaves and diaphragmed but solid pith; stamens 5-15, flowers epigynous; ovulary unilocular with 1 pendulous ovule. Some CORNACEAE.
- a. **Nyssa.** (76).
- 16—
16. Flowers hypogynous or perigynous; ovulary free from the calyx or adherent to the perigynous disc. 17.
16. Flowers epigynous; calyx above the ovulary. 33.
17. Stamens numerous, at least more than 10 and more than twice the petals. 18.
17. Stamens not more than twice as many as the petals, when of just the number as the petals then alternate with them. 21.

17. Stamens of the same number as the petals and opposite them; ovulary 2-5-locular, calyx 4-5-cleft, valvate in the bud; petals involute; fruit a drupe or capsule; shrubs, small trees, or vines with simple leaves. RHAMNACEAE.
 - a. **Rhamnus.** (60).
18. Carpels 1 or more, united, but styles and stigmas may be several. 19.
18. Carpels more than 1, distinct; filaments shorter than the anthers; perianth trimerous; leaves 2-ranked. ANONACEAE.
 - a. **Asimina.** (34).
18. Carpels numerous spirally arranged and cohering over each other, forming an aggregate cone-like fruit; trees; sepals and petals in threes; twigs with stipular rings. MAGNOLIACEAE.
 - a. Anthers introrse; leaves not truncate. **Magnolia** (32).
 - a. Anthers extrorse; leaves truncate. **Liriodendron.** (33).
19. Ovulary compound, plurilocular. 20.
19. Ovulary 1-locular, 2-ovuled; fruit a drupe with 1 seed. ROSACEAE. (DRUPATAE).
 - a. Drupe glabrous, stone smooth or nearly so. **Prunus.** (42).
 - a. Drupe velvety, stone deeply pitted. **Amygdalus** (43).
20. Calyx deciduous; flower cluster subtended by a large membranous bract; trees with alternate, 2-ranked leaves and mucilaginous sap. TILIACEAE.
 - a. **Tilia.** (16).
20. Leaves alternate with deciduous stipules; ovulary composed of 2-5 wholly or partly united carpels; fruit a more or less fleshy pome. ROSACEAE. (POMATAE).
 - a. Ripe carpels papery or leathery. b.
 - a. Ripe carpels bony. **Crataegus.** (41).
 - b. Leaves pinnate. **Sorbus.** (36).
 - b. Leaves simple. c.
 - c. Cavities of the ovulary as many as the styles. d.

- c. Cavities of the ovulary becoming twice as many as the styles. **Amelanchier.** (40).
- d. Cavities of the ovulary with 1-3 seeds. e.
- d. Cavities of the ovulary with many seeds. **Cydonia.** (39).
- e. Flesh of the pome with grit-cells. **Pyrus.** (37).
- e. Flesh of the pome without grit-cells. **Malus.** (38).
- 21. Ovulary only 1, carpels 1 to many, united. 24.
- 21. Carpels 2 or more, distinct, or somewhat united at the base. 22.
- 22. Leaves compound. 23.
- 22. Shrubs or trees with alternate simple leaves. HAMAMELIDACEAE.
 - a. Ovules 1 in each cavity, fruit a woody capsule. **Hamamelis.** (29).
 - a. Ovules several in each cavity, fruit globular, spiny. **Liquidambar.** (30).
- 23. Leaves punctate with pellucid dots, alternate. RUTACEAE.
 - a. Carpels 2-5, distinct. **Xanthoxylum.** (49).
 - a. Ovulary 1, 2-locular. **Ptelea.** (50).
- 23. Leaves large, pinnate, alternate, not punctate but with disc-like glands under the teeth or lobes. SIMARUBACEAE.
 - a. **Ailanthus.** (51).
- 24. Carpel 1, ovulary with 1 parietal placenta; leaves alternate, usually with stipules, usually compound. FABACEAE.
 - A. Fruit a legume; upper petal inclosed by the lateral ones in the bud; leaves simple or compound mostly with stipules. CASSIATAE.
 - a. Leaves simple, flowers bisporangiate. **Cercis.** (44).
 - a. Leaves compound, flowers dioecious or imperfectly dioecious. b.
 - b. Stamens 3-5; pod flat. **Gleditsia.** (45).
 - b. Stamens 10; pod thick, woody. **Gymnocladus.** (46).

- B. Fruit a legume or loment, upper petal inclosing the lateral ones in the bud; leaves compound (sometimes with 1 leaflet) with stipules. PAPILIONATAE.
- a. Without stipular spines; leaflets large, 3-6 in. long; base of petiole covering the axillary buds like a cap. **Cladrastis.** (47).
 - a. With stipular spines; leaflets small, 1-2 in. long; base of petiole not covering the axillary buds like a cap, but solid. **Robinia.** (48).
24. Carpels more than 1 as shown by the compound ovulary, cavities, placentae, styles, or stigmas. 25.
25. Ovulary 2-locular to plurilocular. 26.
25. Ovulary 1-locular, ovules solitary, stigmas 3; shrubs or trees with resinous or milky sap and alternate leaves without stipules. ANACARDIACEAE.
- a. Leaves compound, styles terminal. **Rhus.** (52).
 - a. Leaves simple, styles lateral. **Cotinus.** (53).
26. Flowers regular or nearly so. 27.
26. Flowers irregular; shrubs or trees with opposite digitate leaves; ovulary 3-locular. HIPPOCASTANACEAE.
- a. **Aesculus.** (58).
27. Stamens neither just as many nor twice as many as the petals. 28.
27. Stamens just as many or twice as many as the petals. 29.
28. Stamens distinct and fewer than the 4 petals; trees or shrubs with opposite pinnate or simple leaves. OLEACEAE.
- a. Flowers dioecious, from catkin-like scaly buds. **Adelia.** (70).
 - a. Flowers bisporangiate, petals linear. **Chionanthus.** (71).
28. Stamens more numerous than the petals; leaves palmately veined, opposite; fruit 2-winged. Some ACERACEAE.
- a. **Acer.** (57).
29. Ovules 1 or 2 in each cavity. 30.

29. Ovules several or many in each cavity; stipules between the opposite and pinnately compound leaves, caducous; shrubs or small trees. STAPHYLEACEAE.

a. **Staphylea.** (56).

30. Leaves palmately veined, or compound. 31.
30. Leaves pinnately veined, simple, not punctate. 32.
31. Leaves pinnately compound, alternate; climbing herbaceous vines with fruit an inflated 3-lobed capsule; or trees with a globose or lobed berry. SAPINDACEAE.

a. **Sapindus.** (59).

31. Leaves palmately veined or pinnately compound; fruit 2-winged; trees or shrubs with opposite leaves and no stipules. ACERACEAE.

a. **Acer.** (57).

31. Leaves 3-foliolate, pellucid-punctate, without stipules. Some RUTACEAE.

a. **Ptelea.** (50).

32. Calyx minute, fruit a berry-like drupe; trees or shrubs with simple mostly alternate leaves. ILICACEAE.

a. **Ilex.** (54).

32. Calyx not minute; pod colored, dehiscent; seeds inclosed in a pulpy aril; shrubs or woody climbers with alternate or opposite leaves and with minute fugaceous stipules. CELASTRACEAE.

a. **Euonymus.** (55).

—33—

33. Leaves simple. 34.
33. Leaves compound. 35.
34. Perfect stamens 4, styles 2; leaves alternate, palmately veined and lobed, or if pinnately veined then 2-ranked. HAMAMELIDACEAE.

See 22 above.

34. Stamens 5, 10, or many; styles 2-5; leaves alternate with stipules. ROSACEAE (POMATAE).

See 20 above.

34. Stamens 4 or 5, style and stigma 1; leaves opposite or alternate; fruit a 1-2-seeded drupe. CORNACEAE.

a. Ovary 2-locular, flowers bisporangiate.

Cornus. (75).

a. Ovary 1-locular, flowers dioecious or imperfectly dioecious. **Nyssa.** (76).

34. Stamens 4 or 5 on a flat disc which covers the 3-5-locular ovary; fruit a somewhat fleshy capsule; shrubs, trees or woody climbers with opposite leaves and minute fugaceous stipules. CELASTRACEAE.

See 32 above.

35. Stamens many; leaves odd-pinnate, fruit a berry-like pome. Some — ROSACEAE (POMATAE).

a. **Sorbus.** (36).

35. Stamens 5, styles usually 2-5; fruit a fleshy berry or drupe; leaves bipinnate. ARALIACEAE.

a. **Aralia.** (74).

—36—

36. Flowers hypogynous (ovary superior). 37.

36. Flowers epigynous (ovary inferior); stamens as many as the lobes of the corolla; leaves opposite, usually without stipules, not blackening in drying. CAPRIFOLIACEAE.

a. **Viburnum.** (77).

37. Stamens, free from the corolla (or only slightly united at the base) as many as the petals (flowers tetracyclic) and alternate with them, or twice as many (pentacyclic) or more. 38.

37. Stamens united with the corolla, as many as the petals and opposite them or twice as many or more. 39.

37. Stamens united with the corolla or only united at the base, as many as the petals or fewer and alternate with them.
40.
38. Ovary 2-5-locular; shrubs often with evergreen leaves; fruit a capsule, berry or drupe. ERICACEAE.
a. Fruit a septicial capsule; leaves remaining green throughout the year. b.
a. Fruit a loculicidal capsule; leaves deciduous in autumn. **Oxydendrum.** (64).
b. Corolla somewhat irregular, seeds flat and winged. **Rhododendron.** (62).
b. Corolla regular, seeds angled or rounded. **Kalmia.** (63).
38. Choripetalous plants in which the petals are sometimes partly or completely united.
a. Ovary 1-locular (1 carpel) with 1 parietal placenta. FABACEAE.
See 24 above.
b. Ovary 4-8-locular, with a solitary seed in each cavity; fruit a berry-like drupe. ILICACEAE.
See 33 above.
39. Stamens as many as the lobes of the small white corolla; leaves entire, simple and alternate, with thorns. SAPOTACEAE.
a. **Bumelia.** (65).
39. Stamens twice as many as the lobes of the greenish-yellow corolla or more; styles 2-8; plants mostly monoecious or dioecious; leaves alternate, simple, and entire. EBENACEAE.
a. **Diospyros.** (66).
39. Stamens twice as many as the lobes of the yellow corolla or more; style 1; stamens in several series; flowers mostly bisporangiate; leaves alternate and simple. SYMPLOCACEAE.

a. **Symplocos.** (67).

39. Stamens twice as many as the lobes of the white corolla or more; style 1; stamens in 1 series, flowers mostly bisporangiate, leaves alternate and simple. STYRACACEAE.

a. **Mohrodendron.** (68).

40. Flowers regular; seeds 1-4; fruit a samara, drupe, or berry. OLEACEAE.

a. Fruit a samara; leaves pinnate. **Fraxinus.** (69).

a. Fruit a drupe or berry; leaves simple. b.

b. Flowers dioecious. **Adelia.** (70).

b. Flowers bisporangiate, lobes of the corolla linear. **Chionanthus.** (71).

40. Flowers irregular, zygomorphic; seeds numerous, capsule ovoid, acute; stamens 4, didynamous; pith with cavities. Some — SCROPULARIACEAE.

a. **Paulownia.** (72).

40. Flowers irregular, zygomorphic; seeds numerous, capsule long, terete; fertile stamens usually 2; pith solid. BIGNONIACEAE.

a. **Catalpa.** (73).

CLASSIFICATION AND DESCRIPTION OF THE SPECIES.

SERIES III. SPERMATOPHYTA. SEED-PLANTS.

Subkingdom, GYMNOSPERMAE. Gymnosperms.

Class, GINKGOEAE.

Order, GINKGOALES.

Ginkgoaccac. Ginkgo Family.

1. **Ginkgo** Kaempf. Ginkgo.

Trees with deciduous, fan-shaped, dichotomously veined leaves on wart-like dwarf branches.

* *Ginkgo biloba*. L. Maiden-hair-tree. A large, beautiful and hardy tree with dioecious flowers. Seed large, drupe-like. Autumn leaves orange. Introduced from China and Japan; should be commonly cultivated for ornament.

Class, CONIFERAE. Conifers.

Order, PINALES.

Pinaceae. Pine Family.

2. **Pinus** L. Pine.

Resinous evergreen trees with small dwarf branches bearing 2-5 narrow foliage leaves; dwarf branches and ordinary twigs covered with scale leaves. Dwarf branches self-pruned after a number of years. Carpellate cones woody, with numerous carpels. Our most important lumber trees.

1. Dwarf branches with 5 foliage leaves; ovuliferous scales little thickened at the tip. *P. strobus*.
1. Dwarf branches with 2-3 foliage leaves; ovuliferous scales much thickened at the tip. 2.
2. Dwarf branches with 3 foliage leaves, rarely 2 or 4. 3.
2. Dwarf branches mostly with 2 foliage leaves some of them may be with 3. 4.
3. Leaves 6-10 in. long; carpellate cone oblong-conic. *P. taeda*.
3. Leaves 3-5 in. long; carpellate cones ovoid. *P. rigida*.
4. Twigs glaucous; resin-ducts parenchymatous; carpellate cones 1½-3 in. long; ovuliferous scales tipped with a prickle or small spine. 5.
1. Twigs not glaucous. 6.

5. Leaves slender, $2\frac{1}{2}$ -5 in. long; buds not very resinous; prickles of the ovuliferous scales short and small. *P. echinata*.
5. Leaves stout, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long; buds very resinous; prickles of the ovuliferous scales long and stout. *P. virginiana*.
6. Leaves 1-4 in. long, grayish-green or light green; ovuliferous scales without or with a small prickle, or with a thick point or spine. 7.
6. Leaves 4-6 in. long, dark-green; ovuliferous scale without a spine or prickle, or sometimes with a very small prickle. 9.
7. Ovuliferous scale without a spine or prickle when mature but with a minute central point; leaves $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, curved; resin ducts parenchymatous. *P. divaricata*.
7. Ovuliferous scale with a thick point or spine. 8.
8. Leaves $2\frac{1}{2}$ -4 in. long, light green; twigs orange or orange brown; resin ducts parenchymatous; carpellate cones ovoid. 3-5 in. long. *P. pungens*.
8. Leaves $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, grayish-green; twigs dull greenish-yellow or greenish-brown; resin-ducts peripheral; carpellate cones ovate-conic, 2-3 in. long. *P. silvestris*.
9. Carpellate cones terminal or subterminal, oval-conic; ovuliferous scales pointless when mature. *P. resinosa*.
9. Carpellate cones lateral, ovoid-conic; ovuliferous scale with a small prickle. *P. laricio*.

1. **Pinus stròbus** L. White Pine. A large tree with nearly smooth bark, except when oid; branches horizontal in whorls. Often forming dense forests. Wood-soft and straight-grained; used in enormous quantities for building purposes. One of the most valuable timber trees in the world. Has been more extensively used in America for lumber than any other tree. Newf. to Man., south along the Allegh. to Ga. and to Ohio, Ill. and Ia.

2. **Pinus resinòsa** Ait. Red Pine. A tall tree with reddish bark. Wood rather hard but not very durable. Turpentine is obtained to a limited extent from this species. A tree of rapid growth. Newf. to Man., Mass., Penn., and Minn.

3. **Pinus divaricàta** (Ait.) Gord. Jack Pine. A slender tree with spreading branches, the bark becoming flaky. Wood light and rather soft. In sandy soil. N. B. and N. W. Terr., south to Me., N. Y., Ill., and Minn.

4. **Pinus virginiana** Mill. Scrub Pine. A slender, usually small tree with spreading or drooping branches; the old

bark flaky and dark-colored. Wood very resinous, soft and durable but of poor quality. In sandy soil. L. I. to S. C., Ala., Tenn., Ohio, and Ind.

5. *Pinus echinata* Mill. Yellow Pine. A large tree with spreading branches; leaves sometimes in 3's. Wood rather hard and very valuable; much used as lumber. Also furnishes some turpentine. Produces shoots from stumps. In sandy soil. N. Y. to Fla., Ill., Kan., and Tex.

6. *Pinus pungens* Mx. f. Table-mountain Pine. A tree with spreading branches, the old bark rough and in flakes, leaves sometimes in 3's. Wood light and soft; much used for charcoal. N. J. to Ga. and Tenn.

7. *Pinus taeda* L. Loblolly Pine. A tree of very rapid growth with spreading branches and thick, rugged bark, flaky in age. Wood rather hard; much used for lumber in the south. Often growing in old fields. N. J. to Fla., Ark., and Tex.

8. *Pinus rigida* Mill. Pitch Pine. A tree with spreading branches, the old bark rough and furrowed, flaky in strips. Sprouts readily from the stump if cut down or burned. Wood rather hard and brittle and full of resin; used for fuel, charcoal, and coarse lumber. A source of turpentine to a limited extent. In dry, sandy or rocky soil. N. B. to Ont., Tenn., Ohio, W. Va., and Ga.

9. *Pinus sylvestris* L. Scotch Pine. A large and valuable tree with drooping branches; much cultivated. From it are obtained the red and yellow deal much used as lumber in Europe.

10. *Pinus laricio* Poir. Austrian Pine. A tall, open, pyramidal tree of rapid growth with the thick branches in regular whorls. Often cultivated.

3. *Larix* Adans. Larch.

Tall pyramidal trees with horizontal or ascending branches and with clusters of narrowly linear deciduous leaves on thick wart-like dwarf branches. Carpellate cones woody, with numerous carpels.

1. Carpellate cones small, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, oval or almost globular; ovuliferous scales glabrous. *L. laricina*.

1. Carpellate cones rather large, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long; ovuliferous scales finely tomentose on the back. *L. decidua*.

1. **Larix laricina** (DuRoi) Koch. Tamarack. A slender tree with close or at length scaly bark. Wood hard, durable, and very strong; used in ship-building, for railroad ties, posts, and telegraph poles. In swamps and about the margins of lakes. Newf. to N. W. Terr., south to Minn., Ind., Ohio, and N. J.

2. *Larix decidua* Mill. European Larch. A beautiful tree with horizontal branches and drooping branchlets, conical in shape when young; much cultivated in some parts of the United States. The source of Venice turpentine.

4. **Picea** Link. Spruce.

Evergreen trees, conic in outline, with short linear 4-sided leaves spreading in all directions; the leaf scars on persistent sterigmata. Carpellate cones pendulous.

1. Carpellate cones $2\frac{1}{2}$ -6 in. long. *P. excelsa*.
1. Carpellate cones $\frac{3}{4}$ -2 in. long. 2.
2. Twigs and sterigmata of the leaves glabrous, glaucous; carpellate cones oblong-cylindric. *P. canadensis*.
2. Twigs pubescent, brown; carpellate cones ovoid or oval. 3.
3. Leaves not glaucous. *P. mariana*.
3. Leaves glaucous. *P. brevifolia*.

1. **Picea canadensis** (Mill.) B. S. P. White Spruce. A slender tree sometimes with a strong skunk-like odor. Leaves light green, slender, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, very acute. An important timber tree with light and straight-grained wood. Newf. to Alaska, south to Me., Mich., Black Hills, and Br. Col.

2. **Picea mariana** (Mill) B. S. P. Black Spruce. A tree with spreading branches and smooth or only slightly roughened bark. Leaves not over $\frac{2}{3}$ in. long, stout, green, closely covering the twigs. Wood light and straight-grained; used for paper pulp, for general lumber and for masts and spars of ships. Newf. to N. W. Terr., south to N. J., N. C., Mich., and Minn.

3. **Picea brevifolia** Peck. Swamp Spruce. A small, slender tree, or on mountains a shrub. Leaves nearly straight.

obtuse, or merely mucronate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. In swamps and bogs. Vt. to Ont., N. Y., and Mich.

*. *Picea excélsa* (Lam.) Link. Norway Spruce. A large tree, conical in shape when young, with numerous stout spreading and drooping branches. Abundant in cultivation. Source of Burgundy pitch.

5. *Tsùga* Carr. Hemlock.

Evergreen trees with slender horizontal or drooping branches. Leaves flat, narrowly linear, spreading more or less into 2 ranks. Leaf scars on short sterigmata. Carpellate cones pendulous.

1. *Tsuga canadénsis* (L.) Carr. Hemlock. A tall tree with slender, horizontal or drooping branches, the old bark flaky in scales. Wood very coarse, light and soft; used for wood pulp. Bark used for tanning. Source of Canada pitch. Self-prunes twigs. N. S. to Minn. south to Ohio, and Del., along the Alleghanies to Ala., and to Mich. and Wis.

6. *Abies* Juss. Fir.

Evergreen trees with flat linear leaves. No sterigmata on the twigs but with ordinary circular or oval leaf scars. Carpellate cones erect.

1. Carpellate bract serrulate, shorter than the ovuliferous scale; leaves obtuse. *A. balsamea*.

1. Carpellate bract aristate, longer than the ovuliferous scale; leaves mostly emarginate. *A. fraseri*.

1. *Abies balsàmea* (L.) Mill. Balsam Fir. A slender short-lived tree. Wood very light and soft. Canada balsam is obtained from its resin. Newf. to N. W. Terr., south to Penn., along the Alleghanies to Va., and to Mich. and Minn.

2. *Abies fràseri* (Pursh) Lindl. Fraser Fir. A slender tree growing on the high Alleghanies. W. Va., N. Car., and Tenn.

Taxodiaceae. Bald-cypress Family.

7. *Taxodium* Rich. Bald-cypress.

Tall trees with horizontal or drooping branches, ours with feather-like, annually self-pruned, dwarf branches. Carpellate cones, globose.

1. *Taxodium distichum* (L.) Rich. Bald-cypress. A large tree, the old bark flaky in thin strips. The roots develop upright conic "knees." Wood light, soft and durable. In swamps and along rivers. Del. to Fla., west to Tex., north to Mo. and Ind.

Juniperaceae. Juniper Family.

8. *Thuja* L. Arborvitae.

Evergreen trees or shrubs with flattened fan-like twigs. Carpellate cones ovoid or oblong with dry coriaceous scales, not peltate.

1. *Thuja occidentalis* L. Arborvitae. Usually a small conical tree with fan-like branches. Self-prunes twigs. Wood light and durable; used for posts, railroad ties, etc. Usually in wet soil and along the banks of streams. N. B. to Man., south to Ohio and N. J., along the Alleghanies to N. C., and to Ill. and Minn.

9. *Chamaecyparis* Spach. White-cedar.

Evergreen trees, similar to the Thujas. Carpellate cones globose, with thick, peltate scales.

1. *Chamaecyparis thyoides* (L.) B. S. P. White-cedar. A tree with soft, light, and durable wood; used for boat-building, woodenware, shingles, etc. In swamps. N. H. to N. J., Fla., and Miss.

10. *Juniperus* L. Juniper.

Evergreen trees or shrubs with small globose, berry-like bluish or blackish cones.

1. Leaves all subulate, prickly pointed, verticillate, slender, mostly straight; cones axillary. *J. communis*.

1. Leaves of 2 kinds, scale-like and subulate, opposite or verticillate; cones terminal. *J. virginiana*.

1. **Juniperus communis** L. Common Juniper. A low tree with spreading or drooping branches and shreddy bark. Goats are poisoned from eating the leaves. On dry hills. N. S. to Br. Col. south to N. J., Ohio, Mich., Neb., and in the Rocky Mts. to N. Mex. Also in Europe and Asia.

2. **Juniperus virginiana** L. Red Juniper. A tree, with spreading often irregular branches when old, but conic in shape when young. Self-prunes twigs. Wood very valuable, light, straight-grained, durable, and fragrant; used for posts, cabinet-work, interior finish, veneers and cooperage, and almost exclusively in the manufacture of lead pencils. Often infested with the "cedar-apple." Poisonous to goats. In dry soil; common on bluffs. N. B. to Br. Col., Fla., Tex., and Ariz. Also in W. I., Ohio.

Subkingdom, ANGIOSPERMAE. Angiosperms.

Class, DICOTYLAE. Dicotyls.

Subclass, APETALAE.

Order, SALICALES.

Salicaceae. Willow Family.

II. **Pópulus** L. Poplar.

Trees with scaly resinous buds. Flowers in aments; fruit a capsule; seeds with long cottony hairs. Leaves mostly with 2 or more glands at or near the base of the blade and with gland-tipped teeth. Twigs prominently self-pruned by means of cleavage planes in basal joints. Pith 5-angled.

1. Leaves and twigs persistently and densely white tomentose below; usually lobed; self-pruning scars very prominent on the small twigs. *P. alba*.
1. Leaves and twigs glabrous or nearly so when old, not lobed. 2.
2. Petioles terete or channeled, not much flattened laterally; leaves crenate. 3.
2. Petioles strongly flattened laterally. 4.
3. Leaves densely tomentose when young; capsule slender-pedicelled. *P. heterophylla*.
3. Leaves not tomentose but usually somewhat pubescent; capsule short-pedicelled. *P. balsamifera*.
4. Leaves broadly deltoid, abruptly acuminate; terminal winter buds usually angular. 5.

4. Leaves broadly ovate or suborbicular; terminal winter buds rounded or only slightly angular. 7.
5. Trees of tall, narrow growth with strongly erect branches, giving a spire-like appearance, young twigs glabrous; leaves usually wider than long, more or less acute at the base. *P. dilatata*.
5. Trees with spreading branches. 6.
6. Young leaves pubescent; capsules nearly sessile. *P. nigra*.
6. Young leaves not pubescent, shining; capsules slender-pedicelled. *P. deltoides*.
7. Leaves coarsely sinuate-dentate, densely white-tomentose when young, glabrous when mature. *P. grandidentata*.
7. Leaves crenulate-dentate, glabrous except the ciliate margins. *P. tremuloides*.

1. **Populus álba** L. White Poplar. A large tree with smooth, light, greenish-gray bark often with black diamond-shaped scars; sprouting freely from the roots and hence not desirable for yards. Young foliage densely white-tomentose, the leaves becoming glabrate and dark green above, broadly ovate or nearly orbicular in outline, 3-5 lobed, or irregularly dentate, 2-4 in. long. Native of Europe and Asia. Ohio.

2. **Populus heterophylla** L. Swamp Poplar. An irregularly branching tree with rough bark. Leaves long-petioled, broadly ovate, crenulate-denticulate, 5-6 in. long. In swamps. Conn. to Ga., west to La. and northward to Ark., Ind. and Ohio.

3. **Populus balsamifera** L. Balsam Poplar. A large tree with nearly smooth gray bark. Leaves broadly ovate, dark green and shining above, pale beneath, rounded or acute at the base, crenulate, 3-5 in. long. Wood very light and soft. In moist or dry soil, commonly along streams and lakes. The subspecies **P. balsamifera cándicans** (Ait.) Gr. Balm-of-Gilead, has the leaves broadly ovate, truncate or cordate at the base, and the petioles and nerves usually puberulent. Mostly escaped from cultivation. Newf. to Alaska, south to N. Y., Ohio, Neb., and Nev.

4. **Populus nigra** L. Black Poplar. A large tree with terete twigs. Mature leaves firm, broadly deltoid, abruptly acuminate at the apex, broadly cuneate or obtuse at the base, crenate, 2-4 in. long. Naturalized from Europe. N. Y. and southward along the Delaware R.

4. *Populus dilatata* Ait. Lombardy Poplar. A spire-like tree of rapid growth. Commonly planted for ornament.

5. *Populus deltoides* Marsh. Cottonwood. A large tree of very rapid growth, with rough, deeply furrowed, brown bark when old. Bark of young trees grayish-green and rather smooth. The giant of the poplars. Petiole much flattened laterally causing the leaves to rustle in the wind. Leaves glabrous, broadly deltoid-ovate, abruptly acuminate at the apex, crenulate, truncate at the base, 4-7 in. long. Wood light and soft and very durable if kept in the dry; used for building lumber, light boxes, paper pulp, sugar and flour barrels, cracker boxes, crates and wooden ware; also a good fuel wood. A most useful and ornamental tree of very rapid growth if planted in ravines and low places. In cities only staminate trees should be planted. In moist soil, especially on the banks and flood plains of creeks and rivers. Quebec to Man., south to Fla. and Kan. Ohio.

6. *Populus grandidentata* Mx. Largetooth Aspen. A tree with smooth, greenish-gray bark. Leaves tomentose when young, glabrous when mature, short-acuminate, obtuse or truncate at the base, 2-4 in. long. Wood soft and white; used for paper pulp. In rich moist soil. N. S. to Ont. and Minn., south to N. J. and Ohio, and in the Alleghanies to Tenn.

7. *Populus tremuloides* Mx. American Aspen. A slender tree with light green, smooth bark. Leaves usually short-acuminate at the apex, finely crenulate, truncate, rounded or subcordate at the base, 1-3 in. broad. Petioles very slender, causing the leaves to quiver and rustle in the slightest breeze. Wood white and soft; used for making coarse paper. In moist or dry soil. Newf. to Alaska, south to N. J., Ohio, Ky., and Neb.; in the Rocky Mts. to Mexico and to Lower Cal.

12. *Sàlix* L. Willow.

Trees or shrubs with buds having a single outer scale. Flowers in aments; fruit a capsule; seeds with long cottony hairs. Leaves sometimes with glands on the petiole or at the base of the blade and with gland tipped teeth. Twigs self-pruned by means

of basal brittle zones. The charcoal from the larger species used for making gunpowder.

1. Twigs decidedly pendulous or "weeping", green or yellowish-green; leaves linear-lanceolate, acuminate, serrulate, smooth, rather pale beneath, petioles glandular above; capsule glabrous, pedicel very short, stigma sessile. *S. babylonica*.
1. Twigs not pendulous nor weeping, but some may be drooping. 2.
2. Leaves tapering to the short petioled or nearly sessile base, linear-lanceolate, remotely denticulate, coarsely silky when young, usually glabrate in age; shrubs or small trees with a narrow, slender crown; capsule glabrous or silky; stamens 2. *S. fluviatilis*.
2. Petioles present and rather prominent and slender except in some individuals. 3.
3. Leaves silky, tomentose, or hairy below when mature; stamens 2. 4.
3. Leaves glabrous below, or nearly so, when mature, sometimes finely pubescent when young. 5.
4. Leaves long linear-lanceolate, sparingly repand-crenulate, or entire, white or silvery silky beneath, without glands on the petiole, acuminate; twigs terete, green; capsule nearly sessile, silky or tomentose, style long. *S. viminalis*.
1. Leaves lanceolate, narrowed at the base, serrulate, silky pubescent and glaucous beneath, usually with glands on the petiole at the base of the blade; capsule glabrous, pedicel very short, stigma sessile. *S. alba*.
4. Leaves ovate-lanceolate, slender-pointed, firm, pubescent or white-tomentose beneath, sharply serrate or entire; bracts yellow, linear-oblong or lanceolate; capsule silky or tomentose, pedicel filiform. *S. hebbiana*.
5. Petioles usually without glands, or if with glands then the leaves of the ovate type and short pointed; stamens 2. 7.
5. Petioles usually with glands on the top or at the base of the blade; stamens 3-12, in one species 2; capsule glabrous. 8.
6. Length of leaf-blade less than 3 times its breadth; mature leaves thin and dull, elliptic, ovate-oval, or obovate, acute or obtuse at the apex; stamens 2. *S. balsamifera*.
6. Length of leaf-blade 3 times its breadth or more. 7.
7. Leaves oblanceolate or spatulate, acute, serrulate, somewhat glaucous beneath; twigs purplish, flexible; filaments of stamens united; capsule silky or tomentose, sessile; stigma sessile. *S. purpurea*.
7. Leaves lanceolate or oblanceolate, acuminate, finely serrate with minute gland-tipped teeth, pale and glaucous beneath; twigs of the season pubescent or puberulent; capsule glabrous. *S. missouriensis*.

7. Leaves obovate, oblong or oblanceolate, rather thin, acute at both ends, irregularly or indistinctly toothed, glaucous and nearly white beneath; bracts fuscous, obovate or cuneate, long-hairy; capsule silky or tomentose, stalked. *S. discolor*.
8. Petioles short; leaves narrowly lanceolate, usually falcate, narrowed at the base, glabrous or slightly pubescent, green on both sides or slightly paler beneath. *S. nigra*.
8. Petioles rather prominent and slender except in some individuals; leaves lanceolate or broader. 9.
9. Leaves dark-green above, glaucous or whitish beneath not coriaceous. 10.
9. Leaves yellow-green and glossy on both sides, thick, normally ovate, very long acuminate with a slender tip; catkins thick and dense, stamens mostly 3, flower bracts dentate; capsule large, short-pedicelled; twigs brown, polished. *S. lucida*.
10. Leaves ovate-lanceolate, broadest below the middle, acuminate, petioles often red; stamens 5-12; capsule narrow-conic, pedicel slender, 3-5 times as long as the gland; bark rough, brown. *S. amygdaloides*.
10. Leaves lanceolate, long-acute; stamens 2, capsules very narrow-conic, pedicel short, about twice as long as the gland; bark gray. *S. fragilis*.
10. Leaves lanceolate or oblong-lanceolate, rounded, subcordate, or narrowed at the base, 3-8 in. long; very white and somewhat pubescent beneath; capsule conic, pedicel slender, 3-5 times as long as the gland; bark dark reddish-brown with small scales. *S. longipes*.

1. **Salix nigra** Marsh. Black Willow. A medium-sized tree with rough, flaky, dark brown bark. Leaves narrowed at the base, serrulate, 2-5 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. wide, or wider; capsule ovoid, acute, about as long as its pedicel. Along streams and lakes. The subspecies *S. nigra falcate* (pursh.) Torr. has narrower more falcate leaves. Hybridizes with *S. alba*. N. B. to Ont., Fla., Cal., and Kan. Ohio.

2. **Salix longipes** And. Ward Willow. A tree with spreading or drooping branches and dark reddish-brown bark. Leaves lanceolate or oblong-lanceolate, rounded, subcordate, or narrowed at the base, 2-7 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. wide, somewhat pubescent beneath; capsule conic. Wood dark brown. Along streams and lakes. Md. to Mo., south to Fla., and Texas.

3. *Salix amygdaloides* And. Peachleaf Willow. A tree with rough, brown, scaly bark. Leaves pubescent when young, glabrous when old, dark green above, pale and slightly glaucous beneath, narrowed at the base, 3-5 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. wide; capsule narrowly ovoid, acute, glabrous, finally about as long as the filiform pedicel. Along streams, lakes and ponds. Quebec to Br. Col., N. Y., Ohio, Mo., and N. Mex.

4. *Salix lucida* Muhl. Shining Willow. A tall shrub or small tree with smooth or slightly scaly bark, the twigs yellowish brown and shining. Leaves lanceolate, ovate-lanceolate, or ovate, mostly long-acuminate, narrowed or rounded at the base, sharply serrulate, green and glossy on both sides or with a few scattered hairs when young, 3-5 in. long, $\frac{3}{4}$ - $2\frac{1}{2}$ in. wide; capsule narrowly ovoid, acute, glabrous, much longer than its pedicel. A very beautiful willow in swamps and along streams and lakes. Newf. to N. W. Terr., N. J., Ohio, Ky., and Neb.

5. *Salix fragilis* L. Crack Willow. A tall slender tree with roughish, gray bark and green branches. Leaves lanceolate, long-acuminate, narrowed at the base, sharply serrulate, glabrous on both sides, rather dark green above, paler beneath, 3-6 in. long, $\frac{1}{2}$ -1 in. wide; capsule long-conic. Twigs used for basket work. Native of Europe. Hybridizes with *S. alba*. Mass. to N. J. and Ohio.

6. *Salix álba* L. White Willow. A large tree with rough gray bark. Leaves lanceolate, narrowed at the base, serrulate, silky-pubescent on both sides when young, less so and pale and glaucous beneath when mature, 2-5 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. wide; capsule ovoid, acute. In moist soil. Native of Europe. The subspecies *S. alba vitellina* (L.) Koch., has the mature leaves glabrous and the twigs yellowish-green. N. B. and Ont. to Ohio and Penn.

7. *Salix babylónica* L. Weeping Willow. A large graceful tree with weeping branches, often planted in yards and cemeteries. Leaves linear-lanceolate, serrulate, narrowed at the base, glabrous when mature, green above, paler beneath, 3-6 in. long, $\frac{1}{2}$ -1 in. wide; capsule ovoid-conic. Native of Asia.

8. *Salix balsamifera* (Hook.) Barr. Balsam Willow. Usually a shrub but sometimes arborescent with a slender erect stem. Leaves elliptic, ovate-oval, or obovate, thin, glabrous, acute at the apex, rounded or subcordate at the base, glaucous beneath. 2-3 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. wide, slightly crenulate-serrulate; capsule very narrow, acute. In swamps. Lab. to Man. south to Me., Mich., and Minn.

9. *Salix missouriensis* Bebb. Missouri Willow. A tree with small, appressed scales on the thin bark. Leaves lanceolate, or oblanceolate, acuminate, finely serrate with minute gland-tipped teeth, rounded or narrowed at the base, glabrous or nearly so when mature, pale and glaucous beneath, 2 $\frac{1}{2}$ -5 in. long, $\frac{1}{2}$ -1 in. wide; capsule ovoid. Wood dark brown. On river banks and in moist places. The closely related *S. cordata* is a shrub with pale bracts and the leaves not whitish beneath. Mo., Kan., Neb., and Iowa.

10. *Salix fluviatilis* Nutt. Sandbar Willow. A shrub or small slender tree usually forming thickets. Flowers can be found for a long time. Leaves linear-lanceolate, acuminate, remotely denticulate with somewhat spreading teeth, short-petioled; 2 $\frac{1}{2}$ -4 in. long; capsule ovoid-conic, finely silky when young, glabrate in age. Along streams and ponds and in ravines, sometimes on high ground. Quebec to N. W. Terr., south to Va. and Texas, Ohio.

11. *Salix discolor* Muhl. Pussy Willow. A shrub or low tree in swamps or moist hill-sides. Leaves obovate, oblong or oblanceolate, usually glabrous, glaucous and nearly white beneath, irregularly serrulate or nearly entire, slender-petioled. 1 $\frac{1}{2}$ -4 in. long; capsule narrowly conic, tapering to a slender beak. N. S. to Man., Del., Ohio and Mo.

12. *Salix bebbiana* Sarg. Bebb Willow. A shrub or small tree. Leaves elliptic, oblong, or oblong-lanceolate, sparingly serrate or entire, dull green and puberulent above, pale and tomentose beneath, nearly glabrous when very old; capsule very narrowly long-conic, twice as long as the filiform pedicel. In dry soil along streams. Anticosti to Hudson Bay and Br. Col., south to N. J., Ohio, Neb., and Utah.

13. *Salix viminalis* L. Osier Willow. A small slender tree or shrub with green twigs. Leaves long linear-lanceolate, sparingly repand-crenulate or entire, revolute-margined, short-petioled, glabrous above, silvery-silky beneath, 3-6 in. long; capsule narrowly ovoid-conic, acute. Cultivated for wicker-ware. Native of Europe and Asia.

14. *Salix purpurea* L. Purple Willow. A slender shrub or small tree with smooth and very bitter bark, the branches often trailing. Leaves oblanceolate or spatulate, acute, serrulate, narrowed at the base, short-petioled, glabrous above, paler and somewhat glaucous beneath, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long; capsule ovoid-conic, obtuse, tomentose. Cultivated for wicker-ware. Native of Europe.

Order, MYRICALES.

Myricaceae. Bayberry Family.

13. *Myrica* L. Bayberry.

Shrubs or trees with alternate simple leaves without stipules. Drupe globose or ovoid, its exocarp waxy. Flowers in catkins.

1. *Myrica cerifera* L. Wax-myrtle. A slender dioecious tree with gray, nearly smooth bark. In sandy swamps or wet woods. Pa. and Md. to Fla., and Tex. north to Ark.

Order, JUGLANDALES.

Juglandaceae. Walnut Family.

14. *Juglans* L. Walnut.

Trees with spreading branches, superposed buds, diaphragmed pith with cavities, and odd-pinnate leaves; monoecious. Fruit a nut in a fleshy husk. Staminate flowers in aments. Seed of nut edible.

1. Leaflets almost entire; nut rather smooth and thin-shelled; twigs glabrous. *J. regia.*

1. Leaflets serrate; nut rough, thick-shelled. 2.
2. Petioles smoothish or puberulent; axil of leaf without a hairy cushion below the buds; dark brown or black, rough; fruit globose, not viscid. *J. nigra.*

2. Petioles pubescent, sticky or gummy when young; axil of the leaf with a hairy cushion below the buds; bark gray, the ridges smooth on the surface; fruit oblong, viscid. *J. cinerea.*

1. *Juglans nigra* L. Black Walnut. A large tree with rough brownish black bark and a long tap root. Wood heavy, hard, strong, of coarse texture; heart-wood dark brown, of great value; used for cabinet-work, interior finish, gun-stocks, turnery, and as veneer. Common on flood plains of streams. Mass. to Ont. and Minn., south to Kan., Tex. and Fla., Ohio.

2. *Juglans cinèrea* L. Butternut. A large tree with gray bark the outer surface of the ridges smooth. Heart-wood lighter colored and softer than in *J. nigra*; used for ornamental cabinet-work, interior finish, and cooperage. In rich or rocky woods. N. B. to N. Dak., Neb., Del., Ga., Ark., and Ohio.

*. *Juglans. règeia* L. English Walnut. A round-headed tree with the leaflets almost entire and nearly glabrous. Husk of the nut friable. Cultivated for the sweet nuts; from Asia.

15. *Hicòria* Raf. Hickory.

Trees with odd-pinnate leaves and serrate leaflets; monoecious. Axillary buds usually superposed; pith solid, 5-angled. Staminate flowers in aments. Fruit a nut in a husk.

1. Terminal bud-scales valvate, 4-6; leaflets 7-15, lanceolate or oblong-lanceolate, more or less falcate. 2.
1. Terminal bud-scales imbricate, more than 6; leaflets 3-9, not falcate, the uppermost larger and generally obovate. 4.
2. Nut elongated, almost terete, seed sweet; leaflets 11-15, inequilateral, acuminate. *H. pecan.*
2. Nut somewhat compressed or angled, usually as broad as long; seed intensely bitter; lateral leaflets falcate. 3.
3. Leaflets 7-9; nut smooth; husk thin, splitting to below the middle. *H. minima.*
3. Leaflets 9-13; nut angled, husk thin, splitting to the base. *H. aquatica.*
4. Terminal bud large, $\frac{1}{2}$ -1 in. long; husk splitting freely to the base, nut angled, seed sweet; middle lobe of the staminate calyx narrow, often at least twice as long as the lateral ones. 5.
4. Terminal bud small, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; husk thin, not splitting freely to the base, nut slightly or not angled; lobes of the staminate calyx mostly nearly equal. 8.
5. Bark shaggy, separating in long plates; husk very thick, splitting to the base; outer bud-scales persisting through the winter. 6.

5. Bark close, rough; leaflets 7-9, stellate pubescent; outer bud scales falling away in autumn; husk not separating quite to the base; twigs and petioles tomentose. *H. alba*.
6. Leaflets 3-5, rarely 7, nut rounded at the base, $\frac{1}{2}$ -1 in. long. 7.
6. Leaflets 7-9; nut usually pointed at both ends, 1-1 $\frac{1}{4}$ in. long. *H. laciniosa*.
7. Leaflets oblong-lanceolate to obovate; twigs puberulent. *H. ovata*.
7. Leaflets narrowly lanceolate; twigs glaucous. *H. carolinac-septentrionalis*.
8. Fruit nearly globular; nut thin-shelled; bark of old trees separating in strips. 9.
8. Fruit obovoid; nut thick-shelled; bark close. 10.
9. Fruit little flattened; middle lobe of staminate calyx short; leaflets 5-7. *H. microcarpa*.
9. Fruit much flattened; middle lobe of staminate calyx long; leaflets 5, occasionally 3. *H. borealis*.
10. Leaves glabrous or nearly so; leaflets 5-7, rarely 3 or 9. *H. glabra*.
10. Leaves with silvery peltate glands; leaflets 5-9. *H. villosa*.

1. **Hicoria pecán** (Marsh.) Britt. Pecan (Hickory). A large tree of rapid growth with rough bark and a long tap root. Leaflets 11-15, oblong-lanceolate, short-stalked, inequilateral, acuminate; fruit oblong-cylindric; husk thin, 4-valved; nut smooth, oblong, thin-shelled, pointed, seed delicious and important commercially; wood like *H. ovata*. Along streams and in moist soil. Ind. to Iowa, south to Ky. and Tex.

2. **Hicoria minima** (Marsh.) Britt. Bitternut (Hickory). A slender tree with close rough bark. Leaflets 7-9, sessile, long-acuminate, the lateral ones falcate; fruit subglobose, narrowly 6-ridged; husk thin tardily and irregularly 4-valved; nut short-pointed, thin-shelled. Wood heavy, strong, and tough. In moist woods and swamps. Quebec to Minn., Fla., and Tex. Ohio.

3. **Hicoria aquática** (Mx. f.) Britt. Water Hickory. A tree with close bark, living in swamps. Leaflets 9-13, lanceolate, or the terminal one oblong, long acuminate at the apex, narrowed at the base, the lateral ones falcate; fruit oblong, ridged, pointed; husk thin, tardily splitting; nut oblong, thin-shelled, angular. Wood of poorer quality than that of other hickories. Va. to Fla., Ill., Ark., and Tex.

4. **Hicoria ovàta** (Mill.) Britt. Shagbark (Hickory).

A large tree with shaggy bark in narrow plates. Leaflets 5, sometimes 7, oblong, oblong-lanceolate, or the upper obovate, acuminate at the apex, narrowed to the sessile base; fruit subglobose; husk thick, soon splitting; nut white, somewhat compressed, pointed, slightly angled, thin-shelled. Seed finely flavored, most "hickory nuts" of the markets being from this species. Wood very heavy, hard, tough, and elastic; used for agricultural implements, carriages, wagon stock, axe-handles, cooperage, sucker rods, wheel spokes, etc. Also a fine fuel wood. Not durable in the ground. In rich soil. Quebec to Minn., Fla., Kan., Tex., and Ohio.

5. *Hicoria carolinae-septentrionalis* Ashe. Southern Shagbark (Hickory). A tree with gray bark hanging in loose strips. Leaflets 3-5, glabrous, ciliate; fruit subglobose; husk soon falling into four pieces; nut white or brownish, much compressed, angled, cordate or subcordate at the top, thin-shelled. In sandy or rocky soil. Del. to Ga. and Tenn.

6. *Hicoria laciniösa* (Mx. f.) Sarg. Shellbark (Hickory). A large tree with the bark separating in long narrow plates and with a long tap root. Leaflets 7-9, rarely 5, acute or acuminate, sometimes 8 in. long; fruit oblong; husk thick, soon splitting to the base; nut oblong, somewhat compressed, thick-shelled, pointed at both ends, yellowish-white; seed sweet and edible. In rich soil. N. Y. and Ohio to Iowa, Kan., Okla. and Tenn.

7. *Hicoria álba* (L.) Britt. Mockernut (Hickory). A large tree with close rough bark. Leaflets 7-9, oblong-lanceolate or the upper oblanceolate or obovate, long-acuminate; fruit globose or oblong-globose; husk thick; nut grayish-white, angled, pointed at the summit, little compressed, thick-shelled; kernel small but sweet and edible. Wood much like in *H. ovata*. In rich soil. Mass. to Ont., Neb., Fla., Tex. and Ohio.

8. *Hicoria microcärpa* (Nutt.) Britt. Small Pignut (Hickory). A tree having the older bark separating in narrow plates. Leaflets 5-7, oblong, or ovate-lanceolate, acuminate at the apex; fruit globose or globose-oblong; husk thin, tardily and ärecompletely splitting to the base; nut subglobose, slightly com-

pressed, thin-shelled, pointed; seed sweet. In rich soil. Mass. to Ohio and Mich., Va. and Mo.

9. **Hicoria boreàlis** Ashe. Northern Hickory. A small tree with rough furrowed bark when young, becoming shaggy in narrow strips when old. Leaflets 5, occasionally 3, lanceolate; fruit ovoid, much flattened; husk very thin, rugose, coriaceous, usually not splitting; shell thin and elastic; seed large, sweet and edible. In dry uplands. Mich.

10. **Hicoria glàbra** (Mill.) Britt. Pignut (Hickory). A tree with close rough bark. Leaflets 3-7, rarely 9, oblong, oblong-lanceolate or the upper obovate, sessile, acuminate at the apex, usually narrowed at the base; fruit obovoid or obovoid-oblong; husk thin, the valves very tardily dehiscent; nut brown, angled, pointed, very thick-shelled; seed bitter and astringent, not edible. In dry or moist soil. Me. to Ont., Minn., Kan., Tex., Fla., and Ohio.

11. **Hicoria villòsa** (Sarg.) Ashe. Scurfy Hickory. A small or medium-sized tree with deeply furrowed, dark gray bark. Leaflets 5-9, thickly covered beneath with silvery peltate glands, mixed with resinous globules, generally pubescent; fruit obovoid, the husk partly splitting; nut brown, thick-shelled, angled; seed small, sweet. N. J. to Fla. and from Mo. and Ark. to Tex.

Order, FAGALES.

Betulaceæ. Birch Family.

16. **Carpinus** L. Blue-beech.

Monoecous trees or shrubs with smooth gray bark and ridged stems. Flowers in aments. Leaves with straight and parallel lateral veins. Nuts small in a large-bracted catkin, bracts leaf-like.

1. **Carpinus caroliniàna** Walt. Blue-beech. A small tree with slender terete gray twigs. Wood white, very compact, strong, and heavy, not durable in the ground; used for turnery, tool handles, etc. The charcoal is used for making powder. In moist soil and along streams. N. S. to Minn., Fla., Tex., and Ohio.

17. *Ostrya* Scop. Hop-hornbeam.

Monococious trees with the flowers in aments. Leaves with straight and parallel lateral veins. Nuts small, in a hop-like catkin.

1. *Ostrya virginiana* (Mill.) Willd. Hop-hornbeam. A small tree with scaly bark. Wood white, compact, and very strong. In dry or moist soil. Cape Breton I. to Minn., Fla., Neb., Kan., Tex., and Ohio.

18. *Bétula* L. Birch.

Aromatic, monococious trees or shrubs; bark usually papery or leathery; nuts small, samara-like, in a cone-like ament.

1. Leaves acute, obtuse, or truncate at the base, rarely cordate, prominently doubly serrate or serrate-dentate; bark chalky white or greenish brown; bark of twigs not with the flavor of wintergreen, usually bitter; fruiting aments peduncled. 2.
1. Leaves usually cordate or rounded at the base, sharply serrate, only slightly doubly serrate; bark brown or yellowish, close or separating into layers; bark of twigs with wintergreen flavor; fruiting aments sessile or nearly so. 5.
2. Bark of trunk and larger branches chalky white, usually peeling off in thin layers; fruiting aments cylindrical, pendant or spreading. 3.
2. Bark greenish brown, hardly peeling in layers; leaves rhombic, acute at both ends; young leaves and twigs tomentose; fruiting aments oblong, erect. *B. nigra*.
3. Leaves deltoid, very long acuminate at the apex; bark not readily separable into thin layers; twigs with numerous resinous glands. *B. populifolia*.
3. Leaves acute or acuminate, usually ovate, in some cultivated forms of various shapes; bark peeling off in thin layers. 4.
4. Leaves various, commonly triangular or rhombic-ovate, on slender petioles; twigs pendulous or weeping; much cultivated, from Europe and Asia. *B. alba*.
4. Leaves ovate or suborbicular; twigs pendulous; native, occasionally cultivated. *B. papyrifera*.
5. Bark not separating in layers, becoming furrowed; leaves shining above; fruiting bracts less than $\frac{1}{4}$ in. long, lobed at the apex. *B. lenta*.
5. Bark separating in layers or sometimes close, somewhat silvery; leaves dull above; fruiting bracts more than $\frac{1}{4}$ in. long, lobed to about the middle. *B. lutea*.

1. **Betula populifolia** Marsh. American White Birch. A slender, short-lived tree with smooth white bark, tardily separating in thin sheets. Autumn leaves pure yellow. Wood soft, white, not durable; used for making spools, shoe-pegs, etc. Leaves tremulous like those of the aspens. In moist or dry soil. N. B. to Ont., and Del.

2. **Betula papyrifera** Marsh. Paper Birch. A large tree with chalky white bark separating in thin layers. The bark is very water-proof and is used for making canoes by Indians and trappers. Wood rather heavy, hard, and very close-grained; decays rapidly when exposed; used for making spools, pegs, shoe-lasts, woodenshoes, wagon hubs, ox-yokes, wood-carving, wood pulp, and in wood turnery. Newf. to Alaska, Penn., Mich., Neb., and Wash.

3. **Betula nigra** L. River Birch. A slender tree with reddish or greenish-brown bark peeling off in very thin layers. Branches long and slender, arched and heavily drooping. Wood rather light, hard, strong and close grained; used for furniture and turnery. "Birch brooms" are made from the twigs. Along streams. Mass. and N. H. to Iowa, Kan., Fla., Tex., and Ohio.

4. **Betula lenta** L. Sweet Birch. A large tree with dark brown, close, smooth bark, becoming furrowed and not separating in layers. Wood hard, fine-grained, of a reddish tint; used for cabinet-work. Newf. to Ont., Fla., Tenn., and Ohio.

5. **Betula lutea** Mx. f. Yellow Birch. A large tree with yellowish or gray bark, separating in thin layers or close. Autumn leaves pure yellow. Wood hard and close-grained; used in making furniture, wheel-hubs, pill-boxes, etc. Newf. to Man., N. Car., Ga., Tenn., and Ohio.

*. **Betula alba** L. European White Birch. A tree with chalky-white bark, much cultivated for ornament, especially the "weeping" and cut-leaved varieties.

19. **Alnus** Gaert. Alder.

Shrubs or trees with the flowers in aments, monoecious. Pith 3-angled; buds stalked. Nuts small, compressed, in woody cone-like catkins, which are persistent throughout the year.

1. Leaves obovate, broadly oval or suborbicular, dull; catkins expanding long before the leaves. 2.
1. Leaves oblong, shining above, catkins expanding in autumn. *A. maritima*.
2. Leaves finely tomentose or glaucous beneath. *A. incana*.
2. Leaves green, glabrous or sparingly pubescent beneath. 3.
3. Leaves finely serrulate, foliage not glutinous. *A. rugosa*.
3. Leaves dentate-serrate; twigs glutinous. *A. glutinosa*.

1. ***Alnus incana*** (L.) Willd. Hoary Alder. A shrub or small tree with the young shoots pubescent. In wet soil. Newf. to N. W. Terr., N. Y., Penn., Ohio and Neb. Also in Europe and Asia.

2. ***Alnus rugosa*** (DuRoi) Koch. Smooth Alder. A shrub or small tree with smooth bark, the young shoots somewhat pubescent. In wet soil or on hillsides. Me. to Ohio, Minn., Fla., and Tex.

3. ***Alnus glutinosa*** (L.) Medic. European Alder. A tree of rapid growth, developing readily in ordinary dry soil. Usually in wet places. Native of Europe, N. Y. and N. J.

4. ***Alnus maritima*** (Marsh.) Muhl. Seaside Alder. A small tree, glabrous or nearly so. In wet soil. Del. and Md.; also in Okl.

Fagaceae. Beech Family.

20. ***Fagus*** L. Beech.

Monoecious trees with smooth, light-gray bark. Leaves 2-ranked, the lateral veins straight and parallel. Twigs with prominent medullary rays and very long-pointed winter buds. Nut 3-angled, and enclosed in a 4-valved burr with soft spines.

1. ***Fagus americana*** Sw. American Beech. A large tree, the lower branches spreading. Autumn leaves pure yellow. Nut sweet and edible. Wood hard, heavy, light-colored, rather close-grained, not durable in the ground; used for making chairs, handles, plane-stocks, shoe-lasts, in turnery, and for "acid wood." In rich but not necessarily deep soil. N. S. to Ont. and Wis., Ohio, Fla., and Tex.

21. *Castanea* Adans. Chestnut.

Trees or shrubs, the leaves mostly 2-ranked with straight and parallel lateral veins. Fruit a rounded coriaceous nut, several in a globose, mostly 4-valved, very spiny involucre.

1. Leaves green on both sides; large trees. *C. dentata*.
1. Leaves densely white-tomentose beneath; shrubs or small trees. *C. pumila*.

1. *Castanea dentata* (Marsh.) Borkh. Chestnut. A large tree of very rapid growth with rough bark in longitudinal ridges. Nut sweet and edible. Wood soft, light, and coarse-grained; used for cabinet-work, railway ties, posts, cooperage, "acid wood," and telegraph poles. Sprouts freely from stumps. In rich or gravelly soil. Me. to Mich., Ga., Ala., and Ohio.

2. *Castanea pumila* (L.) Mill. Chinquapin. A shrub or small tree. Nut very sweet. Wood much like in *C. dentata*. In dry soil. N. J. to Ind., Fla., and Tex.

22. *Quercus* L. Oak.

Trees or shrubs with the flowers in aments, monoecious. Pith 5-angled; buds clustered at the tip of the twigs. Fruit a 1-seeded coriaceous nut (acorn) in an involucrate cup.

1. Leaves with bristle-tips; acorns maturing in the autumn of the second year. 2.
1. Leaves not bristle-tipped; acorns maturing the first year. 12.
2. Leaves pinnatifid or pinnately lobed. 3.
2. Leaves 3-5 lobed above the middle, or entire, obovate or spatulate in outline. 10.
2. Leaves entire, oblong, linear-oblong or lanceolate. 11.
3. Leaves green on both sides. 4.
3. Leaves white or gray-tomentose below. 8.
4. Cup of the acorn shallow, saucer-shaped, much broader than deep. 5.
4. Cup of the acorn top-shaped or hemispheric. 6.
5. Leaves dull; cup $\frac{1}{2}$ -1 in. broad; acorn ovoid. *Q. rubra*.
5. Leaves shining; cup $\frac{1}{4}$ - $\frac{1}{2}$ in. broad; acorn subglobose or short-ovoid. *Q. palustris*.
5. Leaves shining; cup $\frac{1}{2}$ - $\frac{3}{4}$ in. broad; acorn ovoid. *Q. schneckii*.

6. Inner bark orange; leaves sometimes lobed to beyond the middle; acorn ovoid, more or less longer than the cup. *Q. velutina*.
6. Inner bark gray or reddish; leaves deeply lobed. 7.
7. Leaves dull and paler beneath; acorn ovoid. *Q. borealis*.
7. Leaves shining on both sides, lobed to near the mid-rib; acorn ovoid; cup $\frac{1}{2}$ in. wide, more or less. *Q. ellipsoidalis*.
8. Leaf-lobes lanceolate or linear-lanceolate, long; large trees. 9.
8. Leaf-lobes triangular-ovate, short; shrubs or low trees. *Q. nana*.
9. Leaves rounded or obtuse at the base, 3-5 lobed; lobes linear or lanceolate, often falcate. *Q. digitata*.
9. Leaves cuneate or acute at the base, 5-11-lobed; lobes triangular. *Q. pagodaefolia*.
10. Leaves obovate-cuneate, brown-floccose beneath; cup deep, acorn ovoid. *Q. marylandica*.
10. Leaves spatulate, glabrous on both sides; cup saucer-shaped, acorn globose-ovoid. *Q. nigra*.
11. Leaves linear-oblong, green and glabrous on both sides. *Q. phellos*.
11. Leaves oblong or lanceolate, tomentulose beneath. *Q. imbricaria*.
12. Leaves pinnatifid or pinnately lobed. 13.
12. Leaves crenate or dentate, not lobed. 17.
13. Mature leaves pale, or glaucous and glabrous below. 14.
13. Mature leaves pubescent or tomentulose below, lyrate-pinnatifid. 15.
14. Bark separating in thin scales, light gray or light brown; cup shallow; bracts thick and warty. *Q. alba*.
14. Bark furrowed and ridged, not scaly, dark gray or dark brown; cup hemispherical, with imbricated, appressed scales; cultivated in many varieties. *Q. robur*.
15. Upper scales of the cup not awned. 16.
15. Upper scales awned, forming a fringe around the acorn. *Q. macrocarpa*.
16. Leaves yellowish-brown, tomentulose beneath; acorn ovoid. *Q. minor*.
16. Leaves white-tomentulose beneath; acorn depressed-globose. *Q. lyrata*.
17. Fruit peduncled; teeth or shallow lobes of the leaves rounded. 18.
17. Fruit sessile or nearly so; teeth or shallow lobes of the leaves acute. 20.
18. Peduncle much longer than the petioles; leaves white-tomentulose beneath. *Q. platanooides*.
18. Peduncle as long or shorter than the petioles; leaves gray-tomentulose beneath. 19.
19. Bark white, flaky; seed sweet and edible; fruit short peduncled or sessile. *Q. michauxii*.
19. Bark close; seed edible; petioles slender; peduncles equalling or shorter than the petioles. *Q. prinus*.

20. Shrub or low tree, leaves obovate or oval; seed edible. *Q. prinoides*.
20. Tall trees. 21.
21. Leaves mostly oblong to lanceolate; cup deep; bark close; seed edible. *Q. acuminata*.
21. Leaves obovate; cup shallow; bark more or less flaky. *Q. alexanderi*

1. **Quercus rubra** L. Red Oak. A large tree with dark gray bark, somewhat roughened. Leaves oval or somewhat obovate, 4-8 in. long, dull green above, paler beneath, lobes triangular-lanceolate, tapering from a broad base to an acuminate apex; cup saucer-shaped, its base flat or slightly convex $\frac{1}{2}$ -1 in. broad; acorn ovoid, 2-4 times as long as the cup. Autumn leaves purplish red. Wood very coarse-grained, reddish in color, porous, and not very durable; used in carpentry, cooperage, and for clapboards. The most rapid grower of all the oaks. An important tree for tan-bark. Sprouts readily from stumps. N. S. to Ont., Minn., Fla., Kan., Tex., and Ohio.

2. **Quercus palustris** DuRoi. Pin Oak. A medium-sized tree with brown bark, rough when old, the lower branches deflexed. Leaves broadly oblong or obovate, deeply pinnatifid, brighter green and shining above, duller beneath, $2\frac{1}{2}$ -5 in. long, the lobes oblong, lanceolate or triangular-lanceolate, divergent; cup saucer-shaped, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, base flat; acorn subglobose or ovoid, 2-3 times as long as the cup. Wood coarse-grained, reddish, and not durable. In moist ground. Mass. to Ohio and Wis., Del. and Ark.

3. **Quercus schneckii** Britt. Schneck's Red Oak. A medium-sized tree with reddish-brown bark with broad ridges broken into plates. Leaves mostly obovate, bright green and shining above, paler beneath, 2-6 in. long, truncate or broadly wedge-shaped at the base, deeply pinnatifid; lobes oblong or triangular; cup saucer-shaped, $\frac{1}{2}$ inch broad more or less, acorn ovoid, 2-3 times as high as the cup. Ind. to Iowa, Mo., Fla., and Tex.

4. **Quercus coccinea** Wang. Scarlet Oak. A tree with pale reddish or gray inner bark. Leaves deeply pinnatifid, glabrous, bright green above, paler beneath, 4-8 in. long; cup hem-

ispheric or top-shaped, acorn ovoid, about twice as long as the cup. Autumn leaves red. In dry soil. Me. to Minn., Fla., Mo., and Ohio.

5. *Quercus ellipsoidalis* Hill. Oval-leaf Oak. A tall tree with gray, close, fissured bark, the innermost layer yellowish; lowest branches drooping. Leaves oval to obovate-orbicular, $2\frac{1}{2}$ -6 in. long, deeply 5-7-lobed, broadly cuneate to truncate at the base; cup turbinate, short-peduncled, acorn ellipsoid to subglobose, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 1-2 times as long as the cup. Ill., Mich., and Minn.

6. *Quercus borealis* Mx. f. Gray Oak. A large tree with leaves like those of *Q. rubra* and acorns like those of *Q. coccinea*. Leaves 7-13-lobed to the middle or somewhat beyond; cup turbinate, peduncled; acorn ovoid, 1-2 times as long as the cup. Quebec to Ont., N. Y. and Penn.

7. *Quercus velutina* Lam. Quercitron Oak. A large tree of rapid growth with very dark brown outer bark, rough in ridges, and bright orange inner bark. Leaves firm, sometimes lobed to beyond the middle, brown-pubescent or sometimes stellate-pubescent when young, glabrous when mature, the lobes broad, oblong or triangular-lanceolate; cup hemispheric or top-shaped, commonly narrowed into a short stalk; acorn ovoid, as long or longer than the cup. The inner bark (quercitron) yields a valuable dye; rich also in tannin. Wood hard, heavy, and strong but not tough. Sparingly self-prunes small twigs by means of basal joints. Me. to Minn., Fla., Neb., Tex., and Ohio.

8. *Quercus digitata* (Marsh.) Sudw. Spanish Oak. A tree growing in dry soil. Leaves glabrous above, gray-tomentulose beneath, deeply pinnatifid into 3-7 linear or lanceolate lobes; cup saucer-shaped with a turbinate base, about $\frac{1}{2}$ in. broad; acorn subglobose or depressed, about twice as high as the cup. Wood very hard and strong; used for cooperage. An important tannin oak. N. J. to Fla., Mo., Neb., and Tex.

9. *Quercus pagodaefolia* (Ell.) Ashe. Swamp Spanish Oak. A tree with spreading branches and dark gray, rough bark. Leaves oval or oblong, cuneate to truncate at the base, 8-12 in. long, deeply 5-11-lobed, persistently white-tomentulose beneath,

lobes narrowly triangular, spreading or somewhat ascending, usually entire; cup sessile, shallow, acorn globose, about $\frac{1}{2}$ enclosed in the cup. In wet or moist soil. Va. and N. Car. to Ga., Ind., and Mo.

10. *Quercus nana* (Marsh.) Sarg. Bear Oak. A shrub or small tree, often forming thickets. Leaves mostly obovate, 2-5 in. long, short-petioled, grayish-white tomentulose beneath 3-7-lobed, lobes triangular-ovate, acute; cup saucer-shaped, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, with a turbinate or rounded base; acorn globose-ovoid, longer than the cup. In sandy or rocky soil. Me. to Pa., Del., and in mountains of N. C. and Ky.

11. *Quercus marylandica* Muench. Black-Jack (Oak). Usually a small shrubby tree; bark nearly black with very rough ridges. Leaves obovate, 3-5 lobed toward the broad usually nearly truncate apex, cuneate below, the lobes short, stellate-pubescent above, brown-tomentose beneath when young, mature leaves glabrous above; cup deep about $\frac{1}{2}$ in. broad; acorn ovoid, 2-3 times as high as the cup. In dry sterile soil. Hybridizes with *Q. phellos* and *Q. nana*. L. I. to Ohio, Neb., Fla., and Tex.

12. *Quercus nigra* L. Black Water Oak. A tree of rapid growth with gray bark, rough in ridges. Leaves spatulate or obovate, 1-3-lobed at the apex or some of them entire and rounded, short-petioled; cup saucer-shaped, rounded at the base, about $\frac{1}{2}$ in. wide; acorn globose-ovoid, 2-3 times as high as the cup. Wood heavy, hard, and strong; used for fuel. Usually along streams and swamps. Del. to Ky., Mo., Fla., and Tex.

13. *Quercus phellos* L. Willow Oak. A tree with slightly roughened, reddish brown bark. Leaves narrowly-oblong or oblong-lanceolate, entire, very short petioled; cup saucer-shaped, nearly flat on the base; acorn subglobose, bitter. Wood poor. In moist woods. Hybridizes with *Q. nana* and probably *Q. rubra*, producing the form known as *Q. heterophylla* Mx. L. I. to Fla., Mo., and Tex.

14. *Quercus imbricaria* Mx. Shingle Oak. A large stout tree, the leaves dying off but remaining on the tree until about April 1. Leaves oblong or lanceolate, entire, persistently gray-tomentulose beneath, 3-7 in. long; cup hemispheric or turbi-

nate, about $\frac{1}{2}$ in. broad; acorn subglobose, bitter. Wood poor; used for shingles and clapboards. Self-prunes twigs by means of basal joints. *Q. leana* Nutt. is a hybrid of this and *Q. velutina*. *Q. tridentata* Engelm. is a hybrid with *Q. marylandica*. Also hybridizes with *Q. palustris* and *Q. rubra*. Pa. to Mich., Neb., Ga., Ark., and Ohio.

15. **Quercus álba** L. White Oak. A large tree with light gray bark scaling off in thin plates. Leaves obovate, pinnatifid, lobes oblong, toothed or entire; cup depressed-hemispheric, its bracts thick and warty, appressed; acorn ovoid-oblong, 3-4 times as high as the cup, sweet and edible. Autumn leaves red and russet. Self-prunes extensively. Wood light-colored, hard and tough; valuable for many purposes; an ideal wood for railroad ties; used for poles, posts, and piling, for fuel and "acid wood," for cooperage, furniture, interior finishing lumber, farm implements, wharves, ship building, and car and wagon work. The most valuable of the American oaks. Hybridizes with *Q. macrocarpa*, *Q. minor*, *Q. prinus*, and *Q. acuminata*. Me. to Ont., Minn., Fla., Kan., Tex., and Ohio.

*. *Quercus robur* L. English Oak. A large strong tree with stout more or less spreading branches forming a broad round-topped head; self-prunes. Many forms are cultivated for ornament, including yellow-leaved and cut-leaved varieties, also forms with varied branches. Native of Europe.

16. **Quercus minor** (Marsh.) Sarg. Post Oak. A shrub or usually a small tree with a long tap root and with rough gray bark and valuable wood. Leaves broadly obovate, deeply lyrate-pinnatifid, glabrous above, brown-tomentulose beneath, 4-8 in. long; cup hemispheric, nearly sessile; acorn ovoid, 2-3 times as long as the cup, very sweet. In dry soil. Mass. to Ohio and Mich., Fla., and Tex.

17. **Quercus lyràta** Walt. Overcup Oak. A large tree with gray or reddish bark in thin plates. Leaves obovate, lyrate-pinnatifid or lobed to beyond the middle 6-8 in. long, shining above, densely white-tomentulose beneath, cup depressed-globose, peduncled, 1-1 $\frac{1}{4}$ in. broad; acorn depressed-globose, nearly or

quite immersed in the cup. Wood like in white oak. In swamps. N. J. to Ind., Mo., Fla., and Tex.

18. **Quercus macrocarpa** Mx. Bur Oak. A large tree with flaky gray bark and with a long tap root. Leaves obovate or oblong-obovate, irregularly lobed, pinnatifid, or coarsely crenate; shining above, grayish-white-tomentulose beneath, 4-8 in. long; cup short peduncled or sessile, hemispheric or subglobose, $\frac{1}{2}$ -1 in. broad, the tips of the bracts forming a fringe around the acorn; acorn ovoid, 1-2 times as high as the cup. Self-prunes abundantly. A very valuable tree with hard and tough wood resembling the White Oak. In rich soil or on river bluffs where it is sometimes small and shrubby. Hybridizes with *Q. acuminata*. N. S. to Man., Mass., Ohio, Kan., and Tex.

19. **Quercus platanoïdes** (Lam.) Sudw. Swamp White Oak. A large tree with flaky gray bark. Leaves obovate, or oblong-obovate, coarsely toothed or sometimes lobed nearly to the middle, dull and glabrous above, densely white-tomentulose beneath; peduncles of the hemispheric cup 2-5 times as long as the petioles; acorn oblong-ovoid, seed rather sweet. Self-prunes. Wood similar in value to that of the White Oak. In moist or swampy soil. Quebec to Ohio and Mich., Ga., and Ark.

20. **Quercus michauxii** Nutt. Cow Oak. A large tree with flaky white bark. Leaves obovate or broadly oblong, crenately toothed the teeth often mucronulate, 4-8 in. long, cup depressed-hemispheric, short-peduncled, 1-1 $\frac{1}{4}$ in. broad; acorns ovoid, about 3 times as high as the cup, sweet and edible. Wood valuable like the White Oak. In moist soil. Del. to Ind., Mo., Ark., Fla., and Tex.

21. **Quercus prinus** L. Rock Chestnut Oak. A large tree with brown bark, ridged, close or slightly flaky. Leaves oblong, oblong-lanceolate, or obovate, coarsely crenate, glabrous above, finely gray-tomentulose beneath, petioles slender; cup hemispheric, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. broad, peduncles equalling or shorter than the petioles; acorn ovoid, 2-3 times as high as the cup, seed edible but not very sweet. Self-prunes. Wood hard and strong; used in fencing and for railroad ties. Bark rich in tannin. In dry soil. Me. to Ont., Ala., Tenn., and Ohio.

22. *Quercus acuminata* (Mx.) Houda. Chestnut Oak. A tree with close gray bark. Leaves oblong, lanceolate, or sometimes obovate, coarsely toothed with acute teeth, shining above, pale and gray-tomentulose beneath, 4-6 in. long; cup sessile or very short-peduncled, hemispheric; acorn ovoid about twice as high as the cup, sweet and edible. Self-prunes abundantly. Wood strong and durable, much like White Oak. Usually in dry soil, commonly on lime stone ridges. Ont. to Minn., Ga., Ala., Tex., and Ohio.

23. *Quercus alexanderi* Britt. Alexander's Chestnut Oak. A tree with gray bark, flaky, especially when old. Leaves obovate or oblong-obovate, broadest above the middle, coarsely toothed; cup short-stalked or sessile, shallow; acorn ovoid, 2-3 times as high as the cup. Self-prunes. Vt. to Mich., and Ind.

24. *Quercus prinoides* Willd. Scrub Chestnut Oak. A shrub or small tree with gray bark. Leaves obovate, coarsely toothed, bright green and shining above, gray-tomentulose beneath, narrowed at the base; cup sessile, hemispheric, thin; acorn ovoid, 2-3 times as long as the cup; seed sweet and edible. Self-prunes. In dry sandy or rocky soil. Me. to Ohio and Minn., Ala., and Tex.

Order, URTICALES.

Ulmaceae. Elm Family.

23. *Ulmus* L. Elm.

Trees of rapid growth with 2-ranked inequilateral leaves, the lateral veins straight and parallel. Flowers bisporangiate or imperfectly bisporangiate in clusters or racemes. Fruit a samara.

1. Leaves very rough above: inner bark very mucilaginous; twigs not corky-winged and not self-pruned, but large numbers of lateral buds cut off; samara not ciliate. *U. fulva*.
1. Leaves smooth or sometimes rather rough above: inner bark not mucilaginous. 2.
2. None of the branches corky-winged; twigs smooth, self-pruned by basal joints and by cleavage planes in the nodes of annual growth; samara faces glabrous. *U. americana*.
2. None of the branches with corky ridges; twigs glabrous or nearly so, not self-pruned; samara glabrous or nearly so, deeply notched. *U. campestris*.

2. Some or all of the branches corky-winged, or twigs puberulent, self-pruned; samara-faces pubescent. 3.
3. Most of the branches with corky wing-like ridges; twigs glabrous or nearly so; leaves 1-3 in. long. *U. alata*.
3. Branches often with corky wing-like ridges; twigs puberulent; leaves 2-5 in. long. *U. racemosa*.

1. **Ulmus americana** L. White Elm. A large tree of rapid growth, with gray flaky bark, much cultivated in cities and along roadsides. Samara ovate-oval, its faces glabrous. Wood heavy, hard, flexible, and very tough; used for wheel-hubs, saddle-trees, rough cooperage and furniture, in boat and ship building, and in the construction of cars and wagons. Common on bluffs and on the flood plains of rivers and creeks. Graceful in form and very suitable for cultivation. Newf. to Man., Fla., Tex., and Ohio.

2. **Ulmus racemosa** Thom. Cork Elm. A large tree with puberulent young twigs, the branches or some of them with corky wings. Samara oval, its margins densely ciliate. Wood harder, stronger, and more durable than that of the White Elm. In rich soil. Quebec to Ont., Mich., N. J., Tenn, Neb., and Ohio.

* *Ulmus campestris* L. English Elm. A tree, rather pyramidal in shape, the twigs ascending, not drooping except in "weeping" forms. Samara not ciliate, nearly or quite glabrous. A good timber tree. Cultivated, from Europe.

3. **Ulmus alata** Mx. Winged Elm. A small tree, branches usually with corky wing-like ridges; twigs glabrous or nearly so. Samara oblong, pubescent on the faces. Wood very compact; used for wheel hubs. In dry or moist soil. Va. to Fla., Ill., Ark., and Tex.

4. **Ulmus fulva** Mx. Slippery Elm. A medium-sized tree with rough grayish-brown fragrant bark and rough-pubescent twigs. Samara oval-orbicular, pubescent over the seed. Inner bark mucilaginous and medicinal. Wood hard and strong but splitting easily when dry. Along streams, on flood plains and on hills. Quebec to N. Dak., Fla., Tex., and Ohio.

24. *Planera* Gmel. Planertree.

Trees similar to the elms but with a nut-like fruit and the flowers expanding with the leaves. Bark of the trunk scaling off in plates.

1. *Planera aquatica* (Walt.) Gmel. Planertree. A small tree with nearly glabrous leaves growing in swamps and on wet banks. Ind. to Mo., Ky., N. Car., La., and Fla.

25. *Céltis* L. Hackberry.

Trees or shrubs with 2-ranked leaves and the pith diaphragmed. Fruit an ovoid or globose drupe.

1. Leaves sharply serrate; smooth or scabrous above; twigs glabrous.

especially the fruiting ones, or pubescent. *C. occidentalis*.

1. Leaves entire or few-toothed, small. *C. mississippiensis*.

1. *Celtis occidentális* L. Common Hackberry. A medium-sized tree with rough bark. Commonly much distorted with "witches brooms." Drupe sweet and edible. Self-prunes the fruiting twigs in winter. Wood heavy, hard, strong, quite tough, greenish-white. In dry soil and on flood plains. Quebec to Man., La., N. Car., Mo., Kan., and Ohio.

2. *Celtis mississippiensis* Bosc. Southern Hackberry. A medium-sized tree with light gray, rough bark. Usually in dry soil. N. Car., to Ill., Mo., Kan., Fla., and Tex.

Moraceae. Mulberry Family.

26. *Mòrus* L. Mulberry.

Shrubs or trees with 2-ranked leaves and milky sap. Fruit aggregate, berry-like.

1. Leaves scabrous above, pubescent beneath. *M. rubra*.

1. Leaves smooth and glabrous on both sides, or nearly so. *M. alba*.

1. *Morus rubra* L. Red Mulberry. A small tree with rough gray bark. Fruit dark purple-red, edible, delicious. Wood rather heavy, hard, strong, and rather tough; very durable in contact with the ground, very valuable for posts; used for farm implements, in cooperage, "acid wood," and ship building. In rich soil. Vt. and Ont., to Ohio and Mich., S. Dak., Fla., and Tex.

2. **Morus álba** L. White Mulberry. A small rapid-growing tree with rough light gray bark and spreading branches. Fruit edible but usually rather insipid. Leaves used for feeding silk-worms. Wood suitable for posts. Although growing best in rich moist soil, it does well in quite dry regions and should be much planted on the dry prairies, especially varieties with the better grade of berries. Introduced from the Old World. Me. and Ont., to Fla., Kan., and Ohio.

27. **Tóxylon** Raf. Osage-orange.

A tree with milky sap, sharp thorns, and entire leaves. Fruit a large spherical, greenish or yellowish syncarp.

1. **Toxylon pomiferum** Raf. Osage-orange. A small thorny tree much planted for hedges. Wood very heavy, exceedingly hard, and strong, but not tough, brownish-yellow; valuable for fence posts and fire wood, also used for wagon making. The thorns produce painful wounds. Horses acquire a strong liking for the young shoots and eat them in large quantities without apparent ill effects. Mo. and Kan. to Tex. Escaped in Ohio and other eastern states.

28. **Broussonétia** L'Her. Paper-mulberry.

Trees with 2-ranked leaves and milky sap. Drupes in a globular head.

1. **Broussonetia papyrifera** (L.) Vent. Paper-mulberry. A small, low-branching, large-headed tree with dark scarlet fruit which is sweet but insipid. Native of eastern Asia. In Japan and China the bark is made into paper. Escaped from cultivation. N. Y. to Ga., and Mo.

Order, PLATANALES.

Hamamelidaceae. Witch-hazel Family.

29. **Hamamèlis** L. Witch-hazel.

Trees or shrubs with alternate simple leaves and bisporangiate or imperfectly bisporangiate flowers. Fruit a 2-ocular woody or cartilaginous capsule.

1. **Hamamelis virginiana** L. Witch-hazel. A shrub or small tree with 2-ranked leaves and stalked buds. Blooms in late autumn. In low ground and on banks. N. B. and N. S. to Minn., Mo., Fla., Tex., and Ohio.

30. **Liquidambar** L. Sweet-gum.

Large trees with resinous, aromatic sap. Capsules in a dense spinose globular head.

1. **Liquidambar styraciflua** L. Sweet-gum. A fine large tree with wide spreading branches, the twigs often covered with corky ridges. Leaves with a peculiar sweet fragrance when crushed. Autumn leaves red, yellow, and brown. Wood valuable, of medium weight, rather soft, strong, tough, and of fine texture, difficult to season. Sometimes used as a substitute for black walnut. Used for furniture, veneer, wooden plates, plaques, baskets, hat blocks and wagon hubs. In low ground. Conn., N. Y. and Ohio. to Fla., Ill., Mo., and Mex.

Platanaceae. Planetree Family.

31. **Plátanus.** L. Planetree.

Large trees, the twigs with complete stipular rings and the axillary buds covered by the base of the petiole. Fruit in a spherical head composed of numerous nutlets.

1. **Platanus occidentalis** L. Sycamore. A very large tree, the largest in the northeastern United States, with whitish or green bark which peels off freely in thin plates; the largest trunks usually hollow. Autumn leaves brown. Wood rather hard, compact, coarse-grained, difficult to split, tough, and of a light-brown color; used for tobacco boxes, cooperage, cabinet-work, and finishing lumber. Along the banks of streams and in moist ground but grows well in ordinary mesophytic conditions. Me. to Ont. and Minn., Fla., Kan., Tex., and Ohio.

Sub-class, CHORIPETALAE.

Order, RANALES.

3. *Magnoliaceae.* Magnolia Family.

32. **Magnòlia** L. Magnolia.

Trees or shrubs with bitter aromatic bark, the twigs showing

complete stipular rings. Flowers bisporangiate, large, solitary. Buds covered with conduplicate sheathing stipules. Pith usually diaphragmed but solid. Fruit aggregate, cone-like.

1. Leaves auriculate, glabrous. Leaf buds glabrous. *M. fraseri*.
1. Leaves rounded or truncate at the base, thin. Leaf buds silky pubescent. *M. acuminata*.
1. Leaves acute at the base. 2.
2. Leaves light green beneath, 1-2 ft. long. Leaf buds glabrous. *M. tripetala*.
2. Leaves glaucous beneath, 3-6 in. long. Leaf buds pubescent. *M. virginiana*.

1. **Magnolia fraseri** Walt. Fraser Magnolia. A tree with spreading branches and glabrous leaf buds. Leaves elongated-obovate or oblong, auriculate, $\frac{1}{2}$ -2 ft. long; flowers white. In mountain woods. Va. and Ky. to Fla. and Miss.

2. **Magnolia tripetala** L. Umbrella Magnolia. A low tree with glabrous leaf-buds and irregular branches. Leaves obovate, acute, cuneate at the base, 1-2 ft. long, flowers white, slightly odorous. Wood soft and light. Penn. to Ga., Ark., and Miss.

3. **Magnolia virginiana** L. Laurel Magnolia. A tree with pubescent leaf buds. Leaves oval or oblong, acute at the base, 3-6 in. long; flowers white, deliciously fragrant. In swamps. Mass. to Penn., Fla., and Tex.

4. **Magnolia acuminata** L. Cucumber Magnolia. A large tree with silky pubescent leaf-buds. Leaves oval, acute or somewhat acuminate, rounded or truncate at the base $\frac{1}{2}$ -1 ft. long; flowers greenish-yellow. Wood soft, light, and durable; used for cabinet-work, pump-logs, and water-troughs. N. Y. to Ohio and Ill., Ga., Ala., and Ark.

33. **Liriodendron** L. Tuliptree.

Trees with alternate truncate leaves, diaphragmed but solid pith, and complete stipular rings. Fruit aggregate, cone-like.

1. **Liriodendron tulipifera** L. Tuliptree. A very large, magnificent, rapid-growing tree with glabrous leaf-buds. Flowers greenish-yellow, orange-colored within. Buds covered with con-

duplicate sheathing stipules. Autumn leaves pure yellow. Next to the Sycamore, probably the largest tree in the Northeastern United States. Wood light, soft, and straight-grained, easily worked; heart wood light yellow or brown; sapwood thin, nearly white. Used for interior finish, shingles, boat-building, panels of carriages, wooden pumps, wooden ware of various kinds, wood pulp, furniture, implements, boxes, shelving, drawers, and for carving and toys. One of the best woods for panelling. Should be extensively cultivated. Vt. and R. I. to Fla., Ohio, Mich., and Ark.

Anonaceae. Custard-apple Family.

34. **Asimina** Adans. Papaw.

Small trees or shrubs with naked silky buds. Leaves 2-ranked; pith diaphragmed but solid; bark with fetid odor.

1. **Asimina triloba** (L.) Dunal. Papaw. A small tree or shrub with smooth dark bark and nodding young twigs. Flowers axillary, nodding; fruit a large fleshy, oblong, greenish-yellow, edible berry which, however, does not agree with some persons. A case of severe poisoning from eating the fruit is recorded. In creek and river bottoms and on hillsides. Ont. and N. Y. to Mich., Neb., Tex., Fla., and Ohio.

Lauraceae. Laurel Family.

35. **Sassafras** Nees and Eberm. Sassafras.

A tree with yellow dioecious flowers and spicy aromatic bark. Fruit a blue drupe.

1. **Sassafras sassafras** (L.) Karst. Sassafras. A large rough-barked tree, the sap of the bark and leaves mucilaginous. Autumn leaves red, yellow, and green. Wood reddish, light and rather soft, of coarse texture, durable; used in cooperage, for small boats, and fencing. The bark of the roots yields a powerful, aromatic stimulant. Fruit pungent, poisonous. Excessive doses of sassafras tea produce narcotic poisoning. In dry or sandy soil. Me. to Ont., Mich., Fla., Tex., and Ohio.

Order, ROSALES.

Rosaceae. Rose Family.

Pomatae. Apple Subfamily.

36. **Sórbus** L. Mountain-ash.

Trees or shrubs with odd-pinnate leaves, the leaflets serrate. Fruit a small red berry-like pome in compound cymes.

1. Leaflets glabrous above. 2.
1. Leaflets pubescent on both sides; calyx and pedicels usually woolly. *S. aucupària.*
2. Leaflets long-acuminate; fruit less than $\frac{1}{4}$ in. in diameter. *S. americana.*
2. Leaflets obtuse or short-pointed; fruit more than $\frac{1}{4}$ in. in diameter. *S. sambucifolia.*

1. **Sorbus americana** Marsh. American Mountain-ash. A small tree with smooth bark. Bark and unripe fruit very astringent. In moist ground. Much prized for ornamental planting. Newf., Man., N. Car., and Mich.

2. **Sorbus sambucifolia** (C. & S.) Roem. Elderleaf Mountain-ash. A small tree with smooth bark. In moist ground. Lab. to Alaska, N. Eng., Ohio, Mich., and in Rocky Mts. to Colo. and Utah.

3. **Sorbus aucupària** L. European Mountain-ash. A small tree, native of Europe. Frequently cultivated. Fruit poisonous to man, but eaten by some birds. N. S. to N. H.

37. **Pyrus** L. Pear.

Trees or shrubs with simple leaves. Fruit a pome, its flesh containing grit-cells.

1. **Pyrus communis** L. Pear. A pyramidal usually slender tree, often with thorn-like stunted branches. Bark smooth. Cultivated for its large fleshy fruit. Native of Europe and Asia. Me to N. J. and Ohio.

38. **Màlus** Hill. Apple, Crab-apple.

Trees or shrubs with simple leaves. Fruit a fleshy pome without grit-cells.

1. Leaves glabrous, at least when mature. 2.
1. Leaves persistently pubescent or tomentose beneath. 3.
2. Leaves oblong, oval, or lanceolate, narrowed at the base. *M. angustifolia*.
2. Leaves ovate, rounded or cordate at the base, often somewhat lobed. *M. coronaria*.
2. Leaves ovate, acute or acuminate at the apex and acute at the base, on slender petioles; finely and nearly evenly serrate. *M. baccata*.
3. Leaves mostly narrowed at the base; pome 1-2 in. in diameter. 4.
3. Leaves rounded or cordate at the base; pome usually large, 2-4 in. in diameter. *M. malus*.
4. Pedicel slender, pubescent, 1-2 in. long. *M. ioensis*.
4. Pedicel stout, white-tomentose, $\frac{1}{2}$ -1 in. long. *M. soulardi*.

1. **Malus angustifolia** (Ait.) Mx. Narrowleaf Crab-apple. A small tree usually with thorn-like stunted branches or spurs. Leaves oblong, oblong-lanceolate, or oval, thick, shining above, sometimes pubescent beneath when young, dentate or often entire. On low ground. N. J. to Ill., Kan., Fla., La., and Ohio.

2. **Malus coronaria** (L.) Mill. Fragrant Crab-apple. A small tree with hard and sour fruit suitable for preserving. Leaves ovate, to triangular-ovate, sparingly pubescent beneath when young, sharply serrate and often somewhat lobed. On low ground. Ont. to Mich., and S. Car., Ohio.

3. **Malus ioensis** (Wood) Britt. Iowa Crab-apple. A small tree much resembling *M. coronaria*. Leaves ovate, oval, or oblong, dentate, crenate or with a few rounded lobes, white-pubescent beneath at length glabrous above. Minn., Wis., and Ill. to Neb., Ky., La., and Okl.

4. **Malus soulardi** (Bail.) Britt. Soulard Crab-apple. A small tree resembling the two preceding. Leaves ovate, elliptic or obovate, irregularly crenate-dentate or sometimes few-lobed, rugose and densely tomentose beneath. Minn. to Mo. and Tex.

*. *Malus baccata* (L.) Siberian Crab-apple. A small spreading tree with compact crown. Pedicels very slender; fruit small, not becoming mellow. Cultivated.

5. **Malus malus** (L.) Britt. Common Apple. A medium-sized tree with spreading branches. Leaves ovate or oval, glabrous or nearly so above, pubescent and often woolly beneath.

Fruit large, various. Introduced from Europe and escaped in many places. The seeds are poisonous. Me. to N. Y., N. J., Ohio, and Ga.

39. *Cydònia* Tourn. Quince.

Shrubs or low, small trees with fleshy pomes.

*. *Cydonia cydònia* (L.) Karst. Quince. A low tree with crooked stem and rambling branches. Cultivated for the large sour fleshy fruit.

40. *Amelánchier* Medic. Juneberry.

Shrubs or small trees with simple mostly 2-ranked leaves and small berry-like pomes.

1. Leaves acute or acuminate at the apex; top of the ovulary glabrous or nearly so. 2.
1. Leaves rounded, obtuse or subacute at the apex; top of the ovulary woolly; petals $\frac{1}{2}$ - $\frac{3}{4}$ in. long. *A. rotundifolia*.
2. Leaves glabrous when mature, but pubescent or woolly when young, ovate to ovate-lanceolate; base cordate or rounded. *A. canadensis*.
2. Leaves densely white-woolly beneath, at least when young, oblong to obovate, rarely sub-cordate at the base. *A. botryapium*.

1. *Amelanchier canadensis* (L.) Med. Common Juneberry. A medium-sized tree with a small, red or purple, sweet and edible, berry-like pome. In dry soil. Newf. to Ont., Fla., La., and Ohio.

2. *Amelanchier botryapium* (L. f.) DC. Swamp Juneberry. A shrub or small tree growing in swamps and moist soil. N. B. to Man., Fla., La., and Ohio.

3. *Amelanchier rotundifolia* (Mx.) Roem. Roundleaf Juneberry. A tall shrub or small tree growing in woods and thickets. N. B. to Minn., N. Y., Ohio and Mich.

41. *Crataëgus* L. Hawthorn.

Small trees or shrubs usually with typical, sometimes branched thorns. Pome drupe-like with bony ripe carpels. Only the common tree-forms are here included.

1. Corymbs many flowered. 2.
1. Corymbs 1-7 flowered; calyx-lobes deeply incised; leaves obovate or spatulate, obtuse. *C. uniflora*.

2. Leaves obovate, spatulate, oblanceolate, or flabellate. 3.
2. Leaves ovate, oval, orbicular-obovate, or nearly orbicular. 5.
3. Leaves, calyx, and peduncles glabrous; oblanceolate or obovate, sharply serrate. 4.
3. Lower surface of leaves, calyx, and peduncles more or less pubescent, at least when young; leaves slender-petioled, obovate, dull, irregularly serrate; fruit large, red or yellow, globose or oval. *C. punctata*.
4. Thorns long, slender; leaves shining; fruit globose or slightly pear-shaped, dark red. *C. crus-galli*.
4. Thorns short, stout, leaves dull; fruit globose, purple-black. *C. brevispina*.
5. Leaves, calyx, and peduncles glabrous or nearly so. 6.
5. Lower surface of leaves or their teeth, calyx, and peduncles pubescent or glandular. 9.
6. Leaves mainly truncate or cordate at the base. 7.
6. Leaves narrowed or wedge-shaped at the base. 8.
7. Leaves lobed; fruit depressed-globose, $\frac{1}{4}$ in. or less high, bright red. *C. cordata*.
7. Leaves irregularly serrate; fruit glaucous, sub-globose, $\frac{1}{2}$ in. high. *C. eggerti*.
8. Leaves deeply cleft; fruit globose or globose-ovoid, small, coral-red. *C. oxyacantha*.
8. Leaves serrate or somewhat lobed; fruit globose or oval, persistent into the winter. *C. viridis*.
9. Leaves glabrous or nearly so. 10.
9. Leaves pubescent, especially along the veins beneath. 12.
10. Leaves or most of them truncate or cordate at the base, sharply incised and serrate; fruit globose or oval, red. *C. coccinea*.
10. Leaves or most of them narrowed at the base. 11.
11. Fruit about $\frac{1}{2}$ in. in diameter, globose to oval, red; bractlets and calyx very glandular. *C. rotundifolia*.
11. Fruit about $\frac{1}{4}$ in. in diameter, globose or oval; bractlets and calyx glandular. *C. macrantha*.
12. Leaves mostly truncate or cordate at the base, ovate-orbicular; fruit bright red, hairy. *C. mollis*.
12. Leaves mostly cuneate or narrowed at the base, ovate or oval, sharply dentate or somewhat lobed; fruit oval or oblong, large, crimson or orange-red, eatable. *C. tomentosa*.

1. **Crataegus crus-galli** L. Cockspur Hawthorn. A small tree with spreading branches and numerous slender thorns. Leaves coriaceous, shining above, sharply serrate. Fruit remain-

ing on the branches until late in the winter. The best hawthorn for hedges. Quebec to Manitoba, N. H., Fla., Tex., and Ohio.

2. **Crataegus brevispina** (Dougl.) Farw. Black Hawthorn. A small tree. Leaves obovate, unequally serrate or somewhat lobed, cuneate or narrowed at the base. Mich., to Br. Col., Colo., and Ore.

3. **Crataegus punctata** Jacq. Dotted Hawthorn. A shrub or small tree with horizontal wide-spreading branches. Leaves obovate, slender-petioled, irregularly serrate or serrulate. Fruit somewhat edible. Quebec and Ont., to N. H., Ga. and Iowa. Ohio.

4. **Crataegus cordata** (Mill.) Ait. Washington Hawthorn. A tree with slender thorns. Leaves broadly ovate, generally sharply 3-7-lobed and serrate. A very desirable species for cultivation. Va. to Ga., Ill., and Tenn. Also from N. J. to Ohio.

5. **Crataegus éggerti** Britt. Eggert Hawthorn. A small tree growing in dry soil. Leaves ovate-orbicular, dull green above, pale beneath, sharply and irregularly serrate or somewhat lobed. Iowa to Mo. and Kan.

6. **Crataegus oxyacantha** L. English Hawthorn. A shrub or small tree with numerous stout thorns. Leaves broadly ovate or slightly obovate, sharply 3-7-lobed. Sparingly escaped from cultivation. Ohio.

7. **Crataegus viridis** L. Green Hawthorn. A small tree often without thorns. Fruit persisting into the winter. Leaves ovate to lanceolate or somewhat obovate, sharply serrate, and somewhat lobed. Mo. and Kan. to Tex., S. Car., and Fla.

8. **Crataegus coccinea** L. Scarlet Hawthorn. A shrub or small low tree with crooked spreading branches and short stout thorns. Leaves broadly ovate or orbicular, sharply incised and serrate, teeth gland-tipped. Fruit somewhat edible. Of considerable decorative value. Petioles with glands. Newf. to Man., Fla., Tex., and Ohio.

9. **Crataegus rotundifolia** (Ehrh.) Borck. Glandular Hawthorn. A shrub or small tree, the petioles with glands. Leaves oval, ovate, obovate, or nearly orbicular, incised-serrate

with gland-tipped teeth, or sometimes lobed. Conn. to Ind., Fla., Ala., and Ohio.

10. *Crataegus macracántha* Lodd. Longspine Hawthorn. A shrub or small tree with bright brown thorns, the petioles glandular. Leaves sharply and often doubly serrate with gland-tipped teeth. Quebec to N. Dak., Va., Mo., and Ohio.

11. *Crataegus móllis* (T. & G.) Scheele. Downy Hawthorn. A small tree with short stout thorns and with densely pubescent twigs. Leaves usually broadly ovate, incised and sharply serrate with gland-tipped teeth. One of the best hawthorns. Quebec to Mich., Neb., Kan., Penn., La., Tex., and Ohio.

12. *Crataegus tomentôsa* L. Pear Hawthorn. A small thickly branching tree with stout thorns and tomentose twigs. Leaves broadly oval or ovate-oval, sharply dentate or somewhat lobed. Ont. to N. J., Ga., Ohio, Mich., and Mo.

13. *Crataegus uniflôra* Muench. Dwarf Hawthorn. A shrub or small tree, the branches with numerous slender thorns. Leaves coriaceous, nearly sessile, crenate at the apex and entire at the base. In sandy soil. N. Y. to Fla., W. Va., Mo., and La.

Drupatae. Plum Subfamily.

42. *Prûnus* L.: Plum, Apricot, Cherry.

Trees or shrubs, the fruit a drupe, mostly edible. Leaves alternate, simple, with glands on the petioles or at the base of the blade; some of the leaves often without glands. Terminal bud sometimes self-pruned, and in some species also twigs of various sizes.

1. Flowers in lateral umbellate clusters or somewhat corymbose, expanding with or before the leaves; stone flattened or globular; terminal bud of twigs absent or present. 2.

1. Flowers in racemes, terminating twigs of the season; stone globular; terminal bud of twigs present. 9.

1. Flowers corymbose, terminating twigs of the season; leaves ovate, abruptly acute at the apex, rounded or slightly cordate at the base; fruit small, stone slightly flattened; terminal bud of twigs present. *P. mahaleb.*

1. Flowers solitary or in twos, appearing before the leaves; fruit velvety, stone compressed; leaves ovate to round-ovate, abruptly pointed; terminal bud of twigs absent. *P. armeniaca*.
2. Leaves mostly convolute in vernation; fruit usually large; stone more or less flattened; terminal bud of twigs absent. 3.
2. Leaves conduplicate in vernation; fruit mostly small; stone mostly globose; terminal bud of twigs present. 8.
3. Leaves abruptly acuminate; drupe red or yellowish. 4.
3. Leaves obtuse, acute, or gradually acuminate; drupe red or purple. 6.
4. Calyx lobes entire, pubescent within; drupe globose; leaves ovate or obovate. *P. americana*.
4. Calyx lobes glandular-serrate; drupe subglobose or oval. 5.
5. Calyx lobes glabrous within; leaves oval or obovate. *P. nigra*.
5. Calyx lobes pubescent on both sides; leaves ovate-lanceolate. *P. hortulana*.
6. Leaves glabrous when mature, acute or acuminate. 7.
6. Leaves pubescent beneath, not pointed, ovate or obovate. *P. domestica*.
7. Leaves lanceolate; drupe red, thin-skinned, with little or no bloom. *P. angustifolia*.
7. Leaves ovate; drupe dark purple with a bloom. *P. alleghaniensis*.
8. Leaves glabrous; inflorescence umbellate; drupe with thick flesh, sour. *P. cerasus*.
8. Leaves glabrous, shining; inflorescence more or less corymbose; drupe with thin sour flesh. *P. pennsylvanica*.
8. Leaves pubescent beneath at least on the veins; inflorescence umbellate; fruit sweet. *P. avium*.
9. Fruit red or purple, astringent; leaves obovate or oval, abruptly acute or acuminate, thin; glands on the petiole usually rounded or disc-like; bark gray. *P. virginiana*.
9. Fruit dark-purple or black, sweet; leaves oval or obovate, acute or obtusish, thick; otherwise much like the preceding. *P. demissa*.
9. Fruit dark-purple or black, sweet; leaves oval-lanceolate to ovate, acuminate or acute; glands on the petiole usually elongated and tooth-like; bark black. *P. serotina*.

Plums and Apricot.

*. *Prunus armeniaca* L. Apricot. A small round-topped tree with reddish bark. Drupe nearly smooth, short stalked, yellow, edible. Cultivated.

1. *Prunus americana* Marsh. Wild Plum. A shrub or small tree with stunted thorn-like branches and thick black bark.

Leaves ovate, or obovate sharply and often doubly serrate, rounded at the base, slender-petioled. Drupe with a tough skin, globose, red or yellowish, edible. Often used as a stock on which to graft domestic plums. Wood hard, reddish in color. N. Y. to Mont., Fla., Colo., and Ohio.

2. *Prunus nigra* Ait. Canada Plum. A tree with thin bark. Leaves oval, ovate, or obovate, long-acuminate, crenulate-serrate; drupe oval, orange-red, thick-skinned, with little or no bloom. Petals pink in age. Newf. to Man., Mass. and Wis.

3. *Prunus hortulana* Bail. Wild-goose Plum. A small tree with spreading branches and thin bark. Leaves ovate-lanceolate to ovate, long-acuminate, closely glandular-serrate. Drupe bright red and thin-skinned, edible. Ill. to Kan., Tenn., and Tex.

4. *Prunus angustifolia* Marsh. Chickasaw Plum. A small tree with thorn-like stunted branches. Leaves acute, serrulate, often rounded at the base. Drupe globose, red, and edible. In dry soil. N. J. to Fla., west to Rocky Mts.

5. *Prunus domestica* L. Common Garden Plum. A small tree with about 100 cultivated varieties. Drupe of various colors, covered with a thick glaucous bloom.

6. *Prunus alleghaniensis* Port. Alleghany Plum. A low shrub or small tree, seldom thorny. Leaves acute or acuminate, finely serrate, rounded at the base. Drupe pleasantly acid, globose-ovoid, with a conspicuous bloom. Penn.

Cherries.

6. *Prunus cérasus* L. Sour Cherry. A small tree with globose, red or reddish-black, sour, edible drupes. Leaves ovate or ovate-lanceolate, abruptly acute or acuminate, rounded at the base, very resinous when young. Self-prunes the fruiting branchlets. Native of Europe. N. H. and Mass. to N. Y. and Ohio.

7. *Prunus àvium* L. Sweet Cherry. A medium-sized tree with globose, black or dark red, sweet, edible drupes. Leaves ovate, oval, or slightly obovate, abruptly short-acuminate, irregularly serrate. Native of Europe. Ont. to Mass., Ohio and Va.

8. *Prunus pennsylvanica* L. f. Red Cherry. A small tree with sour globose, red drupes. Leaves oval or lanceolate,

acute or acuminate, mainly rounded at the base, glabrous, serrulate. Leaves poisonous; kernels probably poisonous. In rocky woods. Newf. to Ga., west to Rocky Mts. Ohio.

9. **Prunus mahaleb** L. Mahaleb Cherry. A small tree with pale smooth bark. Leaves ovate, abruptly acute at the apex, rounded or slightly cordate at the base, denticulate, glabrous, fragrant. Drupes with thin flesh and slightly flattened stone. From Europe. Conn. to Ont., N. Y., to Ohio and Kan.

10. **Prunus virginiana** L. Choke Cherry. A shrub or small tree with gray bark. Leaves obovate or broadly oval, abruptly acute or acuminate at the apex, rounded at the base, serrulate with slender teeth, glabrous or nearly so. Drupe red to nearly black, sometimes yellow, very astringent, not edible. Leaves poisonous; kernels probably poisonous. Self-prunes leafy fruiting branches. Along river banks and in rocky places. Newf. to Man., Br. Col., Ga., Neb., Tex., Colo., and Ohio.

11. **Prunus demissa** (Nutt.) Walp. Western Choke Cherry. A shrub or small tree; drupe dark purple or black, globose, sweet or somewhat astringent. Leaves similar to those of the preceding, thicker, acute or often obtusish at the apex, with shorter teeth. Probably poisonous like the last. On bluffs, and dry ground. N. Dak. to Kan., N. Mex., Br. Col., and Cal.

12. **Prunus serotina** Ehrh. Black Cherry. A large tree with rough, black, flaky bark; drupe globose, dark-purple or black, sweet but slightly astringent. Leaves oval, oval-lanceolate, or ovate, acuminate or acute, serrate with appressed teeth. Leaves very poisonous to cattle, especially when half-wilted. Kernels very poisonous. Wood rather heavy, hard, strong, of fine texture, of a brown or reddish color; much used in cabinet-work and interior finish, especially in cars and boats, also used in turnery. Self-prunes twigs by means of cleavage planes in basal joints. Ont. to Fla., N. Dak., Kan., Tex., and Ohio.

43. **Amygdalus** L. Peach.

Trees or shrubs. Drupe in our species velvety with a deeply pitted stone.

1. **Amygdalus persica** L. Peach. A small tree with

beautiful pink or white flowers and a large edible drupe. Leaves with prominent nectar glands on the petiole or at the base of the blade. Leaves and kernels bitter, poisonous. Native of Asia; abundantly escaped. Ohio.

Fabaceae. Pea Family.

Cassiatae. Senna Subfamily.

44. *Cercis* L. Redbud.

Small trees or shrubs with simple, palmately veined, 2-ranked leaves. Fruit a flat bean.

1. *Cercis canadensis* L. Redbud. A small tree with bright red-purple flowers before the leaves; fine for ornamental purposes. Wood hard and heavy, beautifully variegated. In rich soil. Easily cultivated. Ont. to Minn., Neb., N. J., Fla., Tex., and Ohio.

45. *Gleditsia* L. Honey-locust.

Large usually thorny trees with evenly once or twice pinnate leaves and superposed buds. Fruit a bean.

1. Pod linear-oblong, many seeded, pulpy within; leaflets short stalked, oblong-lanceolate or oval, obtuse at both ends, inequilateral at the base. *G. triacanthos*.

1. Pod obliquely oval, 1-seeded, not pulpy; leaflets thicker, darker green, usually larger, ovate-lanceolate or lanceolate, the margin more crenulate. *G. aquatica*.

1. *Gleditsia triacanthos* L. Honey-locust. A large tree of rapid growth, usually with stout branching or simple thorns and with rough bark. Used as a hedge plant. Autumn leaves pure yellow. Wood heavy, hard, strong, and tough; used for fencing, fuel and wagon hubs. Sprouts freely from the roots if disturbed by plowing. Grows well in dry or sandy soil. Ont. to S. Dak., Ohio, Ga., Kan., and Tex.

2. *Gleditsia aquatica* Marsh. Water Honey-locust. A tree growing in swamps. Ind. to Mo., S. Car., Fla., and La.

46. *Gymnócladus* Lam. Coffee-bean.

Trees with large evenly bipinnate leaves, superposed buds sunken in the epidermis, and large chocolate-colored pith. Fruit a woody bean.

1. *Gymnocladus dioica* (L.) Koch. Coffee-bean. A large, slow-growing tree with rough bark and few branches. Bean short and thick, the greenish pulp within poisonous. The bruised leaves are used as a fly poison, and the seeds have been used as a substitute for coffee. Wood compact, heavy, hard, strong, tough, reddish in color, of coarse texture, and taking a good polish; used to some extent in cabinet-work. In rich soil. Ont to Ohio and Penn., Tenn., S. Dak., and Okl.

Papilionatae. Pea Subfamily.

47. *Cladrástis* Raf. Yellow-wood.

Trees with odd pinnate leaves and showy, fragrant, white flowers. Axillary buds superposed, covered by the base of the petiole. Fruit a slender bean.

1. *Cladrastis lûtea* (Mx.) Koch. American Yellow-wood. Trees with smooth bark, close like in the beech. Wood light-yellow. In rich soil; much planted. Ky., Mo., Tenn., and N. Car.

48. *Robinia* L. Locust.

Trees or shrubs with odd-pinnate leaves and usually with spiny stipules. Fruit a bean.

1. Twigs, petioles and pods glabrous or nearly so; flowers white. *P. pseudacacia*.
1. Twigs and petioles glandular; pods hispid; flowers pinkish. *P. viscosa*.

1. *Robinia pseudacacia* L. Common Locust. A large slender tree with very rough bark, of rapid growth. Wood very heavy, hard, strong, tough, valuable, and very durable in contact with the ground; used for posts, railroad ties, wagon hubs, furniture, and in ship building. All parts of the plant very poisonous.

It is troublesome from sprouting from the roots. Penn. and Ohio to Ga., Iowa, Kan., and Okl.

2. **Robinia viscòsa** Vent. Clammy Locust. A small tree with rough bark. Underground parts somewhat poisonous. Va. to Ga. Also escaped in Middle and Eastern States. Ohio.

Order, GERANIALES.

Rutaceae. Rue Family.

49. **Xanthóxylum** L. Prickly-ash.

Trees or shrubs with punctate, odd-pinnate leaves and usually with stipular spines. Capsule with 1-2 seeds.

1. **Xanthoxylum americanum** Mill. Prickly-ash. A prickly shrub or small tree with small flowers in sessile axillary cymes. Quebec to Va., S. Dak., Neb., Kan., and Ohio.

50. **Ptèlea** L. Hoptree.

Shrubs or small trees with bitter bark. Fruit a samara with a membranous wing.

1. **Ptelea trifoliàta** L. Hoptree. A shrub or small tree with sunken superposed axillary buds covered by the petiole base. Bark and flowers with a disagreeable odor. Conn. to Fla., Ont., Minn., Kan., Tex., and Ohio.

Simarubaceae. Ailanthus Family.

51. **Ailánthus** Desf. Ailanthus.

Large trees with odd-pinnate leaves; branches robust with large brown pith. Samara linear or oblong, usually twisted.

1. **Ailanthus glandulòsa** Desf. Tree-of-heaven. A large tree of rapid growth with thick branches and smooth bark. Leaves ill-scented; leaflets with green glands under the lobes or teeth. Autumn leaves pure yellow. Wood hard and useful. Sprouts freely from the roots and is easily propagated from root cuttings. A pest in pastures in some states; cows will not eat grass near the young shoots. Water contaminated by the leaves is poisonous. Naturalized from China. Ont. to Mass., Va., Kan., and Ohio.

Order, SAPINDALES.

Anacardiaceae. Sumac Family.

52. *Rhús* L. Sumac.

Small trees, shrubs, or climbing vines with acrid resinous or milky sap. Fruit a small, red or gray drupe, in panicles.

1. Petioles not completely covering the axillary buds; leaflets entire. 2.
1. Petioles covering the axillary buds; leaflets serrate. 3.
2. Rachis of the leaf wing-margined; leaflets 7-31; twigs and the red drupes pubescent. *R. copallina*.
2. Rachis not winged; leaflets 7-13; poisonous to the touch; twigs and the gray drupes glabrous. *R. vernix*.
3. Leaves and twigs velvety-pubescent. *R. hirta*.
3. Leaves and twigs glabrous, somewhat glaucous. *R. glabra*.

1. *Rhus copallina* L. Dwarf sumac. A shrub or small tree with a dense terminal panicle of small globose, crimson drupes, covered with short acid hairs. Leaves used for tanning purposes. In dry soil. Me. and Ont. to Fla., Minn., Neb., Tex., and Ohio.

2. *Rhus hirta* (L.) Sudw. Staghorn Sumac. A small tree or shrub with red, pubescent drupes. Wood very soft and brittle. In dry or rocky soil. A good lemonade or "sumacade" is made by steeping the drupes and sweetening to taste. Leaves used for tanning. N. S. to Ga., Ont., S. Dak., Mo., Miss., and Ohio.

3. *Rhus glabra* L. Smooth Sumac. A shrub or small tree with dense panicles of small crimson drupes covered with short acid hairs. Noted for its beautiful, brilliant, red-colored leaves in autumn. Leaves used for tanning. Common on hill-sides and bluffs. N. S. to Br. Col., Fla., Miss, Ariz., and Ohio.

4. *Rhus vérnix* L. Poison Sumac. A shrub or small tree, very poisonous to the touch. Drupes gray, glabrous, in loose axillary panicles. In swamps and wet places. N. S. to Fla., Minn., Neb., Ark., and Ohio.

53. *Cótinus* Adans. Smoketree.

Shrubs or small trees with resinous sap, with buds clustered at the tips of the twigs. Drupes compressed, gibbous.

1. Blade of the leaf slightly decurrent on the petiole, thin, glabrous or slightly pubescent beneath. *C. cotinoides*.
1. Leaves mostly rounded or obtuse at the base, coriaceous, more pubescent. *C. cotinus*.

1. **Cotinus cotinoides** (Nutt.) Britt. American Smoke-tree. A small wide-branched tree. Mo. and Okl. to Tenn. and Ala.

Cotinus còtinus (L.) European Smoketree. A small tree, native of Europe.

Ilicaceae. Holly Family.

54. **Ilex** L. Holly.

Shrubs or trees with watery sap, and alternate simple leaves. Drupe berry-like, with 4-8 long nutlet-like stones.

1. Leaves thick, persistent, evergreen, spiny. *I. opaca*.
1. Leaves thin, deciduous, not spiny. 2.
2. Leaves small, obovate or spatulate, crenate: nutlets of the fruit ribbed. *I. decidua*.
2. Leaves large, ovate or lanceolate, sharply serrate, nutlets ribbed. *I. monticola*.

1. **Ilex opàca** Ait. American Holly. A tree of slow growth with thick, glabrous, evergreen leaves and globose red or rarely yellow drupes. Twigs with leaves and fruit much used for Christmas decoration. Wood very white, fine-grained, hard, strong, tough, light in weight, and easily worked; used for cabinet-work and in turnery. Bird-lime is prepared from the middle bark. In moist soil. Should be much planted for ornament in suitable places. The leaves should be cut off when transplanted. Me. to Fla., Penn., Mo., Tex., and Ohio.

2. **Ilex decidua** Walt. Deciduous Holly. A shrub or small tree with light-gray, glabrous twigs and red drupes. In swamps and low ground. D. C. to Fla., Kan., and Tex.

3. **Ilex monticola** Gr. Mountain Holly. A shrub or slender, erect tree growing in mountain woods. Drupes red. N. Y. to N. Car. and Ala.

Celastraceae. Stafftree Family.

55. **Euonymus** L. Wahoo.

Shrubs or small trees with opposite leaves and 3-5-locular capsules. Seeds enclosed in a red aril.

1. Flowers purple; cymes 6-15-flowered; winter buds long-pointed with long bud scales. *E. atropurpureus*.
1. Flowers greenish yellow; cymes 3-7-flowered; winter buds very short pointed with short bud scales. *E. europæus*.

1. **Euonymus atropurpureus** Jacq. Wahoo. A high shrub or small tree with green, obtusely 4-angled twigs. Leaves dark red and fruit very ornamental in autumn. Self-prunes small twigs by basal joints. Ont. to Fla., Mont., Okl., and Ohio.

2. **Euonymus europæus** L. Spindletree. A shrub or small tree resembling the preceding. Self-prunes twigs. Cultivated from Europe. Escaped. N. H., N. Y., and N. J.

Staphyleaceae. Bladdernut Family.

56. **Staphylèa** L. Bladdernut.

Shrubs sometimes tree-like with opposite compound leaves and bladdery capsules.

1. **Staphylea trifolia** L. American Bladdernut. A shrub or rarely small tree with smooth striped bark. In moist soil. Quebec to Minn., S. Car., Kan., and Ohio.

Aceraceae. Maple Family.

57. **Acer** L. Maple.

Trees or shrubs with opposite leaves and with watery often saccharine, or sometimes milky sap. Fruit a 2-winged samara.

1. Leaves pinnate or trifoliate; twigs green, glaucous. *A. negundo*.
1. Leaves simple. 2.
2. Leaves with very large teeth or lobes, the divisions not serrate or serrate-dentate. 3.
2. Leaves with the large divisions or lobes serrate or serrate-dentate. 5.
3. Leaves with stipules which are often large and foliaceous; leaves green and pubescent beneath at least on the veins; flowers corymbose, unfolding with the leaves; wings of fruit diverging a little less than a right angle. *A. nigrum*.

3. Leaves without stipules. 4.
4. Leaves with much milky sap in the petiole, glabrous, dark green above, lighter below, usually with 7 prominent palmate veins; flowers corymbose, unfolding with the leaves; wings of the fruit diverging nearly in a straight line; petals present; winter buds rounded. *A. platanoides*.
4. Leaves with watery or frothy sap, pale and nearly glabrous beneath, usually with 5 prominent palmate veins; flowers corymbose, unfolding with the leaves; wings of the fruit diverging a little less than a right angle; petals none; winter buds pointed. *A. saccharum*.
5. Leaves very sharply and finely serrate, 3-lobed at the outer end, widest above the middle, the lobes abruptly narrow-acuminate, brown pubescent below when young; twigs green, striped with darker lines; flowers racemed, terminal, unfolding after the leaves. *A. pennsylvanicum*.
5. Leaves dentate-serrate or lobed, not abruptly narrow-acuminate; twigs not striped. 6.
6. Leaves broadly 3-5-lobed, the lobes rather regularly and continuously dentate-serrate or dentate-crenate; flowers racemed, terminal, unfolding after the leaves. 7.
6. Leaves usually with 3-7 slender, long and pointed lobes, the lobes irregularly or interruptedly serrate or serrate-dentate; flowers in dense sessile lateral clusters, appearing before the leaves. 8.
7. Leaves longer than wide, slightly 3-lobed at the outer end, usually only very slightly lobed at the lower end, not glaucous below; bark of twigs green or grayish; racemes erect; a shrub, rarely a small tree. *A. spicatum*.
7. Leaves as broad or broader than long, prominently 5-lobed, glabrous and dark green above, pubescent and light glaucous below, on long reddish petioles; bark of twigs reddish-brown; racemes drooping; wings of fruit pubescent, moderately spreading; a large tree. *A. pseudo-platanus*.
8. Leaves usually deeply 5-lobed, lobes slender, acute, white and glaucous beneath; notches between the lobes often somewhat rounded; fruiting pedicel short and stiff, 1-2 in. long; wings divergent; petals none. *A. saccharinum*.
8. Leaves sharply 3-5-lobed, whitish glaucous beneath, notches acute; fruiting pedicel long, slender and drooping, 2-4 in. long; wings incurved; petals present. *A. rubrum*.

1. **Acer saccharinum** L. Silver Maple. A large tree with flaky bark, the twigs often reddish, self-pruned by basal joints. Leaves deeply 5-lobed, the lobes rather narrow, acumi-

nate, coarsely and irregularly dentate, truncate or slightly cordate at the base, green above, silvery white and more or less pubescent beneath. A fine shade tree and much planted. Wood soft and white; used for furniture. Yields a small amount of sugar. Along streams. N. B. to Fla., Ont., N. Dak., Neb., Okl., and Ohio.

2. **Acer rùbrum** L. Red Maple. A tree with flaky or smoothish bark and reddish twigs. Leaves sharply 3-5-lobed, the lobes irregularly dentate, acute or acuminate, cordate at the base, green above, whitish beneath. Wood of considerable value when it shows a "curly grain." Leaves crimson, scarlet or yellow in autumn. Self-pruning like the preceding. In swamps and low ground, also on moist hillsides. N. B. to Man., Fla., Tex., and Ohio.

3. **Acer sáccharum** Marsh. Sugar Maple. A large tree with yellow or sometimes red leaves in autumn. Leaves cordate or truncate at the base, 3-7-lobed, the lobes acuminate, irregularly sinuate, dark green above, pale and nearly glabrous beneath. Its sap is the main source of maple sugar and syrup. An average tree will yield 2-10 lbs. of sugar a season. A fine shade tree. The ashes give large quantities of potash. Wood heavy, hard, strong and tough; used for fuel, interior finish, furniture, keels of boats and ships, implements and machinery, sucker rods, shoe pegs, piano action, school apparatus, large wood type, tool and broom handles, and wood carving. Newf. to Man., south to Fla. Tex., and Ohio.

4. **Acer nigrum** Mx. Black Maple. A large fine tree with rough blackish bark. Leaves cordate or truncate at the base, 3-7-lobed, the lobes broad and short, green on both sides, generally more or less pubescent beneath. It is equally valuable for the making of sugar. Wood much the same as in the Sugar Maple, and used for the same purposes. Ont. and Vt. to Ga., Minn., La., Ark., and Ohio.

5. **Acer pennsylvánicum** L. Striped Maple. A small tree with smoothish green bark striped with darker lines. Leaves broadest above the middle, thin, glabrous above slightly pubescent beneath when young, truncate or somewhat cordate at the base.

3-lobed near the apex. Wood white and soft. In rocky soil. N. S. to Lake Superior, and along the mountains to Ga. and Tenn.

6. **Acer spicatum** Lam. Mountain Maple. A shrub or small tree, the bark green but not striped. Leaves 3-5-lobed, the lobes acute or acuminate, glabrous above, pubescent beneath at least when young. In damp rocky woods. Newf. to Man., south to N. Car., Tenn., Minn., and Ohio.

7. *Acer platanoides* L. Norway Maple. A medium-sized tree with a broad rounded crown, with brown twigs and milky sap. Leaves sharply 5-7-lobed, very dark green above. Much cultivated.

8. *Acer pseudo-platanus* L. Sycamore Maple. A fine tree with spreading branches. Leaves deeply 3-5-lobed. Self-prunes. Much cultivated.

9. **Acer negundo** L. Boxelder. A small tree with spreading branches and glabrous, sometimes pubescent, green and glaucous twigs. Leaves 3-7 foliate, leaflets ovate or oval. The sap produces a slight amount of sugar. Wood light and of slight value. Along streams. Planted on the prairies for small groves and wind breaks. Vt. to Man., Fla., Kan., N. Mex., and Ohio.

Hippocastanaceae. Buckeye Family.

58. **Aësculus** L. Buckeye, Horse-chestnut.

Trees or shrubs with opposite digitate leaves, and leathery capsules containing large shining nut-like seeds.

1. Flowers white, mottled with yellow and purple; leaflets abruptly acuminate; winter buds gummy; capsule spiny; bundle scars arranged in a curved line. *AE. hippocastanum*.
1. Flowers yellow or purplish; leaflets acuminate, more or less abrupt; winter buds not gummy; bundle scars arranged in 3 areas. 2.
2. Capsule spiny, stamens exerted. 3.
2. Capsule glabrous; stamens not longer than the petals, corolla yellow or purplish. *AE. octandra*.
3. Leaflets acuminate, finely serrate, 5-7; a tree. *AE. glabra*.
3. Leaflets long-acuminate, unequally serrate, 7-9; a shrub-like small tree. *AE. arguta*.

1. **Aesculus hippocástanum** L. Horse-chestnut. A large tree with very resinous, gummy winter buds. Autumn leaves orange. The seeds are poisonous and symptoms of poisoning have been produced from eating the green rind. The twigs contain Aesculin which is fluorescent in aqueous solution. Escaped from cultivation; native of Asia.

2. **Aesculus glàbra** Willd. Ohio Buckeye. A large tree with rough and fetid bark. Leaves, young shoots, and seeds poisonous to cattle. Wood light and hard to split; used for making artificial limbs, wooden-ware, and paper pulp. Penn. to Ala., Mich., Neb., Okl., and Ohio.

3. **Aesculus argùta** Buckl. Western Buckeye. A shrub-like small tree with smooth bark. On flood plains. Kan. to Tex.

4. **Aesculus octándra** Marsh. Yellow Buckeye. A large tree with brown scaly bark. Seeds poisonous. Wood light and hard to split; used for making artificial limbs, wooden-ware, and paper pulp. **Aesculus octandra hybrida** (DC.) Sarg. has purplish or pink flowers, leaflets pubescent beneath, and light brown bark. Penn. to Ga., Iowa and Tex., Ohio.

Sapindaceae. Soapberry Family.

59. **Sapindus** L. Soapberry.

Trees or shrubs with alternate, odd-pinnate leaves. Fruit a berry.

1. **Sapindus drúmmondi** H. & A. Drummond Soapberry. A tree with white flowers in dense terminal panicles and very saponaceous, globose berries. Kan. and La. to Ariz.

Order, RHAMNALES.

Rhamnaceae. Buckthorn Family.

60. **Rhámnus** L. Buckthorn.

Shrubs or small trees, sometimes with thorns, with berry-like drupes, containing 2-4 nutlet-like stones.

1. Leaves with 3 or 4 pairs of lateral veins, the basal pair prominent; nutlets of the fruit grooved; flowers dioecious or imperfectly monosporangiate. *R. cathartica*.

1. Leaves acute, with 6-10 pairs of lateral veins; nutlets smooth; umbels peduncled; flowers bisporangiate. *R. caroliniana*.

1. **Rhamnus cathartica** L. Common Buckthorn. A shrub or small tree with black injurious fruit. Somewhat thorny and used for hedges. Introduced from Europe. Eastern states.

2. **Rhamnus caroliniana** Walt. Carolina Buckthorn. A tall thornless shrub or small tree with a globose sweet drupe. In wet soil. Va. and Ohio to Kan., Fla., and Tex.

Order, MALVALES.

Tiliaceae. Linden Family.

61. **Tilia** L. Linden.

Trees with 2-ranked inequilateral, serrate leaves, the dry drupaceous fruit in cymose clusters, the peduncle subtended by a broad membranous bract.

1. Petals with scales at the base. 2.
1. Petals without scales at the base; leaves glabrous or nearly so; cultivated. *T. europaea*.
2. Leaves glabrous or nearly so on both sides. *T. americana*.
2. Leaves glabrous above, pubescent beneath. *T. pubescens*.
2. Leaves glabrous above, silvery-white beneath. *T. heterophylla*.

1. **Tilia americana** L. American Linden. A large, straight-trunked tree with spreading branches. Inner bark very tough; used for mats and coarse rope. Wood soft and very white, light and uniform in texture, not liable to crack; called "basswood;" used for wooden-ware, cabinet-work, trunks, panelling of carriages, in cooperage, and for toys. The bark and wood of the other lindens are much the same. In rich soil, on bluffs, and along river bottoms. N. B. to Ga., Manitoba, Kan., Tex., and Ohio.

2. **Tilia pubescens** Ait. Downy Linden. A small tree growing in moist soil, mostly along the coast. L. I. to Fla., west to Tex.

3. **Tilia heterophylla** Vent. White Linden. A tree with larger leaves than either of the preceding species. N. Y. to Fla., Ala., Ill., Ky., Tenn., and Ohio.

*. *Tilia europaëa* L. European Linden. A large tree much cultivated in parks. Its name, Lin, was the origin of the family name of Linnaeus.

Subclass, HETEROMERAE.

Order, ERICALES.

Ericaceae. Heath Family.

62. *Rhododéndron* L. Rhododendron.

Shrubs or low trees with alternate persistent, coriaceous leaves; usually with a woody capsule and numerous seeds.

1. *Rhododendron máximum* L. Great Rhododendron. A tall shrub or small tree with beautiful flowers and striking evergreen leaves. Leaves poisonous to stock and the nectar said to produce poisonous honey. On rocky hillsides and along streams. Occasionally cultivated. N. S. to Ont., Ohio, and Ga.

63. *Kálmia* L. Kalmia.

Erect shrubs or small trees with evergreen coriaceous leaves. Fruit a capsule.

1. *Kalmia latifòlia* L. Mountain Kalmia. A shrub or small tree with evergreen leaves. All parts of the plant poisonous to cattle, sheep, and other animals. The honey from the flowers is said to be poisonous; also the flesh of game that has fed upon the leaves or fruit. In woods and on rocky hillsides. Occasionally planted. N. B. to Ont., Ohio, Fla., and La.

64. *Oxydéndrum* DC. Sorrel-tree.

A tree with alternate sour leaves and numerous white flowers in terminal paniced racemes. Fruit a capsule.

1. *Oxydendrum arbòreum* (L.) DC. Sorrel-tree. A small tree with smooth bark and brilliantly red-colored leaves in autumn. Wood hard and close-grained; used for handles of tools, bearings of machinery, etc. On hillsides. Ohio and Penn to Va., Fla., and Miss.

Order, EBENALES.

Sapotaceae. Sapodilla Family.

65. **Bumèlia** Sw. *Bumelia*.

Shrubs or trees with milky sap, usually with thorns, and with very hard wood. Fruit a fleshy berry with a single seed.

1. Leaves glabrous or nearly so; oblanceolate to oblong-ovate, 2-5 in. long. *B. lycioides*.
1. Leaves tomentose or silky, oblong-obovate to cuneate-obovate, usually obtuse, 1-3 in. long. *B. lanuginosa*.

1. **Bumelia lycioides** (L.) Pers. Buckthorn *Bumelia*. A shrub or small tree usually with thorns and thorn-like spurs and with gray bark. Leaves tardily deciduous. In moist soil. Va. to Ill., Mo., Fla., and Tex.

2. **Bumelia lanuginosa** (Mx.) Pers. Woolly *Bumelia*. A shrub or rather large tree with persistent leaves. Ill., to Kan., Tex., Ga., and Fla.

Ebenaceae. Ebony Family.

66. **Diospyros** L. Persimmon.

Trees or shrubs with very hard wood, the fruit a berry.

1. **Diospyros virginiana** L. Persimmon. A handsome tree with hard, dark, furrowed bark. Pith often with lenticular cavities or diaphragmed. Berry large, pulpy, yellow, exceedingly astringent when green but sweet and edible after frost. Bark astringent and tonic. Wood very hard, heavy, strong, and tough. close-grained and dark-colored; used in turnery, for shuttles, plane stocks, and shoe lasts. R. I. to Ohio and Kan., Fla., and Tex.

Symplocaceae. Sweetleaf Family.

67. **Symplocos** L. Sweetleaf.

Trees or shrubs with alternate leaves, the fruit a small, mostly nearly dry drupe.

1. **Symplocos tinctoria** (L.) L'Her. Sweetleaf. A shrub or small tree, the pith diaphragmed. Flowers bright yellow, fragrant; drupe nutlike. Del. to Fla. and La.

Styracaceae. Storax Family.

68. **Mohrodéndron** Britt. Silverbell.

Small trees or shrubs, more or less stellate-pubescent, with large, white, bell-shaped flowers and 2-4-winged, dry fruit.

1. **Mohrodendron carolinum** (L.) Britt. Silverbell. A small tree with diaphragmed pith. In woods and along streams. Va. to Ill., Fla., and Ala.

Subclass, SYMPETALAE HYPOGYNAE.

Order, GENTIANALES.

Oleaceae. Olive Family.

69. **Fráxinus** L. Ash.

Trees with opposite leaves, in our species odd-pinnate. Fruit a samara.

1. Lateral leaflets sessile, 7-11; samara winged all around; calyx none. *F. nigra.*
1. Lateral leaflets more or less stalked; calyx present in the carpellate flower. 2.
2. Body of the samara terete or nearly so, the wing chiefly terminal; twigs not 4-sided. 3.
2. Body of the samara flat, the wing extending around it; twigs 4-sided, often with 4 sharp ridges especially on vigorous shoots; leaflets 7-11. *F. quadrangulata.*
3. Wing almost entirely terminal. 4.
3. Wing extending somewhat down the sides of the body of the samara; leaflets 5-9. 5.
4. Leaves and twigs glabrous or nearly so, pale below, leaflets 5-9. *F. americana.*
4. Leaves and twigs pubescent, leaflets 7-9. *F. biltmoreana.*
5. Wing of the samara spatulate. 6.
5. Wing long linear. *F. darlingtonii.*
6. Leaves, twigs, and pedicels glabrous or nearly so; leaves bright green on both sides. *F. lanceolata.*
6. Leaves, young twigs and pedicels velvety-pubescent; samara 1-2 in. long. *F. pennsylvanica.*

1. **Fraxinus americana** L. White Ash. A large tree of rapid growth, with glabrous twigs. Leaflets 5-9, ovate-lanceolate, oblong, or rarely slightly obovate, entire or denticulate,

pale and often pubescent beneath, acuminate or acute; body of the samara terete, not margined, winged only from near the summit, $\frac{1}{4}$ - $\frac{1}{2}$ the length of the wing. Autumn leaves brown, purple, and salmon. Wood tough and elastic, of very great value; widely used in the manufacture of agricultural implements, boat oars, and carriage shafts; in cabinet-work, for harness work, hoops, baskets, and clothespins. In rich soil. N. S. to Minn., Fla., Kan., Tex., and Ohio.

2. ***Fraxinus biltmoreana*** Bead. Biltmore Ash. A tree with the young twigs pubescent. Leaflets 7-9, ovate to lanceolate, acuminate, entire or obscurely denticulate, more or less pubescent beneath; body of the samara narrowly elliptic, terete; wing linear, or somewhat broadened above, 2-3 times the length of the body. Penn. and Ohio to Ga.

3. ***Fraxinus lanceolata*** Borck. Green Ash. A large tree with glabrous twigs. Leaflets 5-9, entire or denticulate, ovate or oblong-lanceolate, acuminate or acute, green on both sides; samara similar to that of the two preceding species, wing usually spatulate and decurrent on the sides of the body below the middle. Wood rather inferior in value to that of the white ash. In moist soil, on flood-plains, and on bluffs. Vt. to N. W. Terr., Fla., Ariz., and Ohio.

4. ***Fraxinus pennsylvanica*** Marsh. Red Ash. A large tree with velvety-pubescent twigs. Leaflets 5-9, ovate, ovate-lanceolate, or oblong, acuminate or acute, usually denticulate; body of the samara linear margined above by the linear or spatulate decurrent wing. In moist soil. N. B. to S. Dak., Fla., Ala., Kan., and Ohio.

5. ***Fraxinus darlingtonii*** Britt. Darlington Ash. A tree similar to *F. lanceolata* and *F. pennsylvanica*, the leaves and twigs pubescent or glabrate. Leaflets similar to the two preceding species; pubescent or glabrate; wing of the samara longer than the narrowly linear body and decurrent on it for $\frac{1}{4}$ - $\frac{1}{3}$ of its length. N. Y. and Penn.

6. ***Fraxinus quadrangulata*** Mx. Blue Ash. A large tree with 4-sided or 4-winged twigs. Leaflets 7-11, ovate, oblong, or lanceolate, acuminate, green on both sides, sharply serrate or

serrulate; samara linear-oblong or cuneate, winged all around, parallel-nerved, the body extending more than half way to the apex. The inner bark furnishes a blue dye. Wood heavy, hard and valuable; used for flooring, carriage-making, etc. Ont., Minn. and Mich. to Ala., Iowa, Ark., and Ohio.

7. **Fraxinus nigra** Marsh. Black Ash. A large tree. Leaflets 7-11 glabrous, green on both sides, sessile, oblong-lanceolate, long acuminate, sharply serrate or serrulate; samara oblong or linear-oblong, parallel-nerved, the body flat, winged all around and extending to or beyond the middle. Wood used for barrel-hoops, baskets, cabinet-work, and interior finish. In swamps and wet soil. Newf. to Manitoba, Va., Ark., and Ohio.

70. **Adèlia** Br. Adelia.

Shrubs or small trees with opposite simple leaves. Fruit a drupe; flowers fascicled or paniculate, from scaly buds.

1. **Adelia acuminàta** Mx. Adelia. A shrub or small tree usually with somewhat thorny branches. On river banks. Ill. to Ga., Mo., and Tex.

71. **Chionánthus** L. Fringetree.

Shrubs or small trees with opposite simple, entire leaves. Fruit a drupe.

1. **Chionanthus virginica** L. Fringetree. A shrub or small tree with handsome, white, fragrant flowers in drooping panicles. In moist soil. Del. and Ohio to Fla. and Tex.

Order, POLEMONIALES.

Scrophulariaceac. Figwort Family.

72. **Paulòwnia** Sieb. & Zucc. Paulownia.

A large tree with opposite, petioled leaves, the pith with cavities. Fruit an ovoid, acute capsule.

1. **Paulownia tomentòsa** (Thumb.) Baill. Paulownia. A large rapid-growing tree with violet flowers in terminal panicles. Native of Japan; escaped from cultivation.

Bignoniaceae. Trumpet-creper Family.73. *Catálpa* Scop. *Catalpa*.

Trees or shrubs with opposite or verticillate simple leaves and large white or mottled flowers in terminal panicles or corymbs. Leaves with large nectar glands in the axils of the veins on the under side. Capsule long and bean-like.

1. Young twigs glabrous or nearly so, leaf-blades downy below; flowers large, white, with 2 yellow stripes inside and spotted purplish brown. 2.
1. Young twigs and petioles with long hairs; leaf blades glabrous below or nearly so, commonly 3-lobed or angled, strong-scented; flowers small, yellow with orange stripes inside and violet spots; capsule very slender. *C. ovata*.
2. Leaves strong-scented, young petioles glabrous or nearly so; wings of seed usually narrowed at the ends; panicles many-flowered; lower corolla lobe entire; bark thin, flaky. *C. catalpa*.
2. Leaves not unpleasantly scented, young petioles usually pubescent, wings of seed usually broad, the threads parallel; panicles few-flowered; lower corolla lobe emarginate; bark thick and rough. Usually blooms a week or more earlier than *C. catalpa*. *C. speciosa*.

1. *Catalpa catálpa* (L.) Karst. Common *Catalpa*. A tree with thin flaky bark and spreading branches. Wood much less valuable than that of *C. speciosa*. The flowers are said to produce irritation of the skin. Gulf States. Escaped in the northern states as far as Ohio and N. Y.

2. *Catalpa speciosa* Ward. Hardy *Catalpa*. A large rapid-growing tree with thick rough bark. Wood light, soft, not strong, brittle, of very coarse texture and brown in color, very durable in the ground; used for railroad ties, posts, furniture and interior finish; also suitable for paper pulp. Ill. to Tenn., Mo., Ark., and Ohio.

Catalpa ovata Don. Japan *Catalpa*. A small tree, commonly with 3-lobed or angled leaves.

Subclass, SYMPETALAE EPIGYNAE.

Order, UMBELLALES.

Araliaceae. Ginseng Family.

74. *Aràlia* L. Aralia.

Herbs, shrubs, or small trees with alternate, pinnately or ternately decompound leaves. Fruit a small berry.

1. *Aralia spinosa* L. Angelica-tree. A prickly shrub or small tree with long-petioled bipinnate leaves. In low ground and along streams. Sometimes cultivated. Conn. to Fla., Ohio, Mo., and Tex.

Cornaceae. Dogwood Family.

75. *Córnus* L. Dogwood.

Shrubs or small trees with drupes in cymes or heads, the cymes self-pruned when the fruit is ripe.

1. Leaves opposite. 2.

1. Leaves alternate; twigs green, smooth; flowers in cymose panicles, drupe blue. *C. alternifolia*.
2. Leaves oval or ovate, pointed; axillary buds minute, hidden underneath the base of the petiole; flowers in heads with 4-6 large white bracts; drupe red. *C. florida*.
2. Leaves ovate or ovate-lanceolate; axillary buds larger, not covered; flowers cymose; drupe globose, white. *C. asperifolia*.

1. *Cornus florida* L. Flowering Dogwood. A small very ornamental tree, with rough reticulate bark. Wood solid and valuable; used for shuttles. The drupes are reputed to be poisonous. Me. and Ont. to Fla., Ohio, Mo., and Tex.

2. *Cornus asperifolia* Mx. Rough-leaf Dogwood. A tall shrub, sometimes tree-like, with reddish brown twigs. In rich or moist ground. Ont. to Fla., Iowa, Kan., Tex., and Ohio.

3. *Cornus alternifolia* L. f. Blue Dogwood. A shrub or small tree with smooth, greenish, bitter bark. In rich soil. N. S. to Ga., Ont., Minn., W. Va., Ala., and Ohio.

76. *Nyssa* L. Tupelo.

Trees or shrubs with alternate leaves and solid but diaphragmed pith. Fruit a drupe.

1. Leaves mostly entire, mostly acute or acuminate; carpellate flowers 2-14 together; stone little flattened. *N. sylvatica*.
1. Leaves mostly entire, mostly obtuse; carpellate flowers 1-3 together, stone much flattened. *N. biflora*.

1. ***Nyssa sylvatica*** Marsh. Tupelo. A large tree with horizontal branches and with rough bark. Leaves bright crimson, scarlet, or purple in autumn. Wood firm, heavy, strong, tough, close-grained, and hard to split; used for hubs of wheels, pulleys, handles, wooden shoes, wooden ware, etc. Not durable if exposed. In rich moist soil. Not easily transplanted. Me. and Ont. to Fla., Mich., Tex., and Ohio.

2. ***Nyssa biflora*** Walt. Water Tupelo. A large tree similar to the preceding, the base swollen. In swamps and along ponds. N. J. to Va., Fla., and Ala.

Order, RUBIALES.

Caprifoliaceae. Honeysuckle Family.77. ***Viburnum*** L. Viburnum.

Trees or shrubs with opposite leaves and 1-seeded drupes.

1. Leaves prominently acuminate; petioles slender, margined. *V. lentago*.
1. Leaves obtuse or merely acute. 2.
2. Petioles slender, rarely margined; leaves glabrous or nearly so. *V. prunifolium*.
2. Veins of the lower leaf surfaces and winged petioles tomentose. *V. rufotomentosum*.

1. ***Viburnum lentago*** L. Sheepberry. A shrub or small tree with glabrous acuminate winter buds. Drupe reddish-black, with a bloom, sweet and edible. Wood hard, ill-smelling. In rich soil. Hudson Bay to Man., N. J., Ga., Kan., and Ohio.

2. ***Viburnum prunifolium*** L. Black Haw. A shrub or small tree with acute winter buds, often reddish-pubescent. Drupe

blue-black, glaucous, sweet and edible. In dry soil. Conn. to S. Car., Mich., Kan., Tex., and Ohio.

3. **Viburnum rufotomentosum** Small. Southern Black Haw. A small tree with elliptic or obovate, mostly obtuse leaves, with brown-tomentose, winged petioles. Wood ill-smelling. On uplands and dry flood plains. Va. to Ill., Mo., Fla., and Tex.

GLOSSARY.

- Achene. A one-seeded dry indehiscent fruit with a tightly fitting pericarp around the seed.
- Actinomorphic. Radially symmetrical; a flower or organ which can be cut into similar equal halves by two or more planes.
- Acuminate. Tapering gradually to the apex.
- Acute. Sharp pointed.
- Adnate. An organ adhering to another; an anther attached longitudinally to the end of the filament.
- Adventive. Apparently becoming naturalized.
- Alternate. With a single leaf or other organ at each node.
- Ament. A slender usually flexible spike of flowers, as in the willows.
- Androecium. The whole set of stamens in a flower.
- Anther. The spore-bearing part of a stamen; the part which finally contains the pollen sacs.
- Anthesis. The period of flowering.
- Apetalous. Without petals.
- Appressed. Lying close against another organ.
- Aril. A fleshy organ around the hilum.
- Auricled. With ear-like lobes.
- Axillary bud. A bud in the axil of a leaf.
- Axil. The point of a stem just above the base of the leaf.
- Axile. In the axis of an organ.
- Baccate. Berry-like.
- Berry. A fruit with a fleshy or pulpy pericarp.
- Bilocular (2-locular). Having two cavities.
- Bisporangiate. Having both microsporangia and megasporangia; having both stamens and carpels.
- Blade. The expanded part of a leaf.
- Bract. A small, rudimentary, or imperfectly developed leaf.
- Bud scale. One of the scales in the winter bud.
- Bundle scar. A scar in a leaf scar produced by a vascular bundle or strand of bundles.
- Caducous. Falling away very soon after development.
- Calyx. The outer set of sterile floral leaves; the whole set of sepals.
- Canescent. With gray or hoary fine pubescence.
- Capitate. Arranged in a head.
- Capsule. A dry fruit of two or more carpels usually dehiscent by valves or teeth.
- Carpel. The megasporophyll of a seed plant; the modified leaf or stem bearing the ovules.

- Carpellate. Having only carpels, or carpellate flowers.
- Catkin. Same as ament.
- Cauline. Pertaining to the stem.
- Chaff. Dry thin scales.
- Chlorophyll. The green coloring matter of plants.
- Choripetalous. Having the petals separate or free.
- Ciliate. Provided with marginal hairs.
- Ciliolate. Minutely ciliate.
- Conduplicate. Folded lengthwise.
- Cone. A primitive flower as the carpellate cone of the pine.
- Connate. Similar organs more or less united.
- Convolute. Rolled around or rolled up longitudinally.
- Cordate. Heart-shaped.
- Coriaceous. Leathery.
- Corolla. The inner set of sterile, usually colored, floral leaves; the whole set of petals.
- Cotyledon. A leaf-like organ of the embryo in the seed.
- Crenate. With rounded teeth.
- Crenulate. Minutely crenate.
- Cuneate. Wedge-shaped.
- Cuspidate. With a sharp stiff point.
- Cyme. An inflorescence of the determinate type, the central flower developing first.
- Deciduous. Falling away at the end of the growing period.
- Decomound. More than once compound.
- Decurrent. Applied to an organ extending along the side of another.
- Dehiscence. The opening of an ovulary, sporangium, or pollen sac for the discharge of the contents.
- Deltoid. Broadly triangular.
- Dentate. With outwardly projecting teeth.
- Diadelphous. Having the stamens united into two sets.
- Diaphragm. A septum or transverse plate in the pith or other parts.
- Dichotomous. Two-forked.
- Didymous. Twin-like.
- Digitate. Diverging like the spread fingers.
- Dioecious. Having the microsporangiate or staminate flowers and the megasporangiate or carpellate flowers on separate plants.
- Dissected. Divided into many segments.
- Divided. Cleft to the base or to the midrib.
- Drupe. A simple usually indehiscent fruit with fleshy exocarp and bony endocarp.
- Dwarf branch. A highly specialized and reduced shoot on a twig, as in the pine and larch.

- Emarginate. With a notched apex.
- Embryo. An incipient plant in the seed.
- Embryo sac. The female gametophyte, contained in the ovule of seed plants.
- End bud. The bud at the end of the twig in case the terminal bud is self-pruned.
- Endocarp. The inner layer of the pericarp.
- Endosperm. The nourishing tissue developed around the embryo in the female gametophyte of the angiosperms.
- Entire. Without teeth, serrations or lobes.
- Ephemeral. Continuing for only a day or less.
- Epigynous. Having the calyx, corolla, and andrœcium above the ovulary.
- Evanescent. Disappearing early.
- Exocarp. The outer layer of the pericarp.
- Exserted. Extending beyond surrounding organs or parts.
- Extrorse. Facing outwards.
- Falcate. Scythe-shaped.
- Fertile. Bearing spores or seeds.
- Fertilization. The conjugation of the male and female gametes.
- Fetid. Ill-smelling.
- Filament. The stalk of an anther.
- Flower. The modified spore-bearing branch of the seed plants.
- Foliaceous. Leaf-like.
- Follicle. A simple fruit dehiscent along one suture.
- Fruit. The ripe ovulary with the seeds and whatever parts are consolidated with it.
- Fugaceous. Falling soon after development.
- Fugitive. Plants not native, but recurring here and there, without apparently becoming established.
- Gamete. A sexual cell.
- Gametophyte. The sexual generation of plants.
- Geophilous. Earth-loving; growing partly or completely subterranean.
- Gibbous. Enlarged or swollen on one side.
- Glabrate. Nearly without hairs.
- Glabrous. Without hairs.
- Gland. A group of secreting cells.
- Glaucous. Covered with a bluish or white bloom.
- Globose. Spherical or nearly so.
- Glutinous. Sticky or gummy.
- Gynœcium. The whole set of carpels in a flower.
- Habit. General aspect.
- Habitat. The place where a plant grows.
- Hastate. Arrow-shaped with the basal lobes diverging.

Head. A dense, round inflorescence of sessile or nearly sessile flowers. Herbaceous. Leaf-like in texture and color.

Hirsute. Having rather coarse stiff hairs.

Hispid. With bristly stiff hairs.

Hydrophyte. A water plant.

Hypogynous. Having the calyx, corolla, and androecium below the gynoecium.

Imbricated. Overlapping.

Imperfect. Monosporangiate flowers; having only stamens or only carpels.

Incised. Cut into sharp lobes.

Included. Not projecting beyond surrounding parts.

Indehiscent. Not opening.

Inequilateral. With unequal sides.

Inferior. Situated or arising below other organs.

Inflorescence. The flower cluster of a plant and its mode of arrangement.

Internode. The part of a stem between two successive nodes.

Intorse. Facing inwards.

Involucre. A whorl of bracts subtending a flower or flower cluster.

Involute. Rolled inwardly.

Irregular. A flower with one or more organs of a set unlike the others.

Isobilateral. A flower or organ which can be cut into equal halves by two planes, the halves of the one being unlike those of the other.

Lanceolate. Lance-shaped.

Lateral bud. An axillary bud, any bud not the terminal bud of a branch.

Latex. The milky sap of certain plants.

Leaflet. One of the divisions of a compound leaf.

Leaf scar. The scar or cicatrix formed where the petiole of a leaf separates from the stem or twig.

Legume. A simple, dry fruit dehiscent along both sutures.

Lenticel. A small usually oval or rounded spot on the bark of a twig or stem, produced by a special tissue of cells under a stoma and breaking through the epidermis.

Limb. The expanded part of a petal, sepal, or sympetalous corolla.

Linear. A long and narrow organ with the sides nearly parallel.

Lobed. Divided to about the middle or less.

Loculicidal. A capsule which splits longitudinally through the middle of the back of each cavity or component carpel.

Medullary rays. Strips of cells passing radially through the wood from the pith or annual rings to the bark.

Megaspore. The larger of the two kinds of nonsexual spores produced in the flower. The megaspore develops into the female gametophyte.

Megasporangium. A sporangium which produces megaspores; the ovule in seed plants.

Membranous. Thin and rather soft and pliable.

Mesophyte. A land plant adapted to ordinary conditions of moisture.

Microspore. The smaller of the two kinds of nonsexual spores produced in the flower. The microspore develops into the male gametophyte.

Microsporangium. A sporangium which produces the microspores; the incipient pollen sacs in the seed plants.

Midrib. The central rib of a leaf or other organ.

Monadelphous. Stamens with united filaments.

Monoecious. Having staminate and carpellate flowers on the same plant.

Monosporangiate. Flowers bearing only one kind of spores; a flower with only stamens or carpels.

Mucronate. With a sharp abrupt point.

Mucronulate. Slightly mucronate.

Naturalized. Plants not indigenous to a region but having become established as part of the flora.

Natural pruning. The process by which dead twigs and branches are separated from the tree by the formation of a collar or callus.

Nectary. A nectar-secreting organ.

Node. The place where two internodes join, normally with a single leaf or more.

Nut. An indehiscent one-seeded fruit with a hard or bony pericarp.

Nutlet. A very small nut.

Obovate. Inversely heart-shaped.

Oblanceolate. Inversely lanceolate.

Oblong. Somewhat longer than broad with the sides nearly or quite parallel.

Oosphere. The unfertilized egg; the female gamete.

Oospore. The fertilized egg.

Ovary. The female organ of reproduction; an egg-producing organ.

Ovate. Shaped like the longitudinal section of a hen's egg.

Ovulary. The ovule-bearing part of a closed carpel or set of carpels.

Ovule. The megasporangium of a seed plant which later develops into a seed.

Ovum. The egg or oosphere.

Palmate. Diverging like the fingers of a hand.

Panicle. A compound inflorescence of the racemose type usually of pyramidal form.

- Parasitic. Growing upon other living plants or animals and absorbing their juices and tissues as food.
- Parietal. Borne on the wall of the ovulary, or pertaining to it.
- Parted. Deeply cleft.
- Pedicel. The stalk of a flower or flower cluster.
- Peduncle. The stalk of a flower.
- Pellucid. Transparent.
- Peltate. Shield-shaped, as a leaf with the petiole attached at or near the centre of the blade.
- Pentacyclic. Having five cycles.
- Pentamerous. Five-parted.
- Perfect. A flower having both stamens and carpels.
- Perfoliate. Leaves so clasping the stem as to appear as if pierced by it.
- Perianth. The calyx and corolla taken collectively.
- Pericarp. The wall of a fruit; the carpel wall.
- Perigynium. The sac-like envelope around the gynoecium of a *Carex* flower.
- Perigynous. Having the sepals, petals and stamens borne on a disc surrounding the gynoecium.
- Persistent. Remaining attached after the growing period.
- Petal. One of the leaves of the corolla.
- Petiole. The stalk of a leaf.
- Pilose. With long soft hairs.
- Pinna. The primary divisions of a pinnately compound leaf.
- Pinnate. Leaves divided into leaflets or segments along a common axis.
- Pinnatifid. Pinnately cleft to the middle or beyond.
- Pinnule. A division of a pinna in a compound leaf.
- Placenta. The ridge or surface bearing the ovules.
- Plicate. Folded like a fan.
- Plumose. Resembling a plume or feather.
- Plurilocular. Having several or many cavities.
- Pollen grain. The male gametophyte of seed plants.
- Pome. The fruit of the apple and related plants, with an adnate fleshy perigynous disc.
- Prickle. A stiff sharp-pointed outgrowth from the epidermis.
- Puberulent. With very short hairs.
- Pubescent. Hairy, especially with fine and soft hairs.
- Punctate. With translucent dots or glands.
- Raceme. An elongated inflorescence with each flower on a peduncle.
- Rachis. The axis of a compound leaf, spike, or raceme.
- Receptacle. The end of the flower stalk bearing the floral organs.
- Reflexed. Bent backward abruptly.
- Regular. Having the parts of each set alike in size and shape.
- Reniform. Kidney-shaped.

- Repand. With a more or less wavy margin.
 Retuse. With a shallow notch at the end.
 Revolute. Rolled backward.
 Rotate. With a flat round corolla; wheel-shaped.
 Sagittate. Shaped like an arrow head.
 Samara. A simple indehiscent winged fruit.
 Scabrous. Rough.
 Scale. A highly modified dry leaf as in the winter bud of most plants; also a dry, flat, more or less membranous outgrowth from a leaf or stem.
 Scurfy. Covered with scurf, minute membranous scales, as in *Chenopodium*.
 Scarios. Thin, dry, and translucent, not green.
 Seed. The matured and modified ovule with a dormant embryo.
 Self-pruning. The process by which living buds or twigs are naturally separated from the plant.
 Self-pruning scar. A scar produced where a twig or bud has been self-pruned.
 Sepal. One of the leaves of a calyx.
 Septicidal. A capsule which splits longitudinally through its partitions thus dividing it into its component carpels.
 Serrate. With teeth projecting forward.
 Sessile. Without a stalk.
 Sinuate. With strongly wavy margins.
 Sinus. The space between two lobes.
 Spermary. The male reproductive organ.
 Spermatozoid. The male gamete.
 Spike. An elongated inflorescence with sessile or nearly sessile flowers.
 Spine. A sharp thorn-like organ not representing a stem in origin, as the spines on the leaves of the Christmas holly.
 Spore. A modified reproductive cell.
 Sporophyte. The nonsexual generation of plants.
 Spur. A short stunted branch not representing a true dwarf branch and not ending in a thorn-like point; any projecting appendage of a flower looking like a spur.
 Stamen. The organ of a flower which produces microsporangia, which contain the microspores which later develop into pollen grains.
 Staminate. Having only stamens or staminate flowers.
 Stellate. Star-like.
 Sterigma. A small, short, peg-like projection on which certain leaves, spores, etc., are borne.
 Sterile. Not producing spores or seeds.
 Stigma. The upper part of the carpel; a special organ of the Angiosperms to catch the pollen grains.

- Stipel.** The stipule of a leaflet.
- Stipular scar.** The mark made on the bark by deciduous stipules.
- Stipular spine.** A spine representing a stipule or having the position of a stipule.
- Stipules.** Bract-like appendages at the base of the petiole of many leaves.
- Strigose.** With stiff appressed or ascending hairs.
- Style.** The narrow top of the carpel or united carpels between the ovulary and stigma.
- Subulate.** Awl-shaped.
- Succulent.** Soft and juicy.
- Superposed.** Placed one above the other.
- Sympetalous.** With petals more or less united.
- Synantherous.** Having the stamens united by their anthers.
- Syncarp.** A fleshy aggregate fruit.
- Terete.** Circular in cross section.
- Terminal bud.** The bud at the morphological tip of the twig.
- Ternate.** Divided into three segments; arranged in threes.
- Tetracyclic.** A flower with four cycles.
- Tetradynamous.** With four long stamens and two short ones as in the Brassicaceae.
- Tetramerous.** Four-parted.
- Thorn.** A highly modified sharp-pointed branch.
- Thorn-like spur.** A short stunted branch ending in a sharp point or thorn.
- Tomentose.** Covered with dense wool-like hairs.
- Triadelphous.** Having stamens united by their filaments into three bundles.
- Trilocular (3-locular).** With three cavities.
- Trimerous.** Three-parted.
- Truncate.** Terminating abruptly by a nearly straight edge or surface.
- Two-ranked.** Disposed in two vertical rows along the twig; with the third leaf in line with the first.
- Umbel.** A determinate inflorescence with all the peduncles or pedicles arising from the same point.
- Undulate.** With wavy margins.
- Unilocular (1-locular).** With one cavity.
- Utricle.** A one-seeded fruit with a loose pericarp.
- Valvate.** Meeting by the margins in the bud, not overlapping; dehiscent by valves.
- Vascular bundle.** The conducting strands in the plant body composed of wood and bast in which water and food materials are conducted through the roots, stems and leaves.
- Vein.** One of the branches of the vascular portion of leaves or other organs.

Venation. The arrangement of the veins.

Vernation. The arrangement of the leaves in the bud.

Versatile. An anther attached at or near its middle to the filament.

Verticillate. Whorled.

Villous. With long, soft hairs not matted together.

Whorled. A group of three or more similar organs radiating from a node.

Winged. With a thin expansion.

Xerophyte. A plant adapted to desert conditions.

Zygomorphic. A flower or organ which can be cut into similar halves by only one plane.

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