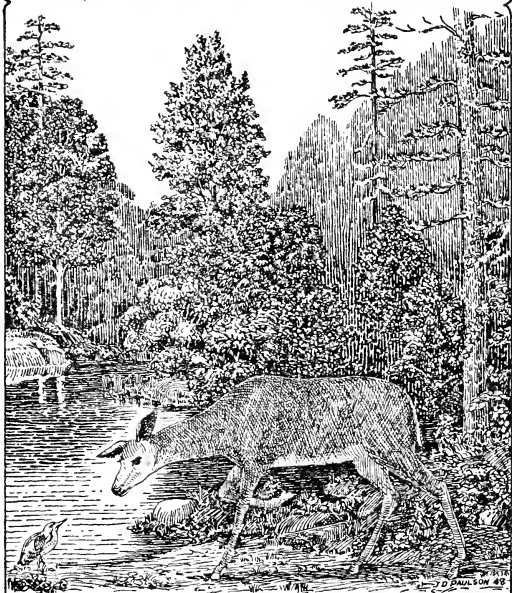


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FIELD MANUAL *of* TREES

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Professor of

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BY

JOHN H. SCHAFFNER

PREFACE.

This little manual represents a revision of the author's former "Trees of Ohio and Surrounding Territory," and attempts to carry out more definitely the idea of having a convenient guide by which it is possible to study our trees at any season of the year. 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 definite characterization is also given for each genus. This will be found to hold for all the species occurring in our region and in most cases for all the species of the genus.

The nomenclature used is essentially that of Britton and Brown's "Illustrated Flora of the Northern United States, Canada and the British Possessions." 2nd Edition, 1913. A rather conservative position has been taken in the treatment of species, since many of the forms recently described are regarded as merely elementary varieties either Mendelian or ecological. 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.

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.

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 becomes 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.

In this second edition, a few typographical errors have been corrected and a few slight changes have been made, but the Manual remains essentially the same as the first edition published in 1914.

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. There are also trees which have no crown of branches, like the palms.

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 very largely by delicate organs called root hairs developed near the root tips. The root hairs are temporary structures developed from the epidermis of the root (piliferous layer) near the tip and dying off at the back as the root grows. 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 bladder-nut. 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 pheloderm 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 of abscission 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 andrecium composed of stamens, and the gynecium 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 staminate and carpellate flowers are on one individual the plant is monoecious, if on two distinct indi-

viduals the plant is dioecious. In this case the plants are spoken of as staminate trees and carpellate trees. The stamens produce microsporangia and the carpels megasporangia or ovules. In the anthophyta 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 gynecium are grown together and in such cases a compound ovulary is produced with one or more cavities.

Following a peculiar process known as the reduction division 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, although some of its parts may show sexual characters and dimorphism. 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, which are the real sexual generation. After pollination has taken place, which is simply the transfer of the pollen to the ovules or to 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. In the anthophyta, endosperm is produced in the seed by the union of the second sperm with two cells from the female gametophyte. 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.** (2).
2. Without dwarf branches. 4.
3. Dwarf branches small, self-pruned, with 2-5 foliage leaves. **Pinus.** (7).
3. Dwarf branches thick, wart-like, persistent, with numerous deciduous leaves. **Larix.** (6).
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.** (5).
6. Leaves flat, those on the upper side of the twig much shorter than the lateral ones; trees. **Tsuga.** (4).
6. Leaves more or less 4-sided, spreading in all directions. **Picea.** (3).
7. Foliage leaves small, scale-like, appressed, opposite 1-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 6-10, not peltate. **Thuja.** (8).

7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked, usually much elongated, on somewhat flattened branches; scales of the carpellate cone 4-6, the two upper fertile, not peltate.

Libocedrus. (9).

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. (10).

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. (11).

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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. **Liriodendron.** (13).
 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. (12).

12. Not with stipular rings. 13.
 13. With thorns and milky sap. 11.
 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. (52).

14. With terminal thorns and some axillary thorns; leaves tapering to the base; narrow or slender-cuneate. **Bumelia.** (69).
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.** (66).
16. Leaves green on both sides, or glaucous beneath, coriaceous, 2-5 in. long; oval or oval-lanceolate, winter buds naked. **Kalmia.** (67).
16. Leaves bright green above, paler beneath, coriaceous, 4-5 in. long, pointed at both ends; bark aromatic. **Persea.** (15).
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.** (14).
18. Leaves not 2-ranked; vascular bundles in base of petiole 3. **Nyssa.** (81).
19. Leaves resin-dotted, waxy-dotted or punctate, oblong-lanceolate, spatulate, or oblanceolate, short-pointed, narrowed at the base. **Myrica.** (63).
19. Leaves not dotted nor punctate. 20.
20. Pith prominently 5-angled; leaves with deciduous stipules and with bristle tips. **Quercus.** (56).
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.** (79).
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.** (70).
23. Leaves pointed at the base, widest above the middle, lower surface pubescent; fruit a nut-like drupe. **Symplocos.** (71).
24. With prominent deciduous stipules; bark not resinous. **Cydonia.** (24).
24. Without stipules; bark resinous, aromatic. **Cotinus.** (44).

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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.** (60).
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.** (56).
28. Leaves with sharply acuminate teeth; buds not clustered at the tip; nuts with a prickly or spiny involucre. **Castanea.** (55).
29. Usually with prominent and typical lateral thorns; carpels of the pome bony. **Crataegus.** (26).
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.** (23).
29. Without thorns; leaves serrate or serrate-dentate; pome berry-like, carpels not bony. **Amelanchier.** (25).

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.** (15).
31. Buds sessile; leaves doubly serrate, bark not scaling off in plates. **Ulmus.** (18).
31. Buds sessile; leaves serrate, bark scaling off in plates like in the Sycamore. **Planera.** (19).
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.** (54).
33. Leaves oblong-lanceolate, acuminate, with slender often inwardly curved points on the serrations; bark rough. **Castanea.** (55).
34. Lateral veins not ending in the serrations or teeth. **Amelanchier.** (25).
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.** (57).
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.** (59).
36. Bark of trunk scaly, fine furrowed; twigs glandular-bristly; carpellate catkin in fruit appearing like that of the hop. **Ostrya.** (58).
36. Bark scaling off in plates like in the Sycamore; fruit coriaceous, nut like. **Planera.** (19).

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.** (59).
38. Bark not in papery or leathery sheets; leaves not doubly serrate, the lateral veins not ending directly in the serrations or teeth. **Amelanchier.** (25).
39. Leaves not with spines. 40.
39. Leaves evergreen, with spine-tipped lobes. **Ilex.** (36).
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.** (81).
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. **Halesia.** (72).
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.** (71).
42. Leaves with peltate scales, or resin-dotted, oblanceolate or wedge-lanceolate. **Myrica.** (63).
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.** (65).
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.** (64).

15. Bundle scars several, scattered; leaves without glands; buds clustered at the tip of the twig
Quercus. (56).
16. With stipules or stipular scars. 47.
16. Without stipules or stipular scars; leaves sour, with prominent scattered hairs on the midrib beneath; fruit a capsule. **Oxydendrum.** (68).
17. With typical lateral thorns; fruit a drupe-like pome with bony ripe carpels. **Crataegus.** (26).
17. Not with typical lateral thorns, but some may have thorn-like stunted branches. 48.
18. Leaves with 1 or more disc-like, wart-like, or tooth-like glands on the petiole or at the base of the blade. 49.
18. 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.
19. 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.** (28).
19. Glands various; twigs not red and green, some with cleavage planes in basal joints; terminal bud present or absent, fruit a smooth drupe. **Prunus.** (27).
50. Axillary buds usually superposed; leaves lanceolate or oblong-lanceolate, tapering towards the short petiole; fruit a berry-like drupe. **Ilex.** (36).
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.** (34).
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. (22).
52. Leaves irregularly dentate or serrate, or more or less lobed; pome without grit cells. **Malus.** (23).

53. Base of petiole covering the axillary bud; twigs with stipular rings. **Platanus.** (47).
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.** (29).
55. Leaves serrate, dentate, or lobed. 56.
56. Pith usually in transverse plates; leaves ovate-lanceolate, inequilateral, taper-pointed. **Celtis.** (50).
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.** (51).
58. Twigs grayish-green, downy; leaves tomentose beneath. **Papyrus.** (53).
59. Leaves not inequilateral; vascular bundles in base of petiole 3. **Betula.** (59).
59. Leaves inequilateral at the base; vascular bundles in base of petiole several, scattered. **Tilia.** (20).
60. Leaves more or less star-shaped, with 3-7 long pointed serrate lobes, strongly aromatic when crushed; pith 5-angled. **Liquidambar.** (46).
60. Leaves entire or three-lobed, bark spicy-aromatic; internodes very unequal. **Sassafras.** (16).
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.** (64).
61. Pith cylindrical or nearly so; usually with prominent typical thorns. **Crataegus.** (26).

62. Pith diaphragmed, with cavities; large trees with pinnate leaves. **Juglans.** (62).
62. Pith not diaphragmed. 63.
63. Leaves trifoliate, odd-pinnate or odd-bipinnate. 64.

63. Leaves evenly pinnate or bipinnate; axillary buds superposed. 73.
64. Lobes or teeth at the base of the leaflets with prominent green glands beneath; leaves pinnate, very large with disagreeable odor. **Ailanthus.** (19).
64. Lobes or teeth if present without green glands. 65.
65. Leaflets glandular punctate; pith not 5-angled; small trees or shrubs. 66.
65. Leaflets not punctate. 67.
66. Leaves pinnate, with stipular spines.
Zanthoxylum. (17).
66. Leaves trifoliate, without stipular spines; bark with disagreeable odor; axillary buds superposed, covered by the petiole base. **Ptelea.** (18).
67. Base of petiole covering the axillary buds, or if not, the petioles and stems prickly; some times with stipular spines. 68.
67. Base of petiole not covering the axillary buds; not spiny or prickly. 70.
68. Leaflets entire. 69.
68. Leaflets serrate or dentate, simply pinnate; pith very large; bark resinous or milky. **Rhus.** (12).
68. Leaves serrate; bipinnate, petioles and stems prickly.
Aralia. (78).
69. Leaflets mucronate, usually obtuse; with stipular spines; base of petiole solid. **Robinia.** (33).
69. Leaflets abruptly acute; without stipular spines; base of petiole covering the buds like a cap.
Cladrastis. (32).
70. Leaflets entire or if occasionally few-toothed then the rachis prominently winged. 71.
70. Leaflets serrate, dentate, or lobed, the rachis not winged. 72.
71. Leaflets decidedly inequilateral, obliquely lanceolate or falcate, acuminate. **Sapindus.** (38).
71. Leaflets not inequilateral or only slightly so, not slender falcate, the rachis winged; twigs pubescent.
Rhus. (12).
71. Leaflets not inequilateral or only slightly so; not slender falcate; rachis not winged; twigs glabrous.
Toxicodendron. (13).

72. Pith 5-angled; stipules none, base of petiole with numerous vascular bundles, scattered or in 3 areas. **Hicoria.** (61).
72. Pith not 5-angled; stipules none; leaflets more or less lobed; vascular bundles in base of petiole scattered; terminal bud absent. **Koelreuteria.** (39).
72. Pith cylindrical or nearly so; leaves with stipules; vascular bundles in base of petiole 3-5. **Sorbus.** (21).
73. Pith small; base of petiole covering the axillary buds; usually with prominent thorns. **Gleditsia.** (30).
73. Pith very large, base of petiole not covering the axillary buds; without thorns. **Gymnocladus.** (31)

74—

74. Leaves simple. 78.
74. Leaves compound. 75.
75. Leaves digitate with 5 or more leaflets. **Aesculus.** (40).
75. Leaves trifoliolate or pinnate. 76.
76. Base of petiole covering the axillary buds; leaflets dentate, lobed, or nearly entire. **Acer.** (41).
76. Base of petiole not covering the axillary buds. 77.
77. Leaves trifoliolate; bark with strong odor; terminal bud self-pruned. **Staphylea.** (37).
77. Leaflets 5-13; terminal bud present. **Fraxinus.** (74).
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.** (76).
80. Pith and petioles solid; axillary buds not superposed; under side of leaves with glands in the axils of the larger veins. **Catalpa.** (77).
81. Leaves more or less lobed; fruit a 2-winged samara. **Acer.** (41).
81. Leaves not lobed; fruit a drupe. **Rhamnus.** (34).
82. Leaves serrate, dentate, crenate, or variously lobed. 83.

82. Leaves entire. 85.
83. Bark of ripe twigs green, bundle scar or vascular bundle in base of petiole 1; pith rhombic.
Euonymus. (35).
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. **Forestiera.** (75).
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. (83).
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.** (34).
85. Leaves coriaceous, evergreen, hence on wood of the previous season. **Kalmia.** (67).
85. Leaves deciduous each year. 86.
86. Leaves with the two outer lateral veins more or less parallel with the midrib. 87.
86. Leaves pinnately veined to the tip. 88.
87. Axillary buds not covered by the petiole base; inflorescence cymose. **Cornus.** (79).
87. Axillary buds minute, hidden by the petiole base; flowers in involucrate heads. **Cynoxylon.** (80).
88. Stipules none; fruit an oblong drupe.
Chionanthus. (73).
88. Stipules present; fruit dry, in a head.
Cephalanthus. (82).

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. 11.
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.** (7).
3. Without true dwarf branches. 4.
4. Leaf buds scaly. 5.
4. Leaf buds not scaly, naked. 7.
5. Leaf scar not on a sterigma, prominent, circular; leaves flat. **Abies.** (5).
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.** (1).
6. Leaves more or less 4-sided, spreading in all directions. **Picea.** (3).
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, usually much elongated, on somewhat flattened branches; scales of the carpellate cone 4-6, the two upper fertile, not peltate. **Libocedrus.** (9).
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.** (10).

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. (11).
8. Leaves with spine-tipped lobes or teeth. **Ilex.** (36).
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.** (56).
9. Leaves glabrous below; pith not 5-angled. 10.
10. Leaves green on both sides, thick, coriaceous, oblong to oblanceolate, 5-10 in. long; winter buds very scaly. **Rhododendron.** (66).
10. Leaves green on both sides or glaucous beneath, coriaceous, 2-5 in. long, oval to oval-lanceolate; winter buds naked; erect shrubs. **Kalmia.** (67).
10. Leaves bright green above, paler beneath, coriaceous, 4-5 in. long, pointed at both ends; bark aromatic.
Persea. (15).

—11—

11. Twigs with thick wart-like dwarf branches; gymnosperms. 12.
11. Twigs without true dwarf branches. 13.
12. Young twigs covered with scales. **Larix.** (6).
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.** (2).
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. **Plantanus.** (47).
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.** (13).
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.** (12)
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.** (78).
20. Leaf scar covering the two or more superposed axillary buds. **Robinia.** (33).
20. Leaf scar below the axillary buds; buds reddish, pubescent. **Zanthoxylum.** (17).
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.** (52)
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. **Crataegus.** (26).

21. Thornus commonly branched, situated above the axil of the leaf; leaf scar covering the two or more superposed axillary buds; twigs polished, often zigzag. **Gleditsia.** (30).
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.** (31).
23. Buds and sometimes twigs pubescent or downy; thornus prominent **Bumelia.** (69).
24. Terminal bud self-pruned; twigs some shade of black, brown, or reddish. **Prunus.** (27).
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.** (22).
25. Buds downy or pubescent, twigs usually pubescent, if glabrous then dark reddish-brown; trees with rounded crowns and spreading branches.
Malus. (23).

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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.** (70).
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.** (11).
28. Pith not diaphragmed; bark not with fetid odor. 29.
29. With very prominent medullary rays. 30.
29. Medullary rays inconspicuous. 31.
30. Winter buds usually long-pointed, with several to numerous dry scales. **Fagus.** (51).
30. Winter buds rather fleshy, usually with 1-3 visible scales. **Tilia.** (29).

31. Pith 5-angled, twigs glabrous or somewhat pubescent, reddish or yellowish-brown. **Castanea.** (50).
31. Pith cylindrical; visible bud scales more than 3; twigs glabrous or pubescent but not downy.
Morus. (51).
31. Pith cylindrical; visible bud scales 1-3, twigs downy, grayish-green, bark very fibrous. **Papyrius.** (53).
32. Pith interruptedly diaphragmed, with cavities, small, greenish-white. **Celtis.** (50).
32. Pith solid. 33.
33. Terminal bud naked, elongated, tomentose; buds prominently stalked, light gray; twigs zigzag.
Hamamelis. (45).
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. (25).
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. (29).
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.** (57).
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.** (49).
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.** (48).

37. Bark scaly, fine-furrowed, the furrows usually somewhat spiral; bud scales green with brown tips, nearly glabrous; twigs glandular-bristly; staminate catkins exposed in winter. **Ostrya.** (58).
37. Bark of trunk and larger branches separating into papery or leathery sheets; catkins in winter. **Betula.** (59).
- 38-
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.** (81).
39. Pith not diaphragmed, solid. 41.
40. Pith large, brown; twigs thick, with large leaf scars and 3 prominent bundle scars. **Juglans.** (62).
40. Pith rather small, white or greenish; leaf scars semi-circular; outer bud scales about 2. **Halesia.** (72).
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.** (31).
42. Leaf scar surrounding the axillary buds, quadrangular U-shaped; bark with pungent odor; pith white. **Ptelea.** (48).
42. Leaf scar covering the axillary buds; pith small; twigs brown, polished, often zigzag. **Gleditsia.** (30).
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 rough twigs. **Hicoria.** (61).

44. Leaf scar surrounding the hairy axillary buds; bundle scars 5-9; terminal bud self-pruned.

Cladrastis. (32).

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. (38).

45. Bundle scar usually 1; buds rounded or somewhat pointed; stipular scars or minute stipules present.

Ilex. (36).

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46. Terminal and lateral buds stalked; pith 3-angled; both staminate and carpellate catkins present all winter.

Alnus. (60).

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.** (42).

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.** (34).

50. Terminal bud present; stipules minute, usually persistent. **Ilex.** (36).

51. Terminal bud present. 52.

51. Terminal bud absent. 53.

52. Pith diaphragmed, with cavities; bark reddish; outer bud scales several, short. **Symplocos.** (71).

52. Pith not diaphragmed; bark green, very spicy aromatic; internodes very unequal. **Sassafras.** (16).

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.** (68).

53. With 2 visible scales in the triangular flattened bud; pith sometimes with cavities; twigs pubescent, zig-zag at the tip. **Diospyros.** (70).

—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; pith small. **Salix.** (65).
55. Pith diaphragmed but solid; bundle scars 3; no stipular scars. **Nyssa.** (81).
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.** (56).
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.** (55).
59. Terminal bud large with 4 or more visible scales, hairy or peltate pubescent; lateral buds usually superposed; twigs tough. **Hicoria.** (61).
60. Without stipular or self-pruning scars; crushed buds fragrant, aromatic, not resinous, glabrous.
Liquidambar. (46).
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.** (61).
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. (19).
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.** (44).
63. Buds not clustered at the tip; bark often very poisonous to the touch; leaf scar partly surrounding the bud; small trees or shrubs. **Toxicodendron.** (43).
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.** (63).
66. Buds not clustered at the tip; twigs not glandular; bundle scars 3. **Prunus.** (27).
66. Buds not clustered at the tip; twigs not glandular; bundle scars numerous; outer bud scales 2. **Koelreuteria.** (39).
67. Buds and twigs very downy, twigs dark brown or black. **Cydonia.** (24).
67. Buds downy or pubescent; twigs glabrous or pubescent, gray or brown. **Rhamnus.** (34).
68. Twigs green or yellowish-green, glabrous; internodes very unequal; lateral buds minute; small trees. **Cornus.** (79).
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.** (28).
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.** (21).
69. Bundle scars 3. 70.
70. Buds rounded at the apex, often clustered at the tip of the twig; twigs glandular dotted. **Myrica.** (63).

70. Buds rounded at the apex; scales thick; twigs often zigzag; plant usually with some thorns, not glandular dotted. **Crataegus.** (26).
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.** (27).
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.** (22).
71. Buds downy or strongly pubescent; twigs strongly pubescent or if glabrous then dark reddish-brown; trees with rounded or spreading crowns.
Malus. (23)
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. (34)
- 72-
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, pith large. 73.
73. Pith with cavities or more or less diaphragmed; axillary buds superposed. **Paulownia.** (76).
73. Pith solid; axillary buds small and flat, not superposed, leaf scars often in threes. **Catalpa.** (77).
74. Twigs very green, more or less 4-angled; pith diamond-shaped or rhomboidal. **Euonymus.** (35).
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.** (34).
75. Terminal bud present unless the twig is fruiting. 76.

76. Axillary buds often superposed; twigs often with thorns; leaf scars small. **Forestiera.** (75).
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.** (73).
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.** (74).
77. Axillary buds minute and sunken; twigs glabrous or pubescent; stipules dry, prominent; or with prominent stipular scars. **Cephalanthus.** (82).
78. With 1 distinct stipular scars; terminal bud self-pruned; twigs green with strong odor. **Staphylea.** (37).
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. **Aesculus.** (40).
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. 81.
80. Terminal bud with one main pair of visible scales and a smaller pair at the base. **Viburnum.** (83).
80. Terminal bud with several pairs of visible scales; bundle scars 3-5; twigs sometimes green. **Acer.** (41).
81. Axillary buds usually minute and undeveloped except at the base of the peduncle which is self-pruned; twigs green or reddish-green, glabrous or nearly so. **Cynoxylon.** (80).
81. Axillary buds normally well developed and prominent; twigs often very pubescent. **Cornus.** (79).

GENERAL KEY TO THE FAMILIES AND GENERA.

Based on the flower and other characters present at the time of blooming. The number following the generic name refers to the list number.

1. Ovules naked on an open carpel; pollen falling directly on the micropyle of the ovule which is without a pollen-chamber; trees or shrubs; ours usually evergreen with narrow leaves; 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. Leaves fan-shaped, dichotomously veined, on thick wart-like dwarf branches; dioecious trees.

GINKGOACEAE.

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

2. Leaves not fan-shaped and dichotomously veined, but needle-shaped, narrowly linear, subulate or scale-like. 3.
3. Leaf buds naked; carpels few, spiral; leaves on feather-like dwarf branches which are deciduous.

TAXODIACEAE.

a. **Taxodium.** (2).

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. Carpellate cones oblong, the scales not peltate. b.
- a. Carpellate cones globose or nearly so, the scales peltate, or forming a bluish berry-like fruit. c.
- b. Cone scales 6-10, the 4 upper fertile. **Thuja.** (8)
- b. Cone scales 4-6, the 2 upper fertile.

Libocedrus. (9).

- c. Cone with dry peltate scales; ovules usually 2.

Chamaecyparis. (10).

- c. Cone becoming blue and fleshy; twigs not flattened; leaves or some of them often subulate.

Juniperus. (11).

3. Leaf-buds scaly; carpels usually numerous; leaves spirally arranged, the foliage leaves often situated on dwarf branches. **PIXACEAE.**

- a. Without dwarf branches. b.

- a. With dwarf branches. d.

- b. Leaf scar on a sterigma, the twigs covered with scales representing the leaf bases. c.

- b. Leaf scar on the bark; twigs without scales; leaves usually flat; carpellate cones erect.

Abies. (5).

- c. Leaves more or less 1-sided, spreading in all directions; carpellate cones pendulous. **Picea.** (3).

- c. Leaves flat, those on the upper side of the twig much shorter than the lateral ones; carpellate cones small, pendulous. **Tsuga.** (4).

- d. Leaves deciduous, numerous on thick, wart-like dwarf branches. **Larix.** (6).

- d. Leaves needle-shaped, persistent, 2-7 on small self-pruned dwarf branches. **Pinus.** (7).

- 4 -

1. Leaves mostly parallel-veined, sometimes netted-veined; parts of the flower very often in threes (trimerous); cotyledon 1; the closed 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 chori-petalous (petals distinct), sepals, petals and stamens sometimes on a disk or hypanthium. 6.
5. Perianth composed of calyx and corolla, calyx may be minute or suppressed; corolla sympetalous (petals more or less united). 39.
6. Calyx and corolla both present, calyx may be minute. 7.
6. Only the calyx present, sepals distinct or united, green or colored; or perianth none. 25.
7. Flowers hypogynous or perigynous; ovulary free or only slightly adherent to the perigynous disk or hypanthium. 8.
7. Flowers epigynous or apparently epigynous; calyx above the ovulary, with or without an hypanthium. 24.
8. Stamens numerous, at least more than 10 and more than twice the petals. 9.
8. Stamens not more than twice as many as the petals, when of just the number as the petals then alternate with them. 12.
8. 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.** (31).

9. Carpels 1 or more, united, but styles and stigmas may be several. 10.
9. Carpels more than 1, distinct; filaments shorter than the anthers; perianth trimerous; leaves 2-ranked. **ANONACEAE.**

a. **Asimina.** (14).

9. 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. (12).
- a. Anthers extrorse; leaves truncate.
Liriodendron. (13).
10. Ovary compound, plurilocular. 11.
10. Ovary multilocular, 2-ovuled; leaves usually with disk-like or tooth-like glands on the petiole or at the base of the blade. ROSACEAE. (Amygdalatae).
- a. Young ovary and drupe glabrous. **Prunus.** (27).
- a. Young ovary and drupe velvety-pubescent.
Amygdalus. (28).
11. Flower cluster subtended by a large, membranous bract; calyx deciduous; leaves alternate, 2-ranked; sap mucilaginous. TILIACEAE.
- a. **Tilia.** (20).
11. Flowers not subtended by a membranous bract; leaves alternate with deciduous stipules; sepals persistent. ROSACEAE. (MALATAE).
- See 24 below.
12. Ovary only 1, carpels 1 to many, united. 15.
12. Carpels 2 or more, distinct, or somewhat united at the base. 13.
13. Leaves compound. 14.
13. Shrubs or trees with alternate simple leaves. HAMAMELIBACEAE.
- a. Ovules 1 in each cavity; leaves inequilateral, not star-shaped. **Hamamelis.** (45).
- a. Ovules several in each cavity, fruit globular, spiny. **Liquidambar.** (46).
14. Leaves punctuate with pellucid dots, alternate. RUTACEAE.
- a. **Zanthoxylum.** (17).
14. Leaves large, pinnate, alternate, not punctuate but with disc-like glands under the teeth or lobes. SIMARUBACEAE.
- a. **Ailanthus.** (19).
15. Carpel 1, ovary with 1 parietal placenta; leaves alternate, usually with stipules, usually compound. FABACEAE.

- A. Upper petal inclosed by the lateral ones in the bud; leaves simple or compound mostly with stipules. **CASSIATAE.**
- a. Leaves simple, flowers bisporangiate.
 - Cercis.** (29).
 - a. Leaves compound, flowers diecious or imperfectly diecious. b.
 - b. Stamens 3-5; pith small; usually with thorns. **Gleditsia.** (30).
 - b. Stamens 10; pith large, chocolate-colored; without thorns. **Gymnocladus.** (31).
- B. Upper petal inclosing the lateral ones in the bud; leaves compound (sometimes with 1 leaflet) with stipules. **FABATAE.**
- a. Without stipular spines; leaflets large, 3-6 in. long; base of petiole covering the axillary buds like a cap. **Cladrastis.** (32).
 - a. With stipular spines; leaflets small, 1-2 in. long; base of petiole not covering the axillary buds like a cap, but solid.
 - Robinia.** (33).
15. Carpels more than 1 as shown by the compound ovulary, cavities, placentae, styles, or stigmas. 16.
16. Ovulary 2-locular to pluriocular. 17.
16. Ovulary 1-locular, ovules solitary, stigmas 3; shrubs or trees with resinous or milky sap and alternate leaves without stipules. **ANACARDIACEAE.**
- a. Leaves compound; style terminal. b.
 - a. Leaves simple; style lateral. **Cotinus.** (41)
 - b. Petiole base covering the axillary buds, or if not then the rachis wing-margined; not poisonous.
 - Rhus.** (42).
 - b. Petiole base not completely covering the axillary buds, the rachis not wing-margined; poisonous to the touch; glabrous; leaflets entire.
 - Toxicodendron.** (43)
17. Flowers regular or nearly so. 18.
17. Flowers irregular; shrubs or trees with opposite digitate leaves; ovulary 3-locular. **ASCLEPIACEAE.**

a. **Aesculus.** (10).

17. Flowers irregular in the number of the several floral sets; leaves pinnate or bipinnate, alternate; ovary 3-locular. SAPINDACEAE.

a. **Koelreuteria.** (39).

18. Stamens neither just as many nor twice as many as the petals. 19.
18. Stamens just as many or twice as many as the petals. 20.
19. Stamens distinct and fewer than the 4 petals; trees or shrubs with opposite pinnate or simple leaves. OLEACEAE.

a. Flowers diecious, from catkin-like scaly buds.

Forestiera. (75).

a. Flowers bisporangiate, petals linear.

Chionanthus. (73).

19. Stamens more numerous than the petals; leaves palmately veined, opposite; fruit 2-winged. Some ACERACEAE.

a. **Acer.** (11).

20. Ovules 1 or 2 in each cavity. 21.
20. Ovules several or many in each cavity; stipules between the opposite and pinnately compound leaves, caducous; shrubs or small trees. STAPHYLEACEAE.

a. **Staphylea.** (37).

21. Leaves palmately veined, or compound. 22.
21. Leaves pinnately veined, simple, not punctate. 23.
22. 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.** (38).

22. Leaves palmately veined or pinnately compound; trees or shrubs with opposite leaves and no stipules. ACERACEAE.

a. **Acer.** (41).

22. Leaves 3-foliolate, pellucid-punctuate, without stipules.
Some RUTACEAE.

a. **Ptelea.** (18).

23. Calyx minute; trees or shrubs with simple mostly alternate leaves. ELICACEAE.

a. **Ilex.** (36).

23. Calyx not minute; trees, shrubs, or woody climbers ours with opposite leaves and with minute fugaceous stipules. CELASTRACEAE.

a. **Euonymus.** (35).

24

24. Perfect stamens 4, styles 2; leaves alternate, palmately veined and lobed, or if pinnately veined then 2-ranked. HAMAMELIDACEAE.

See 13 above.

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

a. Leaves pinnate. **Sorbus.** (21).

a. Leaves simple. b.

b. Cavities of the ovulary as many as the styles. c.

b. Cavities of the ovulary becoming twice as many as the styles. **Amelanchier.** (25).

c. Ovules many in each cavity (carpel). **Cydonia.** (21).

c. Ovules 1-3 in each cavity of the ovulary. d.

d. Usually with typical thorns; ripe carpels bony.

Crataegus. (26).

d. Without thorns, but some may have thorn-like stunted branches; ripe carpels papery or leathery. e.

e. Leaves sharply and regularly serrate, glabrous when mature, petioles long; pome with grit cells. **Pyrus.** (22).

e. Leaves irregularly dentate or serrate, or more or less lobed; pome without grit cells. **Malus.** (23).

24. Stamens 4 or 5, style and stigma 1; leaves opposite or alternate. CORNACEAE.

a. Ovulary 2-locular, flowers bisporangiate. b.

a. Ovulary 1-locular, flowers diecious or imperfectly diecious. **Nyssa.** (81).

b. Flowers cymose, not involucre. **Cornus.** (79).

b. Flowers capitate, with an involucre of 4-6 large white bracts. **Cynoxylon.** (80).

24. Stamens 4 or 5 on a flat disc which covers the 3-5-locular ovulary; shrubs or trees with opposite leaves and minute fugaceous stipules. CELASTRACEAE.

See 23 above.

24. Stamens 5, styles usually 2-5; leaves bipinnate. ARALIACEAE.

a. **Aralia.** (78).

—25—

25. Leaves opposite. 26.

25. Leaves alternate. 27.

26. Stamens 5-8; leaves palmately veined and simple or if pinnately compound then the base of the petiole covering the axillary buds. ACERACEAE.

a. **Acer.** (41).

26. Stamens 2-4; leaves pinnately veined when simple, or pinnately compound then the axillary buds exposed. OLEACEAE.

a. Flowers fasciculate or racemose-fasciculate, not from prominent scaly buds; leaves compound.

Fraxinus. (74).

a. Flowers fasciculate, from scaly buds; leaves simple. **Forestiera.** (75).

27. At least the staminate flowers in catkins or catkin-like spikes or spherical heads. 31.

27. Flowers not in catkins or catkin-like spikes or heads. 28.

28. With prominent stipular spines; leaves punctuate with glands. RUTACEAE.

a. **Zanthoxylum.** (17).

28. Without stipular spines. 29.

29. Styles or stigmas 3 or 4; perigynous stamens 4-5, alternate with the sepals; ovulary 2-5-locular, ovules solitary in each cavity. **RHAMNACEAE.**

a. **Rhamnus.** (34).

29. Styles or stigmas 2; leaves 2-ranked; ovulary 1-2-ovuled; stipules fugaceous. **ULMACEAE.**

a. Flowers in clusters on twigs of the previous season, pith not diaphragmed. b.

a. Flowers on elongated twigs of the season; pith interruptedly diaphragmed. **Celtis.** (50).

b. Flowers expanding before the leaves; bark in rough ridges. **Ulmus.** (48).

b. Flowers expanding with the leaves; bark of trunk scaling off like in the Sycamore. **Planera.** (49).

29. Style and stigma 1. 30.

30. Calyx 6-parted; stamens and staminodes about 12, in 4 series; bark spicy-aromatic. **LAURACEAE.**

a. Flowers bisporangiate, paniced; leaves evergreen. **Persea.** (15).

a. Flowers monosporangiate, racemose or umbellate; leaves deciduous, some of them lobed. **Sassafras.** (16).

30. Calyx 5-parted; stamens 10 or fewer; bark not aromatic. **FABACEAE. (CASSIATAE).**

See 15 above.

30. Calyx 5-parted; stamens 5-15; flowers epigynous; pith solid but diaphragmed. **CORNACEAE.**

a. **Nyssa.** (81).

31. Twigs with complete stipular rings; base of petiole covering the axillary bud; flowers monocious, in dense heads. **PLATANACEAE.**

a. **Platanus.** (47).

31. Twigs without stipular rings. 32.

32. Axillary buds superposed; staminate flowers in flexible catkins; leaves pinnately compound.

JUGLANTACEAE.

a. Pith solid. **Hicoria.** (61).

a. Pith diaphragmed, with cavities. **Juglans.** (62).

32. Axillary buds not superposed or if so then the staminate flowers not in flexible catkins; leaves simple. 33.
33. Carpellate flowers epigynous; pith solid, with diaphragms. **CORNACEAE**.

a. **Nyssa.** (81).

33. Carpellate flowers hypogynous or perigynous; pith not diaphragmed. 34.
34. Staminate and carpellate flowers in dense spherical heads, sap not milky; leaves star-shaped, fragrant when crushed. **HAMAMELIDACEAE**.

a. **Liquidambar.** (16).

34. Staminate and carpellate flowers not in dense spherical heads unless the sap is milky; leaves not star-shaped. 35.
35. With milky sap; leaves with two prominent lateral veins from the base or if not then the twigs thorny. **MORACEAE**.

a. Twigs with thorns; carpellate perianth deeply 4-cleft, carpellate flowers capitate. **Toxylon.** (52).

a. Twigs without thorns. b.

b. Staminate and carpellate flowers in ament-like spikes. **Morus.** (51).

b. Staminate flowers racemose or spikate, the carpellate capitate. **Papyrius.** (53).

35. Sap not milky. 36.

36. Both staminate and carpellate flowers in aments, the carpellate flowers not subtended by a bur or cup. 37.

36. Carpellate flowers not in aments, subtended by a cup or involucre; staminate flowers in flexible or somewhat capitate aments. **FAGACEAE**.

a. Staminate flowers capitate, ovulary 3-angled.

Fagus. (54).

a. Staminate flowers in slender aments. b.

b. Carpellate flowers 2-5 in each involucre, which becomes prickly. **Castanea.** (55).

b. Carpellate flower 1 in each involucre, which consists of numerous scales. **Quercus.** (56).

37. Ovary 1-locular, many seeded; seeds with a tuft of cottony hairs. SALICACEÆ.
- a. Stamens numerous; bracts limbiate or entire, buds with several exposed scales; pith 5-angled. **Populus**. (61).
- a. Stamens 2-10; bracts entire; buds with 1 outer scale. **Salix**. (65).
37. Ovary 1-2 locular, with 1-2 ovules in each cavity; seeds not with cottony hairs. 38.
38. Carpellate flowers single in the axils of the bracts; young twigs and leaves glandular dotted; buds clustered at the tip of the twig. MYRICACEÆ.

a. **Myrica**. (63).

38. Carpellate flowers 2 or more in each bract of the ament; twigs and leaves not glandular dotted; buds not clustered at the tip of the twig. BETULACEÆ.
- a. Pith 3-angled; buds stalked; leaves not 2-ranked; stamens 4. **Alnus**. (60).
- a. Pith not 3-angled; buds sessile; leaves 2-ranked. b.
- b. Staminate flowers 3-6 in the axil of each bract, with a calyx; carpellate flowers without a calyx; stamens 2. **Betula**. (59).
- b. Staminate flowers solitary in the axil of each bract, without a calyx; carpellate flower with a calyx. c.
- c. Fruiting bract flat, 3-cleft and incised; bark smooth; trunk and large branches with peculiar fluted or projecting ridges. **Carpinus**. (57).
- c. Fruiting bract bladder-like, closed; bark of older trunks scaly and line-furrowed. **Ostrya**. (58).

- 39 -

39. Flowers hypogynous (ovary superior). 40.
39. Flowers epigynous (ovary inferior). 41.
40. Stamens free from the corolla (or only very slightly united at the base) as many as the petals (flowers tetra-cyclic) and alternate with them, or twice as many (pentacyclic) or more. 41.
40. Stamens united with the corolla, as many as the petals and opposite them or twice as many or more. 42

10. Stamens united with the corolla, the fertile ones fewer than the petals and alternate with them. 43.
11. Sympetalous trees or shrubs often with evergreen leaves without stipules. ERICACEAE.
- a. Leaves deciduous in autumn; flowers in paniced racemes; leaves sour, with long bristles on the midrib beneath. **Oxydendrum.** (68).
- a. Leaves evergreen, coriaceous. b.
- b. Corolla somewhat irregular, campanulate, without little saes. **Rhododendron.** (66).
- b. Corolla regular, saucer-shaped, 10-saccate, the anthers at first held in the little saes. **Kalmia.** (67).
11. Choripetalous plants in which the petals are sometimes partly or completely united.
- a. Ovary 1-locular (1 carpel) with 1 parietal placenta. FABACEAE.
- See 15 above.
- a. Ovary 4-8-locular, with 1 or 2 ovules in each cavity. LILICACEAE.
- See 23 above.
12. Stamens as many as the lobes of the small white corolla; leaves entire, simple and alternate; with thorns. SAPOTACEAE.
- a. **Bumelia.** (69).
12. 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.** (70).
13. Flowers regular, stamens usually 2. OLEACEAE.
- a. **Chionanthus.** (73).
13. Flowers irregular, zygomorphic; seeds numerous, stamens 4, didynamous; pith with cavities. Some SCROPHULARIACEAE.

a. **Paulownia.** (76).

43. Flowers irregular, zygomorphic; seeds numerous, fertile stamens usually 2 with 3 vestiges; pith solid. BIGNONIACEAE.

a. **Catalpa.** (77).

44. Stamens twice as many as the lobes of the corolla or more; leaves alternate and simple. 45.
44. Stamens as many as the lobes of the corolla; leaves opposite or whorled, simple. 46.
45. Corolla yellow; stamens in several series. SYMPLICACEAE.

a. **Symplocos.** (71)

45. Corolla white; stamens in one series. STYRACACEAE.

a. **Halesia.** (72).

46. Stipules present; flowers in dense heads in our species; usually blackening in drying. RUBRACEAE.

a. **Cephalanthus.** (82).

46. Usually without stipules; flowers in compound cymes in our species; not blackening in drying. CAPRIFOLIACEAE.

a. **Viburnum.** (83).

CLASSIFICATION AND DESCRIPTION OF THE SPECIES.

SPERMATOPHYTA. SEED-PLANTS.

Phylum, CYCADOPHYTA.

Class, GINKGOEAE.

Order, GINKGOALES.

Ginkgoaceae. Ginkgo Family.

1. **Ginkgo** Kaempf. Ginkgo.

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

Stamens and carpels in clusters on the dwarf branches, appearing with the leaves.

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

Phylum, STROBILOPHYTA.

Class, CONIFERAE. Conifers.

Order, PINALES.

Taxodiaceae. Bald-cypress Family.

2. **Taxodium** Rich. Bald-cypress.

Trees with feather like, annually deciduous dwarf branches with the numerous, small, narrow leaves usually spreading into two ranks, and having the slender twigs covered with small self-pruning scars.

Tall trees with horizontal or drooping branches; monoecious; carpellate cones globose, in small terminal clusters; their scales few, each with two ovules at the base.

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, brown and very durable. In swamps and along rivers. N. J. to Fla., west to Tex., north to Mo., and Ind.

Pinaceae. Pine Family.3. **Picea** Link. Spruce.

Evergreen trees with 4-angled leaves, all of about the same length, having the twigs covered with sterigma-bearing scales representing leaf bases.

Conical trees with leaves spirally arranged and spreading in all directions; monocious; staminate and carpellate cones often highly colored; carpellate cones pendulous.

1. Twigs and sterigmata glabrous; carpellate cones cylindric. 2.
1. Twigs pubescent, brown; carpellate cones ovoid or oval. 3.
2. Leaves usually $\frac{3}{4}$ -1 in. long; carpellate cones $2\frac{1}{2}$ -6 in. long. *P. abies*.
2. Leaves usually not much over $\frac{1}{2}$ in. long; very glaucous; carpellate cones $\frac{3}{4}$ -2 in. long. *P. canadensis*.
3. Leaves not glaucous; cones deciduous at the end of the first season. *P. rubens*.
3. Leaves glaucous; cones persistent for two or more seasons. *P. mariana*.

1. *Picea abies* (L.) Karst. Norway Spruce. A large tree, conical in shape when young, with numerous stout spreading and drooping branches. Abundant in cultivation. Source of Burgundy pitch. Native of Europe.

2. **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, soft, weak, and straight-grained wood. Newf. to Alaska, south to Me., Mich., and S. Dak.

3. **Picea rubens** Sarg. Red Spruce. A slender tree with spreading branches, and slender, sparingly pubescent twigs. Wood soft, weak and pale reddish. Newf. to northern N. Y. and Minn.; along the Alleghanies to Va. and Ga.

4. **Picea mariana** (Mill.) B. S. P. Black Spruce. A tree with spreading branches and smooth or only slightly roughened bark. Leaves not over $\frac{3}{4}$ 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.

4. **Tsùga** Carr. Hemlock.

Evergreen trees with flat linear leaves, those on the top of the twig short, and having the twigs covered with sterigma-bearing scales representing leaf bases.

Branches slender, horizontal or drooping; leaves spreading more or less into 2 ranks; monocious; carpellate cones small, pendulous.

1. **Tsuga canadensis** (L.) Carr. Hemlock. A tall tree with slender, horizontal or drooping branches, the old bark flaky in scales. Wood very coarse, light, brittle, 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.

5. **Abies** (Tourn.) Hill. Fir.

Evergreen trees with flat linear leaves, rarely prismatic, without sterigma-bearing scales, but with prominent circular leaf scars with a central bundle scar.

Carpellate cones erect, the scales deciduous; monocious; carpellate bract longer than the ovuliferous scale.

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

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

1. **Abies balsamea** (L.) Mill. Balsam Fir. A slender short-lived tree with smooth blistered bark. Wood very light and soft. Canada balsam is obtained from its resin. Newf., to Hudson Bay and Alberta, south to Penn., along the Alleghanies to Va., and to Mich., Iowa, and Minn.

2. **Abies fraseri** (Pursh) Poir. Fraser Fir. A slender tree growing on the high Alleghanies. Bark smooth, with resin blisters. W. Va., N. Car., and Tenn.

6. **Lârix** (Tourn.) Adams. Larch.

Trees with thick wart-like dwarf branches bearing a cluster of deciduous needle-shaped leaves.

Tall pyramidal, monoecious trees with horizontal or ascending branches; carpellate cones small, erect, with thin woody scales.

1. Carpellate cones small, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, oval or almost globular; ovuliferous scales glabrous; native, growing in bogs and wet places. *L. laricina*.
1. Carpellate cones rather large, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long; ovuliferous scales finely tomentose on the back, cultivated in dry ground. *L. larix*.

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 larix* (L.) Karst. 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. Native of Europe.

7. **Pinus** (Tourn.) L. Pine.

Evergreen trees with self-pruned dwarf branches bearing 1-7 needle-shaped leaves.

Resinous, monoecious trees with very small dwarf branches; 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. 5.
3. Leaves 6-10 in. long; carpellate cone oblong-conic or ovoid. 4.
3. Leaves 3-5 in. long; carpellate cones ovoid. *P. rigida*.
4. Old sheaths of the dwarf branches $\frac{2}{3}$ -1 in. long; leaves not glaucous; carpellate cones oblong-conic. *P. taeda*.
4. Old sheaths about $\frac{1}{2}$ in. long; leaves glaucous; carpellate cones ovoid. *P. scrotina*.
5. Twigs glaucous; resin-ducts parenchymatous; carpellate cones $1\frac{1}{2}$ -3 in. long; ovuliferous scales with a prickle or small spine. 6.
5. Twigs not glaucous. 7.
6. Leaves slender, $2\frac{1}{2}$ -5 in. long; buds not very resinous; prickles of the ovuliferous scales short and small. *P. echinata*.
6. 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*.
7. 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. 9.
7. Leaves 4-6 in. long, dark-green; ovuliferous scale without a spine or prickle, or sometimes with a very small prickle. 8.
8. Foliage lustrous, resin ducts peripheral; carpellate cones terminal or subterminal, oval-conic; ovuliferous scales pointless when mature. *P. resinosa*.
8. Foliage dull; resin ducts parenchymatous; carpellate cones lateral, ovoid-conic; ovuliferous scale with a small prickle. *P. laricio*.
9. Leaves $2\frac{1}{2}$ -4 in. long, grayish-green; twigs orange or brown; resin ducts parenchymatous; carpellate cones ovoid; 3-5 in. long. *P. pungens*.
9. Leaves $\frac{1}{2}$ - $2\frac{1}{2}$ in. long. 10.
10. 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*.

10. Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; resin ducts parenchymatous; carpellate cones oblong-conic, 1-2 in. long, usually upwardly curved. *P. banksiana*.

1. **Pinus stròbus** L. White Pine. A large tree with nearly smooth bark, except when old; 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 taèda** L. Loblolly Pine. A large 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.

3. **Pinus serótina** Mx. Pond Pine. A tree, usually with a short trunk and with the bark fissured into small plates. In swamps and ponds. Wood soft, brittle, and coarse-grained. Coastal plain. N. J. to Fla.

4. **Pinus rígida** 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.

5. **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.

6. *Pinus lar'cio* Poir. Austrian Pine. A tall, open, pyramidal tree of rapid growth with the thick spreading branches in regular whorls. Often cultivated. From Europe.

7. *Pinus silves'tris* 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. Native of northern Europe.

8. **Pinus banksiana** Lamb. 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.

9. **Pinus echinata** Mill. Yellow Pine. A large tree with spreading branches; leaves sometimes in 3's, sometimes in 2'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., Okl., and Tex.

10. **Pinus pungens** Lamb. 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.

11. **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.

Juniperaceae. Juniper Family.

Subfamily, *Cupressatae*.

8. **Thuja** L. Arborvitae.

Evergreen trees or shrubs with decidedly flattened and fan-like twigs, and with naked buds, the small leaves opposite, scale-like, appressed and 1-ranked; carpellate cone oblong, with 6-10 scales the 4 upper fertile.

Resinous and aromatic; flowers minute, monocious; ovules usually 2 on each scale, erect; scales dry coriaceous, not peltate.

1. Branchlets spreading more or less horizontally with a distinct upper and lower side; carpellate cones pendulous, the thin scales appendiculate below the apex; seeds winged. *T. occidentalis*.

1. Branchlets in a vertical plane with both sides alike; carpellate cones erect, the scales with a prominent horn-like process below the apex; seeds wingless. *T. orientalis*.

1. **Thuja occidentalis** L. American 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 Alleghanics to N. C., and to Ill. and Minn.

2. *Thuja orientalis* L. Chinese Arborvitae. A small pyramidal or bushy tree with spreading and ascending branches. Native of Asia. Cultivated in many forms.

9. **Libocèdrus** Endl. Incense-cedar.

Evergreen trees with naked buds and small, scale-like, appressed, opposite, 4-ranked, usually elongated leaves on somewhat flattened branches; scales of the carpellate cone 4-6, the two upper fertile, not peltate.

Tall, resinous aromatic trees with scaly bark, monoecious; staminate and carpellate cones on separate branchlets; seeds with unequal lateral wings.

1. *Libocedrus decurrens* Torr. Incense-cedar. A tree with a tall, straight, slightly lobed trunk, tapering from a broad base. Wood light, soft, close-grained, and very durable in contact with the soil. From the Pacific coast; often cultivated as an ornamental tree.

10. **Chamaecýparis** Spach. White-cedar.

Evergreen trees with small, scale-like appressed, nearly or quite similar leaves, naked buds, and dry peltate carpellate scales with 2-4 seeds.

Monoecious; carpellate cones globose, with thick, opposite scales, each with a central point.

1. Leaves dull blue-green; bark thin, divided into flat ridges. *C. thyoides*.

1. Leaves bright green; bark thick, divided into broad ridges. *C. lawsoniana*.

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

2. *Chamaecyparis lawsoniana* (Murr.) Parl. Lawson Cypress. A large tree with an abruptly enlarged base and a spire-like crown of small horizontal or pendulous branches.

Bark often 10 in. thick. Wood light, hard, and strong, abounding in fragrant resin. From the Pacific coast. Many varieties in cultivation.

Subfamily, *Juniperatae*.

11. **Juniperus** L. Juniper.

Evergreen trees or shrubs with naked buds, subulate or scale-like leaves, one or both kinds on a tree, and with carpellate cones developing into a bluish-black berry-like fruit.

Carpellate cones small, globose; plants usually dioecious, sometimes monoecious, pungent aromatic; bark usually thin and shreddy.

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 Alaska, 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, moth-proof chests 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 western Ont. and S. Dak., south to Fla. and Tex.

Phylum, ANTHOPHYTA.

Class, DICOTYLAÆ. Dicotyls.

Subclass, THALAMIFLORÆ.

Order, RANALES.

Magnoliaceæ. Magnolia Family.

12. **Magnolia** L. Magnolia.

Shrubs or trees with alternate, simple, entire leaves, not truncate, and with complete stipular rings.

Bark bitter aromatic; flowers bisporangrate, large, solitary; buds covered with connate, 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 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 Ontario and Mo., Ga., Ala., and Ark.

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., Mo., 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., Ark., and Tex.

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.

Various Magnolias are in cultivation, the more common one is *Magnolia soulangiana*, Soulange's Magnolia, a small tree with large purplish-pink flowers appearing before the leaves.

13. **Liriodendron** L. Tuliptree.

Trees with alternate, truncate, simple leaves, with solid, diaphragmed pith and complete stipular rings.

Buds with connate stipules; flowers large, perianth trimerous; anthers linear, extrorse; fruit aggregate, cone-like, dry.

1. **Liriodendron tulipifera** L. Tuliptree. A very large, magnificent, rapid-growing tree with glabrous leaf-buds. Flowers greenish-yellow, orange-colored within. Autumn leaves pure yellow. Next to the Sycamore, probably the largest tree in the Northeastern United States; trunk sometimes 34 ft in circumference. 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 paneling. Should be extensively cultivated. Vt. and R. I. to Fla., Mich., Ark., and Miss.

Anonaceae. Custard-apple Family.

II. **Asimina** Adans. Papaw.

Trees or shrubs with alternate, 2-ranked, simple, entire, pinnately veined, deciduous leaves and diaphragmed, solid pith.

Buds naked, silky; bark with fetid odor; perianth trimerous; stamens numerous; carpels 3-15.

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 hill-sides. Ont. and N. Y. to Mich., Neb., Tex., and Fla.

Lauraceae. Laurel Family.

15. **Persea** (Plum.) Gaertn. Bay.

Aromatic, evergreen trees or shrubs with alternate, simple, pinnately veined, entire leaves.

Perianth 6-parted; stamens and staminodes 12, in 4 series; fruit a globose or oblong berry.

1. **Persea borbonia** (L.) Spreng. Red Bay. A tree with dark red bark, lanceolate or oblong-lanceolate leaves, and

puberulent or nearly glabrous leaves. Wood hard, strong, bright red in color, and rather brittle; used for cabinet-making, and interior finish. Along streams and the border of swamps. Del. to Fla., Ark., and Tex.

16. **Sássafras** Nees and Eberm. *Sassafras*.

Trees with entire or 3-lobed, alternate leaves with 2 prominent lateral veins, with spicy aromatic bark and unequal internodes.

Flowers dioecious; perianth 6-parted; fruit a blue drupe.

1. **Sassafras sássafras** (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., Iowa, Fla., and Tex.

Order, GERANIALES.

Rutaceae. Rue Family.

17. **Zanthóxylum** L. Prickly-ash.

Trees or shrubs with alternate, pinnately compound, punctate leaves and with stipular spines.

Bark acrid aromatic; flowers imperfectly dioecious; fruit a capsule with 1-2 seeds.

1. **Zanthoxylum americànum** Mill. Prickly-ash. A prickly shrub or small tree with small flowers in sessile axillary cymes; stamens 3-5; carpels 2-5, distinct, seed oblong, black and shining. Wood soft and light brown. In woods and thickets. Quebec to Va., Ontario, S. Dak. and Kan.

18. **Ptèlea** L. Hoptree.

Shrubs or small trees with alternate, trifoliolate, punctate leaves and superposed buds covered by the petiole base.

Bark bitter; flowers imperfectly monosporangiate; stamens 1-5; fruit a samara with a membranous wing; ovulary 2-locular.

1. **Ptelea trifoliata** L. Hop-tree. A shrub or small tree with sunken superposed axillary buds covered by the petiole base. Bark and flowers with a disagreeable odor. Wood light brown, heavy, and hard. In woods. Com. to Fla., Ont., Minn., Kan., and Mexico.

Simarubaceae. Ailanthus Family.

19. **Ailanthus** Desf. Ailanthus.

Large trees with alternate, pinnately compound, large leaves having green glands on the under side of the teeth at the base of the leaflets.

Branches robust with large brown pith; flowers diceous; the 5 samaras linear or oblong, usually twisted.

1. **Ailanthus glandulosa** 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., and Kan.

Order, MALVALES.

Tiliaceae. Linden Family.

20. **Tilia** (Tourn.) L. Linden.

Trees with 2-ranked, simple palmately veined, inequilateral, serrate or dentate leaves and solid pith.

Flowers bisporangiate, pentamerous, stamens numerous; dry drupaceous fruit in cymose clusters, the peduncle subtended by a broad membranous bract.

1. Leaves glabrous or nearly so on both sides, except on the veins and in their axils. 2.
1. Leaves glabrous above, pubescent beneath. *T. pubescens.*
1. Leaves glabrous above, silvery-white beneath. *T. heterophylla.*
2. Petals with scales at the base; inflorescence without bracts; leaves comparatively large; native. *T. americana.*

2. Petals without scales at the base; inflorescence with large bracts; leaves comparatively small; cultivated. *T. europæa*.

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., and Tex.

2. **Tilia pubescens** Ait. Downy Linden. A small tree growing in moist soil, mostly along the coast. Wood as in *T. americana* but lighter in weight. Va. to Fla., west to Tex.

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

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

Subclass, CALYCIFLORÆ.

Order, ROSALES.

Rosaceæ, Rose Family.

Malacæ, Apple Subfamily.

21. **Sórbus** (Pourn.) L. Mountain-ash.

Trees or shrubs with alternate, odd-pinnate leaves, terminal buds, cylindrical pith, and 3-5 bundle-scars in the narrow leaf scar.

Flowers bisporangiate; 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. aucuparia*.
2. Leaflets long-accuminate; fruit less than $\frac{1}{2}$ in. in diameter. *S. americana*.
2. Leaflets obtuse or short-pointed; fruit more than $\frac{1}{2}$ in. in diameter. *S. scopulina*.

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

2. **Sorbus scopulina** Greene. Western 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 aucuparia** 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.

22. **Pyrus** (Tourn.) L. Pear.

Trees or shrubs with alternate, simple, pinnately-veined, serrate leaves with long petioles; with stipules or stipular scars; with terminal buds, cylindrical pith, and fruit a pome with grit cells.

Flowers bisporangiate with a fleshy hypanthium united with the ovulary; pentamerous; stamens numerous.

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

23. **Malus** Mill. Apple, Crab-apple.

Trees or shrubs with alternate, simple, pinnately-veined, dentate, serrate or more or less lobed leaves, with stipules or stipular scars; with terminal buds, cylindrical pith, and fruit a pome without grit cells.

Flowers bisporangiate with a fleshy hypanthium united with the ovulary, pentamerous, stamens numerous.

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. coronaria*.

2. Leaves ovate, rounded or cordate at the base, often somewhat lobed. *M. glaucescens*.

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. *M. ioensis*.
3. Leaves rounded or cordate at the base; pome usually large, 2-4 in. in diameter. *M. malus*.

1. **Malus coronària** (L.) Mill. Narrow-leaf 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. Wood hard, reddish-brown. On low ground. N. J. to Ill., Kan., Fla., and La.

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

3. **Malus glaucéscens** Rehd. 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. Wood soft and reddish-brown. On low ground. Ont. to Mich., S. Car., Iowa, and Mo.

4. **Malus ioénsis** (Wood) Britt. Iowa Crab-apple. A small tree much resembling *M. glaucéscens*. 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 Okla.

5. **Malus màlus** (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.

21. **Cydònia** FOURR. Quince

Shrubs or low small trees, our cultivated species with alternate, simple, pinnately veined, entire, deciduous leaves with stipules or stipular scars; cylindrical pith, and with fruit a pome containing many seeds in each cavity.

Flowers bisporangiate, perianth pentamerous, pome fleshy.

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

25. **Amelanchier** Medic. Juneberry.

Shrubs or small trees with alternate, simple, serrate, pinnately-veined leaves; with 3 bundle scars, terminal bud, a narrow leaf scar, and fruit a berry-like pome.

Flower bisporangiate, perianth pentamerous, pome small with twice the number of cavities as styles.

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. sanguinea*.

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. intermedia*.

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

2. **Amelanchier intermedia** Spach. Swamp Juneberry. A shrub or small tree growing in swamps and moist soil. Variable. N. Eng. to Ont., Fla., and La.

3. **Amelanchier sanguinea** (Pursh) DC. Roundleaf Juneberry. A tall shrub or small tree growing in woods and thickets. N. B. to Minn., N. C., and Mich.

26. **Crataegus** L. Hawthorn.

Small trees or shrubs with simple, serrate or lobed leaves, with stipules or stipular scars, and usually with typical axillary thorns, but without terminal thorns.

Flowers bisporangiate, perianth pentamerous, stamens 5-25; pome drupe-like with bony ripe carpels.

The species of *Crataegus* are at present in a very unsatisfactory condition. Probably many of those included

below are merely hybrids or forms of freely interbreeding elementary varieties. Many of the specific English names are also unsatisfactory.

Required for identification, the leaves and fruit.

1. Leaves not deltoid-cordate. 2.
1. Leaves conspicuously deltoid-cordate, glabrous. (*Cordatae*). 55.
2. Leaves glabrous, glabrous above and pubescent beneath, or pubescent on both sides. 3.
2. Leaves pubescent above, glabrous beneath; thorns $\frac{1}{2}$ -1 in. long; fruit black. (*Douglasianae*). 54.
3. Petioles $\frac{1}{2}$ in. long or longer. 4.
3. Petioles less than $\frac{1}{2}$ in. long. (*Parvifoliae*). 53.
4. Leaves not deeply cut. 5.
4. Leaves deeply cut, lobes numerous; thorns less than 1 in. long (*Oxyacanthae*). 52.
5. Leaves broadest at the middle or apex, cuneate. 6.
5. Leaves broadest at the base. 12.
6. Leaves broadest toward the apex. 7.
6. Leaves broadest at the middle. 8.
7. Leaves shining, not impressed-veined above. (*Crusgalli*). 14.
7. Leaves dull, impressed-veined above. (*Punctatae*). 18.
8. Petioles usually glandless, or if so then the nutlets pitted on the ventral faces. 9.
8. Petioles always with small stalked glands along their entire length; nutlets without ventral pits. (*Intricatae*). 30.
9. Calyx-lobes glandular-laciniate, glandular-serrate, or glandular-margined. 10.
9. Calyx-lobes not glandular-margined; leaves not impressed-veined, often trilobed towards the apex. (*Virides*). 29.
10. Leaves impressed-veined. 11.
10. Leaves not impressed-veined, elliptic ovate to orbicular; calyx-lobes glandular-margined; leaves not trilobate (*Rotundifoliae*). 24.
11. Leaves rhombic-elliptic; calyx-lobes usually deeply cut; nutlets deeply pitted on the ventral faces. (*Macracanthae*). 21.

- 11. Leaves elliptic to ovate; calyx-lobes less deeply cut; nutlets with shallow pits on the ventral faces (Brainerdianae). 23.
- 12. Leaves $\frac{1}{2}$ - $2\frac{1}{2}$ in. long and wide, membranous; calyx-lobes usually entire. 13.
- 12. Leaves 1-4 in. long and wide; calyx-lobes usually serrate. (Coccineae). 14.
- 13. Leaves yellow-green often slightly pubescent; fruit soft at maturity. (Tenuifoliae). 34.
- 13. Leaves blue-green, usually glabrous; fruit hard at maturity. (Pruinosae). 38.

— *Crus-galli*. —

- 14. Leaves not lobed. 15.
- 14. Leaves somewhat lobed. 16.
- 15. Leaves $\frac{3}{4}$ -1 in. long. *C. crus-galli*.
- 15. Leaves $\frac{3}{4}$ - $2\frac{1}{2}$ in. long. *C. berberifolia*.
- 16. Styles and nutlets usually 2.

C. schizophylla.

- 16. Styles and nutlets usually 3-5. 17.
- 17. Lobes of the leaves irregular, obtuse; fruit globose. *C. denaria*.
- 17. Lobes of the leaves regular, acute; calyx-lobes serrate. *C. fecunda*.

— *Punctatae*. —

- 18. Fruit ellipsoidal; nutlets usually 3 or 4. 19.
- 18. Fruit globose. 20.
- 19. Leaves bright yellow-green, slightly impressed-veined above. *C. cuneiformis*.
- 19. Leaves dull gray-green, strongly impressed-veined above, obovate, narrow. *C. punctata*.
- 20. Nutlets 2 or 3. *C. margaritta*.
- 20. Nutlets 4 or 5. *C. suborbiculata*.

— *Macracanthae*. —

- 21. Leaves dark green, glabrous and shining above, coriaceous. 22.
- 21. Leaves gray-green, pubescent and dull above, subcoriaceous, rhombic-ovate, lobed. *C. calpodendron*.
- 22. Fruit $\frac{3}{8}$ in. thick or less; leaves large. *C. succulenta*.
- 22. Fruit $\frac{1}{2}$ in. thick or less; leaves small. *C. neofluvialis*.

— *Braincrdianae*. —

23. Fruit and corymbs pubescent; calyx-lobes sharply glandular-serrate; leaves serrate; styles and nutlets 2 or 3. *C. pertomentosa*.
23. Fruit and corymbs glabrous; calyx-lobes remotely glandular-serrate. *C. braincrdi*.

— *Rotundifoliae*. —

24. Leaves longer than wide. 25.
24. Leaves about as wide as long. 26.
25. Leaf lobes acuminate. *C. laurentiana*.
25. Leaf lobes acute. *C. lucorum*.
26. Leaf-lobes acuminate. *C. irrasa*.
26. Leaf-lobes acute or obtuse. 27.
27. Calyx-tube prominent; fruit subglobose. *C. macaulcyae*.
27. Calyx-tube obscure. 28.
28. Leaves acutely lobed toward the apex; calyx-lobes glandular-laciniate. *C. bicknellii*.
28. Leaves not acutely lobed; calyx-lobes glandular-margined only; fruit globose, red, round in cross-section *C. chrysocarpa*.

— *Virides*. —

29. Leaves ovate; lobes shallow; fruit yellow-red. *C. ovata*.
29. Leaves oblong-ovate lobes deep; fruit bright red, glaucous. *C. viridis*.

— *Intricatae*. —

30. Foliage and fruit pubescent; corymbs villous. 31.
30. Foliage, fruit, and corymbs glabrous. 32.
31. Fruit globose, greenish to reddish-brown. *C. intricata*.
31. Fruit ellipsoid or pyriform, yellow. *C. stouci*.
32. Leaves cordate, lobed. *C. populifolia*.
32. Leaves cuneate, lobed. 33.
33. Leaves elliptic-ovate; fruit pyriform-ellipsoid. *C. straminea*.
33. Leaves ovate to oval; fruit globose or subglobose, reddish-green to reddish-brown. *C. boyntoni*.

— *Tenuifoliae*. —

34. Fruit ellipsoid, ovoid, or pyriform; calyx-lobes entire. 35.
34. Fruit compressed-globose or subglobose. 36.
35. Leaves much lobed; fruit small, $\frac{1}{2}$ - $\frac{3}{4}$ in. thick, with rather firm flesh. *C. roanensis*.

35. Leaves not conspicuously lobed; fruit large, $\frac{1}{2}$ - $\frac{3}{4}$ in. thick, with soft flesh. *C. macrosperma*.
 36. Lobes of the leaves reflexed. *C. grayana*.
 36. Leaf-lobes spreading or ascending. 37.
 37. Terminal leaves cuneate. *C. alnorum*.
 37. Terminal leaves cordate. *C. populnea*.

- *Pruinosae*. —

38. Leaves elliptic-ovate. *C. jescupi*.
 38. Leaves ovate. 39.
 39. Leaves usually cordate. 40.
 39. Leaves usually cuneate. 41.
 40. Fruit conspicuously angled, strongly pruinose. *C. rugosa*.
 40. Fruit not conspicuously angled, only slightly pruinose. *C. filipes*.
 41. Lobes of the leaves deep, acuminate. *C. leiophylla*.
 41. Lobes of the leaves shallow, acute. 42.
 42. Fruit without conspicuous angles. *C. beata*.
 42. Fruit conspicuously angled. 43.
 43. Leaves deltoid. *C. gallingeri*.
 43. Leaves ovate. *C. pruinosa*.

— *Coccineae*. —

44. Mature leaves usually glabrous above; young foliage bronze-green. 45.
 44. Mature leaves tomentose above; young foliage yellow-green. 50.
 45. Leaves oblong-ovate. 46.
 45. Leaves broadly ovate. 47.
 46. Corymbs nearly glabrous. *C. zillipes*.
 46. Corymbs very pubescent. *C. anomala*.
 47. Corymbs and fruit glabrous. *C. coccinioides*.
 47. Corymbs and fruit pubescent or tomentose 48.
 48. Leaves on the vegetative shoots cuneate. 49.
 48. Leaves on the vegetative shoots cordate. *C. albicans*.
 49. Leaves concave, 1 $\frac{1}{2}$ -3 in. long, 1 $\frac{1}{4}$ -2 $\frac{3}{4}$ in. wide. *C. pringlei*.
 49. Leaves plane, 1 $\frac{1}{2}$ -4 in. long, 1 $\frac{1}{4}$ -3 $\frac{1}{2}$ in. wide. *C. coccinea*.
 50. Leaves on the vegetative shoots emneate at the base. 51.
 50. Leaves on the vegetative shoots cordate. *C. mollis*.
 51. Lobes of the leaves broad, shallow, acuminate. *C. arnoldiana*.

51. Lobes narrow, deep, and acute; fruit ellipsoid-pyriform.
C. submollis.
— *Oxyacanthae*. —
52. Leaves ovate, 3-5-lobed or cleft. *C. monogyna*.
Parvifoliae. —
53. Leaves small, subcoriaceous, corymbs 1-3-flowered.
C. uniflora.
— *Douglasianae*. —
54. Leaves subcoriaceous, petioles $\frac{1}{4}$ - $\frac{3}{4}$ in. long. *C. douglasii*.
— *Cordatae*. —
55. Leaves often conspicuously 3-5-lobed, petioles $\frac{1}{2}$ -2 in.
long. *C. phacopyrum*.

1. **Crataegus crús-gálli** L. Cockspur Hawthorn. A small tree with spreading branches and numerous slender thorns. Leaves coriaceous, shining above, sharply serrate. Fruit ellipsoid-ovoid to subglobose, greenish to red, flesh hard, remaining on the branches until late in the winter. The best hawthorn for hedges. N. Y. to Ont., south to Conn., Ga., and Kan.

2. **Crataegus berberifòlia** T. & G. Barberry-leaf Hawthorn. A small tree with spreading branches and a broad crown, with few thorns. Leaves oblong-cuneiform, spatulate, or obovate, rough-pubescent above, white-pubescent or tomentose beneath. Fruit subglobose to short-ellipsoid, yellow, orange, or red. Ky. to Mo. and the Gulf States.

3. **Crataegus schizophýlla** Eggl. Martha's Vineyard Hawthorn. A small tree with irregular ascending branches and numerous thorns. Leaves oblong-ovate to ovate, coarsely serrate with short acute lobes toward the apex, glabrous, slightly impressed-veined. Fruit pyriform-ellipsoid, dark red; nutlets ribbed on the back. Mass.

4. **Crataegus denària** Beadle. Palmer's Hawthorn. A small tree with spreading branches and a round-topped crown. Leaves oval, ovate, or oblong-ovate, often slightly lobed towards the apex. Fruit globose or subglobose, reddish-green or light red. In low rich soil. Ky. to Mo. and Miss.

5. **Crataegus fecúnda** Sarg. Fruitful Hawthorn. A small tree with spreading branches and numerous thorns.

Leaves oblong-obovate to oval. Fruit short-ellipsoid to subglobose, orange-red, slightly pubescent. Rich bottom lands. Ill. and Mo.

6. **Crataegus cuneifórmis** (Marsh.) Eggli. Marshall's Hawthorn. A small tree with widely spreading branches, dark brown scaly bark, and numerous, often branched thorns. Leaves oblanceolate-obovate. Fruit ellipsoid-pyriform, scarlet or dark red. N. Y. and Pa. to Va. and Ill.

7. **Crataegus punctàta** Jacq. Dotted Hawthorn. A small flat-topped tree with horizontal or ascending branches and light gray thorns. Leaves obovate, serrate, doubly serrate, or lobed at the apex. Fruit short-ellipsoid, yellow or red, somewhat edible. Quebec to Pa., Minn., Iowa, and Ky.

8. **Crataegus margarétta** Ashe. Margaret's Hawthorn. A shrub or small tree with ascending branches forming a round crown. Leaves oblong-obovate to ovate, serrate or doubly serrate, usually somewhat lobed. Fruit dull rusty green, yellow, or red, compressed globose to short ellipsoid, angular. Ont. to Iowa, Mo., Tenn., and Va.

9. **Crataegus suborbiculàta** Sarg. Caughuawaga Hawthorn. A small tree with spreading branches and a broad crown. Leaves ovate-orbicular, serrate or doubly serrate. Fruit globose or compressed-globose, dull green to scarlet. In lime-stone areas. Montreal to Mich.

10. **Crataegus succulènta** Schrad. Longthorn Hawthorn. A small tree with ascending branches forming a broad irregular crown, and with numerous bright, brown thorns. Leaves rhombic-ovate to obovate, doubly serrate and usually somewhat lobed toward the apex. Fruit subglobose, dark red. N. S. to Minn., N. C., Neb., and Col.

11. **Crataegus neofluviàlis** Ashe. New River Hawthorn. A small tree with ascending and spreading branches, and numerous thorns. Leaves elliptic-ovate to obovate, doubly serrate and somewhat lobed towards the apex, coriaceous, dark green and shining above. Fruit globose or short-ellipsoid, dark red. Vt. to Wis., N. C., and Iowa.

12. **Crataegus calpodéndron** (Ehrh.) Medic. Pear Hawthorn. A shrub or small tree with ascending and spreading branches forming a broad crown, with stout thorns and tomentose twigs. Leaves rhombic-ovate, acute or acuminate

at the apex, doubly serrate. Fruit pyriform or ellipsoid, orange-red or red. N. Y. and N. J. to Minn. and Mo.

13. **Crataegus pertomentosa** Ashe. Prairie Hawthorn. A small tree with nearly horizontal branches forming a flattened crown and with numerous curved thorns. Leaves oblong to obovate finely doubly serrate or lobed. Fruit globular or nearly so, cherry-red, villous when young. Rocky soil. Iowa, Mo., and Kan.

14. **Crataegus brainerdi** Sarg. Brainerd's Hawthorn. A shrub or small tree with ascending branches. Leaves elliptic to ovate finely doubly serrate or lobed. Fruit short-ellipsoid to globose, cherry-red to scarlet. New Eng. to Iowa and Pa.

15. **Crataegus laurentiana** Sarg. Fernald's Hawthorn. A large, much-branched shrub or small tree with long thorns. Leaves oblong to oblong-ovate, sharply doubly serrate or lobed. Fruit ellipsoid, dark crimson. Newf., N. S., Quebec, Me., and shores of Lake Superior.

16. **Crataegus lucorum** Sarg. Grove Hawthorn. A shrub or small tree with ascending branches. Leaves oblong-ovate to broadly ovate, doubly serrate or lobed. Fruit pyriform—ellipsoid, crimson. Ill. and Wis.

17. **Crataegus irrasa** Sarg. Blanchard's Hawthorn. A shrub or small tree with numerous spines. Leaves ovate to elliptic, doubly serrate or lobed. Fruit subglobose to short-ellipsoid, red or scarlet, somewhat pubescent. Quebec to Vt and N. Y.

18. **Crataegus macauleyae** Sarg. Macauley's Hawthorn. A small round-topped tree with somewhat pendulous branches. Leaves ovate to oval, doubly serrate or lobed. Fruit subglobose to short-ellipsoid, dark crimson. N. Y.

19. **Crataegus bicknelli** Eggl. Bicknell's Hawthorn. A round-topped shrubby tree with numerous stout thorns. Leaves ovate or oblong-ovate, sharply doubly serrate and lobed. Fruit globose, red. Mass.

20. **Crataegus chrysocarpa** Ashe. Roundleaf Hawthorn. A beautiful, round-topped shrub or small tree with numerous thorns. Leaves ovate-orbicular or obovate, doubly serrate or lobed, shining above. Fruit depressed-globose to short-ovoid, red. N. S. and N. B. to Saskatch., south to N. C., Neb., and N. M.

21. **Crataegus ovàta** Sarg. Ovate-leaf Hawthorn. A tree with yellow scaly bark. Leaves ovate-elliptic or obovate, coarsely serrate or doubly serrate, often somewhat lobed towards the apex, dark green and shining above. Fruit globose or compressed-globose, yellow to orange-red. River bottoms. Ky. and Mo.

22. **Crataegus víridis** L. Green Hawthorn. A tree with ascending branches and a broad crown, often without thorns. Leaves oblong ovate, serrate or doubly serrate, often lobed toward the apex, dark green and shining above. Fruit globose or compressed-globose, bright red or orange, glaucous. Alluvial soil. Va. to Fla., Ind., Ill., Kan., and Tex.

23. **Crataegus intricàta** Lange. Biltmore Hawthorn. An irregularly branched shrub or small tree with few thorns. Leaves elliptic-ovate to broadly ovate doubly serrate or lobed, rough-pubescent. Fruit short-ellipsoid to globose, greenish-yellow or becoming dark reddish-brown, somewhat pubescent. Open rocky woods. N. Eng. and N. Y., south to S. Car. and Mo.

24. **Crataegus stònei** Sarg. Stone's Hawthorn. A much-branched shrub or small tree with prominent thorns. Leaves oblong to oblong-ovate, doubly serrate or lobed. Fruit pyriform to short-ellipsoid, light yellow or yellow-green tinged with red. Rocky soil. Mass., Conn., and N. Y.

25. **Crataegus populifòlia** Walt. Poplar-leaf Hawthorn. A shrub or small tree with ascending and spreading branches forming a round crown. Leaves deltoid-ovate or oblong-ovate, serrate or doubly serrate with acute lobes. Fruit globose, light red, without angles. Va. to S. C.

26. **Crataegus stramínea** Beadle. Alleghany Hawthorn. An irregularly branched shrub or small tree with occasional thorns. Leaves elliptic-ovate, doubly serrate or lobed. Fruit pyriform to ellipsoid, angular, yellow-green. Rocky hills. Vt. to Mich., south to Del., Ala., and Mo.

27. **Crataegus boýntoni** Beadle. Boynton's Hawthorn. A round-topped, irregularly branched shrub or small tree with occasional thorns. Leaves oval to ovate, doubly serrate or slightly lobed. Fruit subglobose, orange-red or red-brown. Shaly soil. Mass. to Mich., south to S. C. and Tenn.

28. **Crataegus roanénsis** Ashe. Roan Mountain Hawthorn. A shrub or small tree with ascending branches and numerous curved thorns. Leaves ovate or oblong-ovate, serrate with acute straight lobes. Fruit ellipsoid, ovoid, or pyriform, crimson. Quebec to Wis., N. C., and Tenn.

29. **Crataegus macrosérma** Ashe. Variable Hawthorn. A shrub or small tree with ascending branches and numerous thorns. Leaves elliptic-ovate to broadly ovate, doubly serrate and somewhat lobed. Fruit ellipsoid or pyriform, scarlet to crimson, often glaucous. N. S. and Maine to Minn., N. C., and Tenn.

30. **Crataegus grayàna** Eggl. Gray's Hawthorn. A large shrub or small tree with ascending branches. Leaves ovate, doubly serrate with 4-6 pairs of acuminate lobes. Fruit subglobose to short ellipsoid, angular, dark cherry-red. N. Eng. to Ont. and N. Y.

31. **Crataegus alnòrum** Sarg. Edson's Hawthorn. A broad shrub or small tree with ascending branches. Leaves ovate, serrate or doubly serrate with acute lobes. Fruit subglobose, slightly angular, dark cherry-red. N. Eng. to Mich. and Pa.

32. **Crataegus popùlnea** Ashe. Gruber's Hawthorn. A shrub or small tree with a flattened round crown. Leaves broadly ovate to elliptic-ovate, slightly villous, serrate or doubly serrate, sometimes lobed. Fruit glabrous to short-ellipsoid, scarlet. Low ground. Ont. to Pa. and Del.

33. **Crataegus jésupi** Sarg. Jesup's Hawthorn. A large shrub or small tree with ascending branches. Leaves elliptic-ovate, serrate or doubly serrate with 4 or 5 pairs of acute lobes. Fruit short-ellipsoid to pyriform, slightly angled, dark red. Vt. to Wis. south to Pa.

34. **Crataegus rugòsa** Ashe. Rugose Hawthorn. A shrub or small tree with ascending branches. Leaves broadly ovate, serrate or doubly serrate with 4-6 pairs of broad acuminate lobes, glabrous. Fruit depressed-globose, bright red. Conn. to Pa., Ind., and N. C.

35. **Crataegus fílipes** Ashe. Beekwith's Hawthorn. A shrub or small tree with ascending branches and numerous thorns. Leaves ovate, serrate or twice serrate and lobed, glabrous. Fruit globose or compressed-globose, cherry-red. Western N. Eng. to Mich. south to Pa.

36. *Crataegus leiophylla* Sarg. Maine's Hawthorn. A large shrub or small tree with erect branches and numerous thorns. Leaves broadly ovate, doubly serrate, with 3-5 pairs of acuminate spreading lobes, dull. Fruit pyriform to globose, slightly angular, bright or dark scarlet. N. Y. to Pa.

37. *Crataegus leata* Sarg. Dunbar's Hawthorn. A shrub or small tree with ascending or erect branches. Leaves ovate, doubly serrate with acute lobes, dull. Fruit short ellipsoid, slightly angular, crimson. Ont. to Pa.

38. *Crataegus gattingeri* Ashe Gattinger's Hawthorn. A shrub or small tree with ascending branches forming an irregular crown, and with numerous thorns. Leaves narrowly ovate to deltoid, serrate or doubly serrate, lobed toward the apex, glabrous, dark green above. Fruit globose, angular, red. Pa. to Ind., south to W. Va. and Tenn.

39. *Crataegus pruinosa* (Wendl.) Koch. Waxy-fruited Hawthorn. A shrub or small tree with ascending branches, irregular crown, and numerous slender thorns. Leaves elliptic-ovate to broadly ovate, doubly serrate with 3 or 4 pairs of broad acute lobes toward the apex, glabrous. Fruit depressed-globose or short-ellipsoid, strongly angled, pruinose, scarlet or purple. Rocky open woods. N. Eng. to Mich., N. C. and Mo.

40. *Crataegus villipes* Ashe. Thinleaf Hawthorn. A tree with strongly ascending branches. Leaves elliptic-ovate, serrate or doubly serrate with 4-6 pairs of acute or acuminate lobes, pubescent or scabrous. Fruit pyriform or ellipsoid, crimson. Maine to Quebec to Mich., south in the mountains to N. C.

41. *Crataegus anomala* Sarg. Oblong-leaf Hawthorn. A shrubby tree with numerous thorns. Leaves oblong to ovate, serrate or doubly serrate with acute lobes. Fruit pyriform-ellipsoid, crimson. Quebec to Mass. and N. Y.

42. *Crataegus coccinoides* Ashe. Eggert's Hawthorn. A shrub or small tree with spreading branches. Leaves broadly ovate, doubly serrate, dark green above. Fruit subglobose, obtusely angled. Quebec to R. I., west to Mo. and Kan.

43. *Crataegus pringlei* Sarg. Pringle's Hawthorn. A small tree with ascending branches. Leaves ovate to oval, doubly serrate, with shallow lobes. Fruit short-ellipsoid to

pyriform, pubescent, red. Western N. Eng. to Ill. south to Pa.

44. **Crataegus coccinea** L. Scarlet Hawthorn. A small tree with ascending and spreading branches and stout short thorns. Leaves broadly ovate, acute or acuminate at the apex, broadly cuneate or truncate at the base, doubly serrate or lobed, somewhat scabrous. Fruit pyriform to short ellipsoid, red, somewhat edible. Of considerable decorative value. Conn. to Ont., Ill., Del. and Pa.

45. **Crataegus albicans** Ashe. Tatnall's Hawthorn. A shrub or small tree with spreading branches. Leaves broadly ovate to oblong-ovate, doubly serrate or lobed. Fruit subglobose or somewhat pyriform, dark red. Western N. Eng. to Mich., south to Del. and Tenn.

46. **Crataegus arnoldiana** Sarg. Arnold's Hawthorn. A small tree with ascending branches, forming a broad crown, and numerous long thorns. Leaves broadly ovate to oval, serrate or doubly serrate with broad shallow lobes, tomentose or scabrous above. Fruit globose or subglobose, bright crimson, slightly pubescent; flesh thick, juicy, and edible. Mass. and Conn.

47. **Crataegus submollis** Sarg. Emerson's Hawthorn. A small tree with spreading branches, forming a broad symmetrical crown, and with numerous thorns. Leaves ovate doubly serrate and acutely lobed, tomentose, becoming scabrate. Fruit short-ellipsoid to pyriform, orange-red, slightly tomentose, edible. Quebec to Mass. and N. Y.

48. **Crataegus mollis** (T. & G.) Scheele. Downy Hawthorn. A tree with spreading branches and densely pubescent twigs, forming a broad-topped crown. Leaves broadly ovate, doubly serrate with narrow acute lobes, densely tomentose. Fruit short-ellipsoid to subglobose, scarlet, edible. Ont. to S. Dak., Tenn. and Ark.

49. **Crataegus monógyna** Jacq. English Hawthorn. A shrub or tree with ascending branches and numerous thorns. Leaves ovate, sharply 3-15 lobed or cleft, dark green and glabrous above when mature. Fruit globose or subglobose, red. Native of Europe. Sparingly escaped in the eastern states.

50. **Crataegus uniflora** Muench. Dwarf Hawthorn. An irregular shrub or small tree with numerous, slender,

straight thorns. Leaves obovate to spatulate, crenate or crenate-serrate, shining above. Corymbs 1-3 flowered. Fruit ellipsoid, pyriform or globose, greenish-yellow or red. In sandy soil. N. Y. to Fla., west to W. Va., Mo., and Tex.

51. *Crataegus douglásii* Lindl. Douglas' Hawthorn. A shrub or tree with dark brown scaly bark and short thorns. Leaves ovate to obovate, doubly serrate and lobed, dark green and pubescent above. Fruit short-ellipsoid, dark purple; flesh soft, sweet. From Mich. northwestward.

52. *Crataegus phaenopyrum* (L. f.) Medic. Washington Hawthorn. A shrub or small tree with strongly ascending branches and numerous thorns. Leaves ovate-triangular, simply or doubly serrate, often 3-5 lobed, bright green and glabrous above. Fruit depressed-globose, scarlet. Moist rich ground. A very desirable species for cultivation. Va. to Ga., Ill., and Ark. Naturalized northward to N. J., Pa., and Ohio.

Amygdalatae. Peach Subfamily.

27. *Prúnus* (Tourne.) L. Apricot, Plum, Cherry.

Shrubs or trees with alternate, simple, serrate, pinnately-veined leaves, with disk-like or tooth-like glands on the petiole; with stipules or stipular scars, cylindrical pith, twigs some shade of brown, and with the fruit a drupe.

Terminal bud present or self-pruned; perianth pentamerous; carpel 1, hypanthium deciduous; drupe mostly edible.

1. Terminal bud usually present; leaves conduplicate in vernation; stone globose, little or not at all flattened; inflorescence racemose, corymbose, or umbellate. 2.
1. Terminal bud self-pruned; leaves convolute in vernation; stone of the drupe compressed; inflorescence umbellate or with only 1 or 2 flowers. 7.
2. Petioles usually not over $\frac{1}{2}$ in. long; leaves ovate, abruptly acute at the apex; flowers corymbose, terminating twigs of the season. *P. mahaleb*.
2. Petioles usually an inch or more long, or if not, the leaves not ovate; flowers in umbellate or somewhat corymbose clusters, or in racemes. 3.
3. Flowers in umbellate or corymbose clusters. 4.
3. Flowers in racemes. 6.

4. Leaves glabrous or nearly so. 5.
4. Leaves pubescent beneath, at least on the veins, with prominent hairs; inflorescence umbellate; drupe sweet. *P. acutum*.
5. Leaves ovate lanceolate to lanceolate; inflorescence more or less corymbose; drupe with thin sour flesh. *P. pennsylvanica*.
5. Leaves ovate to ovate-lanceolate; inflorescence umbellate, drupe with thick sour flesh. *P. cerasus*.
6. Leaves oval-lanceolate to ovate, acuminate or acute; glands on the petiole usually elongated and tooth-like; bark black; drupe dark-purple or black, sweet. *P. virginiana*.
6. Leaves obovate to oval, abruptly acute or acuminate; glands on the petiole usually rounded or disk-like; bark gray; drupe red or purple, astringent. *P. nana*.
7. Leaves abruptly acuminate, petiole much less than $\frac{1}{2}$ as long as the blade. 8.
7. Leaves abruptly long-acute or acuminate, ovate to round-ovate; petiole $\frac{1}{2}$ as long as the blade; flowers solitary or in twos; fruit velvety. *P. armeniaca*.
7. Leaves acute or obtusish, or gradually acuminate. 10.
8. Leaves mostly broad and thick, somewhat pubescent or roughish beneath; calyx lobes pubescent or glabrous within. 9.
8. Leaves mostly narrow and peach-like, firm and more or less shining, glabrous; calyx lobes pubescent on both sides. *P. hortulana*.
9. Calyx-lobes entire, pubescent within; fruit globose; flowers white. *P. americana*.
9. Calyx lobes glandular-serrate, glabrous within; fruit subglobose or oval; flowers white, turning pink. *P. nigra*.
10. Leaves glabrous when mature, acute or acuminate. 11.
10. Leaves pubescent beneath, not pointed or only slightly so, ovate or obovate. *P. domestica*.
11. Leaves lanceolate; drupe red with little or no bloom. *P. angustifolia*.
11. Leaves ovate, drupe dark purple, with a bloom. *P. alleghaniensis*.

Cherries.

1. **Prunus virginiana** L. 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.

2. **Prunus nana** Du Roi. 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.

3. **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.

4. **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.

5. **Prunus avium** 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.

6. **Prunus cerasus** 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-primes the fruiting branchlets. Native of Europe. N. H. and Mass. to N. Y. and Ohio.

Plums and Apricot.

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

8. ***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.

9. ***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.

10. ***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.

11. ***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.

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

13. ***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.

28. ***Amýgdalus*** L. Peach.

Trees or shrubs with alternate, simple, serrate, pinnately-veined leaves with 2-4 disk-like glands at the edge of the

base of the blade, with terminal bud, stipular scars or stipules, reddish or greenish twigs, and velvety drupe.

Perianth pentamerous, carpel 1, hypanthium deciduous; drupe mostly edible with a deeply pitted stone.

1. **Amygdalus pérsica** 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. N. Y. to Fla. and Kan.

Fabaceae. Pea Family.

Cassiatae. Senna Subfamily.

29. **Cércis** L. Redbud.

Trees or shrubs with 2-ranked, entire, palmately veined leaves.

Flowers zygomorphic in short lateral fascicles; stamens 10, distinct; fruit a flat bean.

1. **Cercis canadénsis** 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. and N. Y. to Iowa, Neb., N. J., Fla., Tex.

30. **Gledítsia** L. Honey-locust.

Trees with alternate, evenly pinnate or bipinnate leaves, superposed buds beneath the petiole base, and usually with branched axillary thorns.

Flowers small, greenish, imperfectly monosporangiate and diceous; 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 triacánthos** L. Honey-locust. A large tree of rapid growth, usually with stout branching or simple thorns and with rough bark, the catkin-like racemes often

appearing on the main trunk and larger branches. 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. and N. Y. to S. Dak., Ga., Kan., and Tex.

2. **Gleditsia aquática** Marsh. Water Honey-locust. A tree growing in swamps. Thorns usually little branched. Wood very hard and bright reddish-brown. Ind. to Mo., S. Car., Fla., and Texas.

31. **Gymnócladus** Lam. Coffee-bean.

Trees with alternate evenly bipinnate leaves, sunken superposed axillary buds, and large chocolate-colored pith.

Flowers greenish, diceious, both types with vestages of the opposite sporophylls; 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, rather soft, strong, tough, reddish in color, or 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 Okla.

Fabaceæ. Pea Subfamily.

32. **Cladrástis** Raf. Yellow-wood.

Trees with alternate, odd-pinnate leaves with entire leaflets, with the petiole base covering the superposed buds, and without milky or resinous sap.

Flowers white, showy, fragrant; fruit a slender bean.

1. **Cladrastis lutea** (Mx. f.) 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.

33. **Robínia** L. Locust.

Trees or shrubs with alternate odd-pinnate non-punctate leaves and with stipular spines.

Flowers showy, in racemes; fruit a flat bean.

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

1. **Robinia pseudoacacia** 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 Okla.

2. **Robinia viscosa** Vent. Clammy Locust. A small tree with rough bark. Underground parts somewhat poisonous. Wood brown, the sap-wood yellow. Va. to Ga. Also escaped in Middle and Eastern States.

Order, CELASTRALES.

Rhamnaceae. Buckthorn Family.31. **Rhámnus** (Fourn.) L. Buckthorn.

Shrubs or small trees with alternate, rarely opposite, simple serrate or minutely serrulate leaves, and with berry-like drupes containing 2-4 stones.

Flowers bisporangiate or diecious or imperfectly monosporangiate, small, in small axillary clusters. Twigs sometimes ending in stout thorns.

1. Leaves acute, with 6-10 pairs of lateral veins; nutlets smooth; umbels peduncled; flowers bisporangiate. *R. caroliniana*.
1. Leaves with 3 or 4 pairs of lateral veins, the basal pair prominent; nutlets of the fruit grooved; flowers diecious or imperfectly monosporangiate. *R. cathartica*.

1. **Rhamnus caroliniàna** 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.

2. **Rhamnus cathàrtica** L. Common Buckthorn. A shrub or small tree with black injurious fruit. Somewhat thorny and used for hedges. The fruit yields a dye and has powerful medicinal properties. Introduced from Europe. Eastern states.

Celastraceae. Stafftree Family.

35. **Euónymus** (Tourn.) L. Wahoo

Shrubs or small trees with opposite, simple, pinnately veined, serrate leaves, green twigs and central bundle-scars.

Flowers regular, small; fruit a 3-5-locular dehiscent capsule; 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 atropurpùreus** 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. Wood nearly white. Ont. to Fla., Mont. and Okla.

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

Illicaceae. Holly Family.

36. **Ilex** L. Holly.

Shrubs or trees with alternate, not two-ranked, simple, pinnately veined, serrate or lobed leaves which are sometimes evergreen; with watery sap; and with berry-like drupes containing several small stones.

Flowers small, in axillary clusters or solitary, mostly imperfectly diecious.

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. montana*.

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

2. **Ilex montana** (T. & G.) Gr. Mountain Holly. A shrub or slender, erect tree growing in mountain woods. Drupes red. N. Y. to Ga., and Ma.

3. **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., and Tex.

Staphyleaceae. Bladdernut Family.

37. **Staphylèa** L. Bladdernut.

Shrubs or small trees with opposite trifoliate serrate leaves.

Stipules caducous; flowers in axillary racemes or panicles, white, bisporangiate, regular; capsule large and bladdery, triocular.

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

Order, SAPINDALES.

Sapindaceae. Soapberry Family.

38. **Sapíndus** (Tourn.) L. Soapberry.

Trees or shrubs with alternate, odd-pinnate leaves, with entire, inequilateral, acuminate leaflets, and with solid pith; with axillary, exposed, superposed buds; and without stipular spines.

Flowers imperfectly dicious; fruit a 1-3-seeded berry.

1. **Sapíndus drummondii** H & A. Drummond Soapberry. A tree with white flowers in dense terminal panicles and very saponaceous, globose berries. Wood hard, light yellowish brown; used in Texas for cotton baskets. Kan. and Mo. to La. and Ariz.

39. **Koelreutèria** Laxm.

Trees with alternate, odd-pinnate or bipinnate leaves with the leaflets toothed and usually more or less cut and lobed; without prickles, stipules, or terminal buds, but with numerous scattered bundle-scars and large cylindrical pith.

Flowers yellow, dicious, in large terminal panicles; fruit a trilocular bladderly capsule; outer bud-scales 2.

1. **Koelreuteria paniculata** Laxm. Chinese Varnish-tree. A tree much planted for ornament. Reported as spontaneous from seed in Indiana.

Aesculaceae. Buckeye Family.

40. **Aésculus** L. Buckeye, Horse-chestnut.

Trees or shrubs with opposite palmately compound leaves. Flowers imperfectly monosporangiate, zygomorphic, in terminal panicles; capsules leathery, 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. *A. 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. *A. octandra*.
3. Leaflets acuminate, finely serrate, 5-7; a tree. *A. glabra*.
3. Leaflets long-acuminate, unequally serrate, 7-9; a shrub-like small tree. *A. 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., and Okla.

3. **Aesculus argùta** Buckl. Western Buckeye. A shrub-like small tree with smooth bark. On flood plains. Mo. and Kan. to Texas. Reported from Iowa.

1. **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, woodenware, 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.

Aceraceae. Maple Family.

II. **Acer** (Tourn.) L. Maple.

Trees or shrubs with opposite leaves, with 3-5 bundle scars in the narrow, contiguous leaf scars, and with a terminal bud showing several pairs of visible scales.

Sap watery or sometimes milky, often saccharine; fruit a 2-winged samara. Usually dioecious or imperfectly dioecious.

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.
1. 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 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.

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

3. ***Acer pennsylvanicum*** 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.

4. ***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 Iowa.

5. **Acer sácccharum** 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, rims of bicycle wheels, piano action, school apparatus, large wood type, tool and broom handles, and wood carving. Newf. to Man., south to Fla. and Tex.

6. **Acer nígrum** 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., S. Dak., La. and Ark.

7. **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. S. to Man., Fla., Neb., and Tex.

8. **Acer sacchárinum** 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, acuminate, 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., S. Dak., Neb. and Okla.

9. **Acer negúndo** L. Boxelder. A small tree with spreading branches and glabrous, sometimes pubescent, green and glaucous twigs. Leaves 3-7-foliolate, 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. Maine to Man., Fla., Kan. and Mex.

Anacardiaceae. Sumac Family.

42. **Rhús** (Tourn.) L. Sumac.

Small trees or shrubs with alternate pinnately compound leaves, with sticky milky or resinous sap, and pubescent drupes.

Flowers in panicles, imperfectly bisporangiate, small; stamens five, styles three; drupe red.

1. Petioles not completely covering the axillary buds; leaflets entire; rachis of the leaf wing-margined; leaflets 7-31; twigs and the red drupes pubescent. *R. copallina*.

1. Petioles covering the axillary buds; leaflets serrate. 2.

2. Leaves and twigs velvety-pubescent. *R. hirta*.

2. Leaves and twigs glabrous, somewhat glaucous. *R. glabra*.

1. **Rhus copallina** L. Mountain 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. Wood soft and light brown. In dry soil. Me. and Ont. to Fla., Minn., Neb. and Tex.

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. Wood soft, greenish-yellow w. N. S. to Ga., Ont., S. Dak., Mo. and Iowa.

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 Minn., Fla., Miss. and La

13. **Toxicodéndron.** POISON-SUMAC.

Small trees or shrubs, ours with alternate pinnate leaves with entire leaflets, with poisonous resinous sap, and with glabrous or slightly pubescent drupes.

Flowers small, in axillary panicles, imperfectly bisporangiate; drupes gray or white.

1. **Toxicodendron vérnix** (L.) Ktze. Poison Sumac. A shrub or small tree, very poisonous to the touch. Drupes gray, glabrous, in loose axillary panicles. In swamps and wet places. Wood soft, yellowish brown, poisonous. Maine to Fla., Ont., Minn., Mo., and Ia.

14. **Cótinus** Adans. Smoketree.

Small trees or shrubs with alternate, simple pinnately veined, entire, deciduous leaves and fragrant resinous sap.

Flowers small, imperfectly bisporangiate, on a large terminal panicle; stamens 5, styles 3, lateral; drupe oblique, small, compressed; buds clustered at the tip of the twig.

1. Blade of the leaf slightly decurrent on the petiole, thin, glabrous or slightly pubescent beneath. *C. americanus*.

1. Leaves mostly rounded or obtuse at the base, coriaceous, more pubescent. *C. cotinus*.

1. **Cotinus americànus** Nutt. American Smoketree. A small wide-branched tree. Wood soft, orange-yellow, yielding a rich dye. Mo., and Okla. to Tenn. and Ala.

2. *Cotinus còtinus* (L.) Sarg. European Smoketree. A small tree, native of Europe, frequently cultivated.

Subclass, AMENTIFERÆ.

Order, PLATANALES.

Hamamelidaceæ. Witch-hazel Family.Subfamily, *Hamamelidatac.*15. **Hamamèlis** L. Witch-hazel.

Shrubs or small trees with 2-ranked, simple, inequilateral, straight-veined leaves and stalked axillary buds.

Flowers bisporangiate or imperfectly bisporangiate, in axillary clusters; fruit a bilocular, woody or cartilaginous, nut-like capsule.

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

Subfamily, *Altingiatae*.

16. **Liquidambar** L. Sweet-gum.

Trees with alternate, simple, palmately veined, fragrant, star-shaped, serrate leaves and 5-angled pith.

Sap resinous, aromatic; flowers monocious, in heads, the staminate clusters racemose; capsules in a dense spiny 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, hard, not strong, tough, and of fine texture, reddish brown, 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.

17. **Plátanus** (Tourn.) L. Planetree.

Large trees with alternate simple leaves having the base of the petiole cover the axillary bud and with complete stipular rings.

Terminal bud self-pruned; flowers in spherical heads, monocious, without perianth; fruit in pendant spherical heads composed of numerous small nutlets.

1. Bark exfoliating in small plates; leaves 5-angled only slightly 3-lobed, or seldom slightly 5-lobed. *P. occidentalis*.

1. Bark exfoliating in large plates; leaves somewhat 5-lobed, in some varieties deeply lobed. *P. orientalis*.

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, sometimes as much as 42 ft. in circumference. 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. and Tex.

2. *Platanus orientalis* L. Oriental Planetree. A large tree much like the preceding, but usually with a comparatively short, massive trunk and a broad round crown. Leaves more ent and becoming smooth earlier. Occasionally planted from Western Asia and Eastern Europe.

Order, URTICALES.

Ulmaceae. Elm Family.

18. **Ulmus** (Tourn.) L. Elm.

Trees with alternate, 2-ranked, pinnately straight-veined, inequilateral, doubly serrate leaves and sessile axillary buds.

Flowers bisporangiate or imperfectly bisporangiate, in clusters or racemes; fruit a samara; trees of rapid growth.

1. Leaves very rough above; twigs not corky-winged and not self-pruned, but large numbers of lateral buds cut off; inner bark sometimes mucilaginous. 2.
1. Leaves smooth or sometimes somewhat rough above. 3.
2. Inner bark very mucilaginous, buds rusty-downy, samara much less than 1 in. long. *U. fulva*.
2. Inner bark not mucilaginous, buds not downy, samaras 1 in. long. *U. montana*.
3. 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*.
3. None of the branches with corky ridges; twigs glabrous or nearly so, not self-pruned; samara glabrous or nearly so, deeply notched. *U. campestris*.
3. Some or all of the branches corky-winged, or twigs puberulent, self-pruned; samara faces pubescent. 4.

4. Most of the branches with corky wing-like ridges; twigs glabrous or nearly so; leaves 1-3 in. long. *U. alata*.
4. Branches often with corky wing-like ridges; twigs puberulent; leaves 2-5 in. long. *U. thomasi*.

1. **Ulmus americana** L. White Elm. A large tree of rapid growth, with the bark in thick, rough ridges; much cultivated in cities and along roadsides. Trunks up to 33 ft. in circumference. 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, in the construction of cars and wagons, and especially for barrel hoops. Common on bluffs and on the flood plains of rivers and creeks. Graceful in form and very suitable for cultivation. Newf. to Man., Fla. and Tex.

2. **Ulmus thomasi** Sarg. 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., Minn., Ky., Neb. and Mo.

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., Mo. and Tex.

4. *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.

5. **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. and Tex.

6. *Ulmus montana* With. Scotch Elm. A large tree with spreading branches, or in some varieties with strictly

upright branches; branchlets pubescent. Leaves rough above, pubescent beneath, doubly serrate, often somewhat 3-lobed at the apex. Many varieties fine for planting. From Europe.

49. *Plánera* Gmel. Planertree.

Trees with alternate, two-ranked, straight-veined, inequilateral, serrate leaves and with bark scaling off in plates.

Trees similar to the elms but with a nut-like fruit and the flowers expanding with the leaves.

1. *Planera aquática* (Walt.) Gmel. Planertree. A small tree with nearly glabrous leaves growing in swamps and on wet banks. Wood compact, soft, weak, light brown. Ind. to Mo., Ky., N. Car., Fla. and Tex.

50. *Céltis* (Tourn.) L. Hackberry.

Trees or shrubs with 2-ranked, simple, leaves with two prominent lateral veins from the base and with interruptedly diaphragmed pith with cavities.

Flowers in the axils of leaves, on short branches; 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 occidentàlis* 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., N. Car., Mo., Kan. and Okla.

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

Moraceae. Mulberry Family.
Subfamily, *Moratae*.

51. **Mòrus** (Tourn.) L. Mulberry.

Trees or shrubs with alternate, simple, 2-ranked leaves with two prominent side ribs from the base, with milky sap, and with glabrous or pubescent but not downy twigs.

Flowers monosporangiate; 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, monoecious or dioecious tree with rough gray bark, separating in strips. 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 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. and Kan.

52. **Tóxylon** Raf. Osage-orange.

Small trees with alternate simple entire leaves, typical axillary thorns, and milky sap.

Flowers dioecious, the staminate racemose, the carpellate capitate; fruit a large spherical, greenish or yellowing aggregate.

1 **Toxylon pomíferum** Raf. Osage-orange. A small thorny tree much planted for hedges. Leaves ovate to ovate-lanceolate, acuminate or taper-pointed. Wood very heavy, exceedingly hard, and strong, but not tough, brownish-yellow; valuable for fence posts and fire wood; also 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.

53. **Papýrius** Lam. Paper-mulberry.

Trees with alternate simple 2-ranked leaves having two prominent side-ribs from the base, with milky sap, and with downy twigs.

Flowers diecious, the staminate in ament-like spikes, the carpellate capitate; fruit a globular head of red drupes.

1. **Papyrius papyrifera** (L.) Ktz. 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, FAGALES,

Fagaceae. Beech Family.

54. **Fàgus** (Tourn.) L. Beech.

Large trees with alternate 2-ranked simple equilateral pinnately straight-veined dentate leaves, with a vein for each tooth, and with prominent green medullary rays.

Winter buds usually very long-pointed; flowers monœcious; nut 3-angled, enclosed in a 4-valved bur with soft, short prickles.

1. **Fagus grandifòlia** Ehrh. 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 Minn., Mo., Fla., and Tex.

55. **Castànea** (Tourn.) Hill. Chestnut.

Trees or shrubs with simple alternate equilateral pinnately straight-veined serrate leaves, with a vein for each tooth, with 5-angled pith and inconspicuous medullary rays.

Flowers monœcious; fruit a rounded coriaceous nut; several in a globose, mostly 4-valved involucre covered with long prickles.

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

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, durable; used for cabinet-work, railway ties, posts, cooperage, "acid wood," and telegraph poles. Sprouts freely from stumps. In rich gravelly or sandy soil. Me. to Mich., Ga., and Ark.

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

56. **Quercus** (Tourn.) L. Oak.

Trees or shrubs with simple alternate leaves, not 2-ranked; with 5-angled pith; buds clustered at the tip of the twig; and with scattered bundle-scars.

Flowers monocious, the staminate in slender aments; fruit a 1-seeded coriaceous nut (acorn) in an involucre cup.

1. Leaves not bristle-tipped: acorns maturing the first year. 2.
1. Leaves with bristle-tips; acorns maturing in the autumn of the second year. 11.
2. Leaves crenate or dentate, not lobed. 3.
2. Leaves pinnatifid or pinnately lobed. 7.
3. Fruits not on a peduncle, nearly sessile, teeth or shallow lobes of the leaves acute. 4.
3. Fruits on a peduncle; teeth or shallow lobes of the leaves rounded. 5.
4. Tall trees, leaves oblong, obovate or lanceolate. *Q. muhlenbergii*.
4. Shrub or low tree, leaves obovate or oval; seed edible. *Q. prinoides*.
5. Peduncle as long or shorter than the petioles; leaves gray-tomentulose beneath. 6.
5. Peduncle much longer than the petioles; leaves white-tomentulose beneath. *Q. bicolor*.

6. Teeth of the leaves acute or mucronulate; bark white, flaky; seed sweet and edible; fruit short peduncled or sometimes nearly sessile. *Q. michauxii*.
6. Teeth of the leaves rounded; bark close; seed edible; petioles slender; peduncles equalling or shorter than the petioles. *Q. prinus*.
7. Mature leaves pale, or glaucous and glabrous below. 8.
7. Mature leaves pubescent or tomentose below, lyrate-pinnatifid. 9.
8. Bark separating in thin scales, light gray or light brown; cup shallow; bracts thick and warty. *Q. alba*.
8. Bark furrowed and ridged, not scaly, dark gray or dark brown; cup hemispherical, with imbricated, appressed scales; cultivated in many varieties. *Q. robur*.
9. Leaves pubescent beneath, oblong-obovate, usually 5-lobed, stellate-pubescent above; upper scales of the cup not awned. *Q. stellata*.
9. Leaves white-tomentulose beneath. 10.
10. Leaves obovate or oblong, lyrate pinnatifid or deeply sinuate-lobed; upper scales awned, forming a fringe around the acorn. *Q. macrocarpa*.
10. Leaves obovate-oblong, deeply 5-9-lobed; acorn often nearly enclosed in the cup, the upper scales not awned. *Q. lyrata*.
11. Leaves entire, oblong, linear-oblong or lanceolate. 12.
11. Leaves 3-5 lobed above the middle, or entire, obovate or spatulate in outline. 13.
11. Leaves pinnatifid or pinnately lobed. 14.
12. Leaves oblong or lanceolate, tomentulose beneath. *Q. imbricaria*.
12. Leaves linear-oblong, green and glabrous on both sides. *Q. phellos*.
13. Leaves spatulate, glabrous on both sides; cup saucer-shaped, acorn globose-ovoid. *Q. nigra*.
13. Leaves obovate-cuneate, brown-floccose beneath; cup deep, acorn ovoid. *Q. marylandica*.
11. Leaves white or gray-tomentose below. 15.
11. Leaves green on both sides. 17.
15. Leaf-lobes lanceolate or linear-lanceolate, long; large trees. 16.

15. Leaf-lobes triangular-ovate, short; shrubs or low trees. *Q. ilicifolia*.
16. Leaves rounded or obtuse at the base, 3-5 lobed; lobes linear or lanceolate, often falcate. *Q. triloba*.
16. Leaves cuneate to truncate at the base, 5-11 lobed; lobes triangular. *Q. pagodaefolia*.
17. Leaves usually pubescent below; winter buds tomentose; cup turbinate or hemispherical; inner bark orange. *Q. velutina*.
17. Leaves glabrous with the exception of tufts of hairs in the axils of the veins below; winter buds glabrous or minutely pubescent. 18.
18. Cup of the acorn top-shaped or hemispheric. 19.
18. Cup of the acorn shallow, saucer-shaped, much broader than deep. 20.
19. Leaves dull, paler beneath; acorn ovoid, cup depressed-hemispheric. *Q. borealis*.
19. Leaves shining on both sides, 1 bed to near the mid-rib; acorn ovoid; cup top-shaped. *Q. coccinea*.
20. Leaves dull; cup $\frac{1}{2}$ -1 in. broad; acorn ovoid or elongated. *Q. rubra*.
20. Leaves shining deeply pinnatifid; cup $\frac{1}{2}$ - $\frac{1}{2}$ in. broad; acorn subglobose or ovoid. *Q. palustris*.

Chestnut oaks.

1. **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., Ma., and Tenn.

2. **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.

3. **Quercus muhlenbergii** Engelm. Chestnut Oak. A tree with close gray bark. Leaves oblong, lanceolate, or 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. Vt. and Ont. to Minn., Ala., Neb., and Tex.

4. **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 Minn., Kan., Ala., and Tex.

5. **Quercus bicolor** Willd. 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 Minn., Ga., and Ark.

White oaks.

6. **Quercus álba**. L. White Oak. A large tree with a trunk up to 21 ft. in circumference and 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. stellata* and *Q. prinus*. Me. to Ont., Minn., Fla., Kan., and Tex.

7. *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.

8. *Quercus stellata* Wang. 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, glossy and stellate-pubescent 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, Mich., Iowa, Fla., and Tex.

9. *Quercus lyrata* 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, 1-1½ 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.

10. *Quercus macrocarpa* Mx. Bur Oak. A large tree with bark in narrow rough ridges, slightly flaky, 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, ½-1 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. N. S. to Man., Mass., Ga., Wyo., Kan., Tex.

Willow oaks.

11. *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 turbinate, about ½ in. broad; acorn subglobose, bitter. Wood poor; used for shingles and clapboards. Self-prunes twigs by means of basal joints. *Q. laevis* Nutt. is a hybrid of this and *Q. velutina*. *Q. tridentata* Engelm. is a

hybrid with *Q. marylandica*. Also hybridizes with *Q. palustris*. Pa. to Mich., Neb., Ga., and Ark.

12. **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. ilicifolia* and probably with *Q. rubra*, producing the form known as *Q. heterophylla*. L. I. to Fla., Ky., Mo., and Tex.

Black oaks.

13. **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.

14. **Quercus marilandica** 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. ilicifolia*. L. I. to Minn., Neb., Fla., and Tex.

Red oaks.

15. **Quercus ilicifolia** Wang. 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, $\frac{1}{2}$ - $\frac{1}{2}$ 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 to N. C. and Ky.

16. **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. Mass. to Fla., Ill., Mo., and Ark.

17. **Quercus tríloba** Mx. 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 and depressed, about twice as high as the cup. Wood very hard and strong; used for cooperage. An important tanbark oak. N. J. to Fla., Ohio, Mo., and Tex.

18. **Quercus velútina** Lam. Quercitron Oak. A large tree of rapid growth with very dark brown 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 and shining 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., and Tex.

19. **Quercus boreàlis** Mx. f. Gray Oak. A large tree with leaves like those of *Q. rubra* and acorns like those of *Q. coccínea*. 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.

20. **Quercus coccínea** 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 hemispheric or top shaped, acorn ovoid, about twice as long as the cup. Autumn leaves red. In dry soil. Me. to Minn., Mo., and N. Car.

21. **Quercus rùbra** 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., and Tex.

22. **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., Ohio and Wis., Va., and Ark.

Betulaceae. Birch Family.

57. **Carpinus** (Tourn.) L. Blue-beech.

Small trees with alternate, 2-ranked, simple, straight-veined, equilateral, serrate leaves; with peculiar fluted or projecting ridges on the trunks and larger branches; and with dark, smooth bark.

Flowers in aments; monoecious; nuts small in the large-bracted fruiting ament; bracts leaf-like.

1. **Carpinus caroliniana** Walt. Blue-beech. A small tree with slender terete gray twigs. Wood light brown, 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., Kan., and Tex.

58. **Ostrya** (Michx.) Scop. Hop-hornbeam.

Small trees with alternate, 2-ranked, simple, straight-veined, equilateral, serrate leaves; with glandular pubescent young twigs and line-furrowed scaly bark.

Flowers in aments; monoecious; nuts small, in a hop-like fruiting ament.

1. **Ostrya virginiana** (Mill.) Willd. Hop-hornbeam. A small tree with scaly bark. Wood white, compact, very

hard and strong. In dry or moist soil. Cape Breton I. to Man., Fla., Neb., Kan., and Tex.

59. **Bétula** (Tourn.) L. Birch.

Trees or shrubs with simple, serrate, 2-ranked leaves; with small samara-like nuts in a cone-like ament, and frequently with papery or leathery bark.

Usually aromatic, monoecious, styles 2, ovulary bilocular.

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. 2.
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. 3.
2. Bark not separating in layers, becoming furrowed; leaves shining above; fruiting bracts glabrous or pubescent, less than $\frac{1}{4}$ in. long, lobed at the apex. *B. lenta*.
2. Bark separating in papery layers when old, somewhat silvery; leaves dull above; fruiting bracts ciliate, more than $\frac{1}{4}$ in. long, lobed to about the middle. *B. lutea*.
3. Bark greenish or reddish brown, peeling in papery layers especially above; leaves rhombic, acute at both ends; young leaves, twigs, and aments tomentose; fruiting aments oblong, erect. *B. nigra*.
3. Bark of trunk and larger branches chalky white, usually peeling off in thin layers; fruiting aments cylindrical, pendant or spreading. 4.
4. Leaves deltoid, very long acuminate at the apex; bark not readily separable into thin layers; twigs with numerous resinous glands. *B. populifolia*.
4. Leaves acute or acuminate, usually ovate, in some cultivated forms of various shapes; bark peeling off in thin layers. 5.
5. Leaves ovate or suborbicular; native, occasionally cultivated. *B. papyrifera*.

5. Leaves various, commonly triangular or rhombic-ovate, on slender petioles; twigs often pendulous or weeping; much cultivated, from Europe and Asia. *B. alba*.

1. **Betula lénta** 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. N. Eng. to Ont., Fla., and Tenn.

2. **Betula lûtea** 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., and Tenn.

3. **Betula nîgra** 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, Minn., Kan., Fla., and Tex.

4. **Betula papyrífera** 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, wooden shoes, wagon hubs, ox-yokes, wood-carving, wood pulp, and in wood turnery. Newf. to Alaska, Penn., Mich., Neb., and Wash.

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

6. **Betula populifòlia** 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. S. to Ont., Penn., and Del.

60. **Álnus** (Tourn.) Hill. Alder.

Trees or shrubs with 3-angled pith, alternate straight-veined, simple leaves and stalked winter buds.

Monocious: nuts small, compressed, in woody cone-like aments 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. alnus*.

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

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

3. ***Alnus ál nus*** (L.) Britt. European Alder. A tree of rapid growth, developing readily in ordinary dry soil. Usually in wet places. Wood soft, brown. Native of Europe, Newf., and N. J. to Ill.

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

Juglandaceae. Walnut Family.

61. **Hicòria** Raf. Hickory.

Large trees with alternate serrate odd-pinnate leaves, terminal buds, 5-angled solid pitá, and numerous bundle scars scattered or in 3 areas.

Monocious: axillary buds superposed; staminate flowers in slender 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. 1.

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 7-11; nut smooth; husk thin, splitting to below the middle. *H. cordiformis.*
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; leaflets 5-7. *H. microcarpa.*
8. Fruit obovoid; nut thick-shelled; bark close. 9.
9. Leaves glabrous or nearly so; leaflets 5-7, rarely 3 or 9. *H. glabra.*
9. 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, in-

equilateral, acuminate; fruit oblong-cylindric; husk thin, 4-valved; nut smooth, oblong, thin-shelled, pointed, seed delicious and important commercially; wood hard, brittle, light brown. Along streams and in moist soil. Ind. to Iowa and Kan., south to Ala. and Tex.

2. *Hicoria cordifórmis* (Wang.) Britt. Bitternut (Hickory). A slender tree with close rough bark. Leaflets 7-11, 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.

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 microcârpa* (Nutt.) Britt. Small-fruited 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 incompletely splitting to the base; nut subglobose, slightly compressed, thin-shelled, pointed; seed sweet. Wood hard, strong and tough. In rich soil. Mass. to Ohio and Mich., Va., Ga., Ill., and Mo.

5. *Hicoria glâbra* (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-blong; husk thin, the valves very tardily deliscent; nut brown, angled, pointed, very thick-shelled; seed bitter and astringent, not edible. Wood hard, strong, tough, and rather dark brown. In dry or moist soil. Me. to Ont., Minn., Kan., Tex., and Fla.

6. *Hicoria villôsa* (Sarg.) Ashe. Scurfy Hickory. A small or medium-sized tree with deeply furrowed, dark gray bark. Leaflets 5-9, thickly covered beneath with silvery pel-tate glands, mixed with resinous globules, generally pubescent; fruit obovoid, the husk partly splitting; nut brown, thick-

shelled, angled; seed small, sweet. Wood hard and dark brown. Del. to Fla. and Mo.

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*, very hard and tough, dark brown. In rich soil. Mass. to Ont., Neb., Fla., and Tex.

8. **Hicoria laciniòsa** (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. Wood like in *H. ovata*, strong and tough. In rich soil. N. Y. and Ohio to Iowa, Kan., Okla., and Tenn.

9. **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.

10. **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, cooprage, sucker rods, wheel spokes, etc. Also a fine fuel wood. Not durable in the ground. In rich soil. Quebec to Minn., Fla., Kan., and Tex.

62. **Jùglans** L. Walnut.

Large trees with laternate odd-pinnately compound leaves and diaphragmed pith.

Monocious; axillary buds superposed; staminate flowers in slender catkins; fruit a nut in a fleshy husk; seed 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; bark 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 regia* 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.

2. *Juglans nigra* L. Black Walnut. A large tree with a trunk up to 24 ft. in circumference and 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.

3. *Juglans cinerea* 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., Kan., Del., Ga., Ark., and Miss.

Myricaceae. Bayberry Family.

63. *Myrica* L. Bayberry.

Shrubs or small trees with alternate simple peltate-scaly or resin-dotted leaves; with cylindrical pith, 3 bundle scars and glandular-dotted twigs.

Mostly dicious; flowers in catkins; drupe globose or ovoid; its exocarp waxy.

1. *Myrica cerifera* L. Wax-myrtle. A slender dicious tree with gray, nearly smooth bark. Leaves persistent through the winter. Wood light, brown in color. In sandy swamps or wet woods. Penn. and N. J. to Md., Fla., and Tex. north to Ark.

Order, SALICALES,

Salicaceae. Willow Family.64. **PÓPULUS** L. Poplar.

Large trees with alternate simple leaves, not 2-ranked and not entire but with gland-tipped teeth; with 5-angled pith, 3 bundle scars, and terminal, more or less resinous buds with several bud scales.

Dicocious; 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; twigs prominently self-pruned by means of cleavage planes in basal joints.

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 often with 2 small lobes at the base; 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. italica*.
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. Wood soft and nearly white. Native of Europe and Asia. N. B. to Ont., Va., and Ohio.

2. **Populus heterophýlla** L. Swamp Poplar. An irregularly branching tree with rough bark. Leaves long-petioled, broadly ovate, crenulate-denticulate, 5-6 in. long. Wood soft, compact, weak, brown in color. In swamps, Conn. to Ga., west to La. and northward to Mo., Ind. and Ohio.

3. **Populus balsamífera** 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, weak, brown. In moist or dry soil, commonly along streams and lakes. The subspecies **P. balsamífera 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 Va., Ohio, S. Dak., and Ore.

4. **Populus deltoídes** 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 favorable soil often attaining a trunk diameter of 3½ ft. in 40 years. In moist soil,

especially on the banks and flood plains of creeks and rivers. Quebec to Man., south to Fla., Kan., and N. Mex.

5. **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.

6. *Populus italica* Moench. Lombardy Poplar. A spire-like tree of rapid growth. Commonly planted for ornament.

7. **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.

8. **Populus tremuloïdes** 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.

65. **Sàlix** (Tourn.) L. Willow.

Shrubs or trees with alternate simple serrate pinnately veined leaves and axillary buds with a single outer scale.

Diecious; flowers in aments; fruit a capsule, the 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. Stamen 2. *S. interior*.
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*.
4. 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. bebbiana*.
5. Petioles usually without glands, or if with glands then the leaves of the ovate type and short pointed; stamens 2. 6.
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. pyrifolia*.
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. cordata*.
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. cardi*.

1. **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.

2. **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 falcata* (Pursh.) Torr. has narrower more falcate leaves. Hybridizes with *S. alba*. N. B. to Ont., Fla., Cal. and Kan.

3. **Salix wàrdi** Belsb. 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 Kan., south to Fla., and Ark.

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. Ter., N. J., Ohio, Ky., and Neb.

5. **Salix frágilis** L. Crack Willow. A tall slender tree with roughish, gray bark and green branches. Leaves lanceolate, long-acuminate, narrowed at the base, sharply serrulated, 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., Ky. and Ohio.

6. **Salix intèrior** Row. 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. Ter., south to Va. and Texas.

7. **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, $\frac{1}{2}$ - $\frac{1}{2}$ 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. S. and Ont. to N. C. and Iowa.

8. **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, 5-6 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. wide; capsule ovoid-conic. Native of Asia. Conn. to Va. and Mich.

9. **Salix pyrifólia** And. 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, $\frac{2}{3}$ - $1\frac{1}{2}$ in. wide, slightly crenulate-serrulate; capsule very narrow, acute. In swamps. Newf. to B. C. south to Me., Mich., and Minn.

10. **Salix cordàta** Muhl. Heartleaf Willow. A tree or shrub 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 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. N. B. to B. C., Va., Mo., Col., and Cal.

11. **Salix viminàlis** 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. Newf. to Penn.

12. **Salix bebbiàna** 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. Newf. to Alaska, N. J., Ohio, Neb., and Utah.

13. **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 Sask., Del. and Mo.

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 wickerware. Native of Europe. Escaped from Ont. and Ohio eastward.

Subclass, HETEROMERAE.

Order, ERICALES.

Ericaceae. Heath Family.

66. **Rhododéndron** L. Rhododendron.

Shrubs or small trees with simple, alternate, entire, pinnately veined, coriaceous, evergreen leaves and very scaly winter buds.

Flowers showy, bisporangiate, pentamerous, sympetalous; fruit usually a woody capsule with 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, Ga. and Ma.

67. **Kálmia** L. Kalmia.

Shrubs or small trees with simple, alternate, entire, pinnately veined, coriaceous evergreen leaves, and with naked winter buds.

Flowers bisporangiate, pentamerous, sympetalous; stamens 10, the anthers at first in 10 pouches, sympetalous; fruit a capsule with small seeds.

1. **Kalmia latifolia** 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, Ind., Fla., and La.

68. **Oxydéndrum** DC. Sorrel-tree.

Trees with simple alternate, pinnately veined, serrate, sour leaves, not glandular, but with prominent scattered bristle-like hairs on the midrib beneath; and with cylindrical pith and a central ring-shaped bundle-scar.

Flowers bisporangiate, pentamerous, white, numerous in terminal paniced racemes; fruit a capsule.

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

Order, EBENALES.

Sapotaceae. Sapodilla Family.

69. **Bumelia** Sw. Bumelia.

Shrubs or small trees with alternate, simple, pinnately veined, entire leaves; with milky sap; and usually with both terminal and axillary thorns.

Flowers small in axillary fascicles, pentamerous; 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 emneate-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 thornlike spurs and with gray bark. Leaves tardily deciduous. Wood very hard, yellowish-brown. 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. Wood rather soft, weak, yellowish-brown. Ill. to Kan., Tex., Ga., and Fla.

Ebenaceae. Ebony Family.

70. **Diospyros** L. Persimmon.

Trees, ours with alternate, pinnately veined, entire, deciduous leaves, having the petiole jointed to the twig; and with a central bundle scar.

Flowers monosporangiate; fruit a large berry with 4-12 flat oblong seeds.

1. **Diospyros virginiana** L. Persimmon. A handsome tree with hard, dark, furrowed bark. Pith often with cavities. 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, Iowa and Kan., Fla., and Tex.

Symplocaceae. Sweetleaf Family.

71. **Symplocos** Jacq. Sweetleaf.

Shrubs or trees with simple, alternate, serrate or repand leaves; with diaphragmed pith showing lenticular cavities; and with axillary buds not superposed.

Flowers bisporangiate, pentamerous, but the stamens numerous; 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. Wood soft, weak, pale red or white. Del. to Fla., La., and Ark.

Styracaceae. Storax Family.

72. **Halesia** Ell. Silverbell.

Shrubs or small trees with simple, alternate, serrate leaves, with diaphragmed pith showing cavities; and with superposed axillary buds.

More or less stellate pubescent; flowers large, white, drooping, in lateral fascicles or short racemes; fruit dry, 2-4-winged.

1. **Halesia carolina** L. Silverbell. A small tree with diaphragmed pith. Wood soft, light brown. In woods and along streams. Va. to Ill., Fla., and Ala.

Subclass, TUBIFLORAE.

Order, GENTIANALES.

Oleaceae. Olive Family.

73. **Chionánthus** L. Fringetree.

Shrubs or small trees with opposite, simple, entire deciduous leaves, pinnately veined to the tip; and with pubescent twigs and buds.

Flowers bisporangiate, in large loose panicles; perianth tetramerous; fruit a drupe.

1. **Chionanthus virginica** L. Fringetree. A shrub or small tree with handsome, white, fragrant flowers in drooping panicles. Wood heavy, hard, and light brown. In moist soil. N. J. and Ohio to Fla., Mo., and Tex.

74. **Fráxinus** (Tourn.) L. Ash.

Trees with opposite odd-pinnate leaves without stipules or stipels and with closely crowded bundle scars in a curved line.

Flowers sympetalous or apetalous, bisporangiate or monosporangiate; stamens usually 2; fruit a samara.

1. Leaflets sessile. 2.

1. Leaflets more or less stalked. 3.

2. Leaflets 7-11, long, gradually tapering to a point, oblong lanceolate. *F. nigra*.

2. Leaflets short pointed, ovate to obovate. *F. excelsior*.

3. Twigs not quadrangular. 4.

3. Twigs quadrangular; stems sometimes sharply four-angled; leaflets 7-11, green on both sides, upper ones usually sessile, lower ones short stalked.

F. quadrangulata

4. Twigs pubescent, often velvety. 5.

4. Twigs smooth or nearly so. 7.

5. Leaflets ovate to ovate lanceolate; base usually truncate or rounded, unsymmetrical; upper surface dark yellow green, soft pubescent beneath; calyx large.
F. profunda.
5. Leaflets ovate, ovate-lanceolate, or lanceolate, usually acute at the base; calyx minute. 6.
6. Leaflets pale beneath; ovate to ovate lanceolate, 7-11; wing of samara terminal or nearly so. *F. biltmoreana.*
6. Leaflets green or greenish beneath, ovate-lanceolate to lanceolate, 5-9; samara with a decurrent wing.
F. pennsylvanica.
7. Leaflets pale beneath, ovate to ovate-lanceolate, entire or indefinitely serrate, abruptly acute or acuminate, glabrous or somewhat pubescent; wing of samara terminal. *F. americana.*
7. Leaflets green on both sides, glabrous or somewhat pubescent, usually serrate, lanceolate to ovate-lanceolate, acuminate; wing of samara decurrent on the sides of the slender body. *F. lanceolata.*

1. **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 and Ark.

2. **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 heavy, soft, dark brown, used for barrel-hoops, baskets, cabinet-work, and interior finish. In swamps and wet soil. Newf. to Man., Va., and Ark.

3. *Fraxinus excelsior* L. European Ash. A fine hardy tree with bright green leaves. Samara flat, linear-oblong. Weeping varieties are in cultivation. Native of Europe.

4. **Fraxinus profûnda** Bush. Pumpkin Ash. A large tree with thick, gray, fissured bark and velvety pubescent twigs. Leaflets 7-9, ovate-lanceolate to oblong-lanceolate, stalked, acuminate, bright green above, paler and pubescent beneath, large. Samara with a flattish body, wing decurrent to below the middle. In swamps. Va. to Ill., Mo., Ark., and Fla.

5. **Fraxinus pennsylvânica** 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. Wood hard, strong, brown. In moist soil. N. B. to Minn., Fla., and Kan.

6. **Fraxinus lanceolâta** Borek. 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. Me. to Sask., south to Fla., Kan., and Tex.

7. **Fraxinus biltmoreâna** 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. Woodlands and river banks. Penn. and Ohio to Ga.

8. **Fraxinus americanâ** L. White Ash. A large tree of rapid growth, with glabrous twigs. Leaflets 5-9, ovate, 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, $\frac{1}{2}$ - $\frac{1}{3}$ the length of the wing. Autumn leaves brown, purple, and salmon. Wood heavy, hard, strong, brown, 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., and Tex.

75. *Forestiera* Poir. Adelia.

Shrubs or small trees with simple, opposite, pinnately veined, usually serrate leaves; with brown twigs; and usually with thorns and superposed buds.

Flowers dieciuos or imperfectly monosporangiate, in fascicles, or paniculate, from scaly buds; fruit a drupe. •

1. *Forestiera acuminàta* (Mx.) Poir. Adelia. A shrub or small tree usually with somewhat thorny branches. Wood heavy, soft, yellowish-brown, not strong. On river banks. Ind. to Ga., Mo., Ark., and Tex.

Order, SCROPHULARIALES.

Scrophulariaceae. Figwort Family.

76. *Paulownia* Sieb. & Zucc. Paulownia.

Trees with opposite petioled, palmately veined, simple leaves; with superposed axillary buds; and with large white pith, sometimes with cavities.

Flowers in large panicles, bisporangiate, zygomorphic, tetracylic; stamens 4; fruit a capsule with numerous winged seeds.

1. *Paulownia tomentosa* (Thumb.) Baill. Paulownia. A large rapid-growing tree with violet flowers in terminal panicles. Native of Japan; escaped from cultivation. N. Y. and N. J. to Ga.

Bignoniaceae. Trumpet-creeper Family.

77. *Catálpa* Scop. Catalpa.

Trees with opposite or whorled, simple leaves with entire margins and with prominent green glands in the axils of the veins on the lower side.

Flowers large, white or mottled, in terminal panicles or corymbs, bisporangiate, zygomorphic; stamens usually 2 with 3 prominent vestiges; capsule long and bean-like with numerous winged seeds.

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, usually with 4 red oval glands at the base of the blade on the upper side; flowers small, yellow with orange stripes inside and violet spots; capsule very slender. *C. ovata*.
2. Bark thin, flaky; young petioles glabrous or nearly so; wings of seed usually narrowed at the ends, panicle many-flowered. *C. catalpa*.
2. Bark thick and rough; young petioles usually pubescent; wings of seed usually broad, the threads parallel; panicle few-flowered. *C. speciosa*.

1. **Catalpa catálpa** (L.) Karst. Common Catalpa. A tree with thin flaky bark and spreading branches. Wood brown, soft, weak, durable in contact with the soil, 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 speciòsa** 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.

3. *Catalpa ovàta* Don. Japan Catalpa. A small tree, commonly with 3-lobed or angled leaves. Flowers small. From Japan. Often cultivated.

Subclass, INFERAE.

Order, UMBELLALES.

Araliaceae. Ginseng Family.

78. **Aràlia** L. Aralia.

Our species small trees with alternate, bipinnate, decomposed, prickly leaves; with prickly twigs; and with about 20 bundle scars in the leaf scar.

Flowers pentamerous tetracyelic, epigynous, in paniced umbels; fruit a small berry.

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

Cornaceae. Dogwood Family.

79. **Cornus** (Tourn.) L. Dogwood.

Shrubs or small trees with opposite or rarely alternate, entire pinnately veined leaves having the upper two veins curving toward the tip and more or less parallel with the midrib; and with distinct, exposed, axillary buds.

Flowers in panicles; fruit a bilocular white or blue drupe; cymes self-pruned when the fruit is ripe.

1. Leaves alternate; twigs green, smooth; flowers in cymose panicles, drupe blue. *C. alternifolia*.

1. Leaves opposite, ovate or ovate-lanceolate; drupe globose, white. *C. asperifolia*.

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

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

80. **Cynoxylon** Raf. Dogwood.

Trees or shrubs with opposite, entire, pinnately veined leaves having the upper two veins curving toward the tip and more or less parallel with the midrib; and with minute axillary buds hidden under the petiole bases.

Flowers in heads subtended by an involucre of 4 large whitish bracts; fruit a bilocular, red drupe.

1. **Cynoxylon floridum** (L.) Raf. Flowering Dogwood. A small very ornamental tree, with rough reticulate bark. Leaves bright red in autumn. Wood solid, hard, brown, valuable; used for shuttles. The drupes are reputed to be poisonous. Me. and Ont. to Fla., Minn., Mo., and Tex.

81. *Nýssa* L. Tupelo.

Trees with alternate leaves, not 2-ranked; with 3 vascular bundles in the base of the petiole and with solid diaphragmed pith.

Flowers small, greenish, imperfectly dicious in capitate clusters or short racemes; sometimes solitary; fruit a drupe the stone usually ridged.

1. Leaves mostly entire; carpellate flowers 2-14 in a cluster. 2.
1. Leaves usually dentate; carpellate flowers solitary. *N. aquatica*.
2. Leaves mostly acute or acuminate; carpellate flowers 2-14 together; stone little flattened. *N. sylvatica*.
2. Leaves mostly obtuse; carpellate flowers 2-3 together, stone much flattened. *N. biflora*.

1. ***Nyssa sylvatica*** Marsh. Common 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, woodenware, etc. Not durable if exposed. In rich moist soil. Not easily transplanted. Me. and Ont. to Fla., Mich., Mo., and Tex.

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

3. ***Nyssa aquatica*** L. Water Tupelo. A large tree with slender-petioled, oval or ovate, acute or acuminate leaves, usually angular dentate. Wood soft, tough, light brown, or nearly white. In swamps. Va. to Ill. and Mo., south to Fla. and Tex.

Order, RUBIALES.

Rubiaceae, Madder Family.82. *Cephalánthus* L. Buttonbush.

Shrubs or small trees with opposite or whorled, entire.

Flowers small, white, densely capitate, tetracyelic; perianth pinnately veined, deciduous leaves and prominent stipules, tetramerous; stamens 4; fruit dry, 1-2-seeded.

1. **Cephalanthus occidentàlis** L. Buttonbush. A shrub or small tree with petioled, ovate or oval, entire acute or acuminate leaves. In swamps and low ground. N. B. to Ont. and Wis., Fla., Tex., Ariz., and Cal.

Caprifoliaceae. Honeysuckle Family.

83. **Vibúrnum** (Tourn.) L. Viburnum.

Shrubs or small trees with opposite, simple, serrate or lobed leaves; with 3 bundle scars; and with a terminal bud showing a large and a small pair of scales.

Flowers in compound cymes, tetra-cyclic; perianth and andrecium pentamerous; fruit a 1-seeded drupe.

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. rufidulum*.

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

2. **Viburnum prunifòlium** L. Black Haw. A shrub or small tree with acute winter buds, often reddish-pubescent. Drupe blue-black, glaucous, sweet and edible. Wood hard, reddish-brown. In dry soil. Conn. to Ga., Mich., Kan., and Tex.

3. **Viburnum rufídulum** Raf. 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. N. J. to Mo., Kan., Fla., and Tex.

APPENDIX.

KEY TO THE FRUITS.

The complete fruit at maturity, including the peduncle, is required for determination. The number after each genus refers to the list number.

1. Fruit a cone, a cone-like catkin, a compact aggregate, or an ordinary catkin. 2.
1. Fruit simple, consisting of a single carpel or set of united carpels, not cone-like or catkin-like, but often clustered. 22.
2. Fruit dry at maturity. 3.
2. Fruit fleshy. 16.
3. Fruit a globular aggregate of flowers on a long slender peduncle. 4.
3. Fruit not globular, except in some true cones, but ovoid or cylindrical, peduncle short, or if rather long then thick and rigid. 5.
4. Fruit an aggregate of deliscent spiny-pointed capsules with several seeds. **Liquidambar.** (46).
4. Fruit an aggregate of 1-seeded nutlets, not spiny-pointed. **Platanus.** (47).
4. Fruit an aggregate of dry obpyramidal pods showing a prominent calyx at the tip; receptacle with bristles. **Cephalanthus.** (82).
5. Fruit a true cone with naked seeds, or an aggregate of closed carpels showing stamen, petal and sepal scars on the peduncle. 6.
5. Fruit a catkin or a cone-like catkin. 19.
6. Seeds in closed carpels, the cone-like fruit showing stamen, petal, and sepal scars at the base on the peduncle. 7.
6. Fruit a true cone with naked seeds, not showing stamen, petal and sepal scars on the peduncle. 8.

7. Carpels of the fruit forming dehiscent follicles at maturity; the fleshy seeds suspended from the pink or rose tissues of the fruit by slender threads. **Magnolia.** (12).
7. Carpels samara-like, dry and indehiscent. **Liriodendron.** (13).
8. Cones with numerous ovuliferous scales, more than 15. 9.
8. Cones with 3-12 ovuliferous scales. 12.
9. Cones erect, their scales deciduous from the persistent axis; ovuliferous scales orbicular or broad, obtuse. **Abies.** (5).
9. Cones pendulous or projecting from the branch, the scales persistent. 10.
10. Cone scales woody and thickened at the outer end, elongated, often with a rigid point, spine, or prickle. **Pinus.** (7).
10. Cone scales sub-obicular or oval, sometimes with erose or emarginate tips. 11.
11. Cone with subulate leaf-scales at the base. **Larix.** (6).
11. Cone without subulate leaf-scales at the base, short and ovoid, usually less than 1½ in. long. **Tsuga.** (4).
11. Cone without subulate leaf-scales at the base, cylindrical or long ovoid, usually 1-6 in. long, scales often with erose or emarginate tips. **Picea.** (3).
12. Carpels spirally arranged. 13.
12. Carpels opposite. 11.
13. Cone globose, the scales closely compressed on the outside, seeds not winged. **Taxodium.** (2).
13. Cone ovoid, with subulate leaf-scales at the base, the carpellate scales loose and open; seeds somewhat winged. **Larix.** (6).
14. Carpels imbricate, not shield-shaped, with 1-3 (usually 2 seeds). 15.
14. Carpels shield-shaped, with 2-3 seeds, more or less winged. **Chamaecyparis.** (10).
15. Carpels 6-8, the four upper fertile. **Thuja.** (8).
15. Carpels 4-6, the two upper fertile. **Libocedrus.** (9).
16. Fruit globose, over 2 in. in diameter. 17.
16. Fruit elongated, ovoid or cylindrical. 18.

17. Fruit green or yellowish-green, 3-5 in. in diameter.
Toxylon. (52).
17. Fruit an aggregate of red drupes projecting beyond the persistent perianths. **Papyrius.** (53).
18. Fruit very juicy, consisting of a catkin-like aggregate of small fleshy flowers. **Morus.** (51).
18. Fruit an aggregate of carpels, the ripe follicles dehiscent, and the seeds pendant from slender threads. **Magnolia.** (12).
18. Fruit a small blue berry-like cone. **Juniperus.** (11).
19. Catkin composed of capsules with numerous seeds having tufts of cottony hairs. 20.
19. Catkin containing 1-seeded nutlets, achenes, or samara-like nutlets. 21.
20. Capsule with a little cup at the base. **Populus.** (64).
20. No cup at the base of the capsule but 1 or 2 little glands may be present. **Salix.** (65).
21. Fruiting catkin with leaf-like bracts; nutlets with ridges, somewhat compressed. **Carpinus.** (57).
21. Fruiting catkin hop-like, with bladder-like bracts; nutlets somewhat compressed, ridges inconspicuous. **Ostrya.** (58).
21. Fruiting catkin woody and cone-like, nutlets small compressed, winged or wingless. **Alnus.** (60).
21. Fruiting catkin compact with rather thin scale-like bracts, cone-like; nutlets compressed, membranous-winged; samara-like. **Betula.** (59).

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22. Fruit a dry or nearly dry samara, nut, achene, bean, or capsule, or a dry drupe. 23.
22. Fruit fleshy, indehiscent. 55.
23. Fruit or the peduncle prominently winged. 24.
23. Fruit and peduncle not with wings. 30.
24. Peduncle of the fruit cluster with a large wing; fruit a dry drupe. **Tilia.** (20).
24. Peduncle not winged; fruit a true samara, or with 1 or more prominent wings. 25.
25. Fruit with a prominent spine-like beak at the tip and with 2 or 4 wings, large. **Halesia.** (72).
25. Fruit not with a prominent spine-like point. 26.

26. Fruit double with 2 cavities and 2 large wings.
Acer. (41).
26. Samara with a wing all around or with a single wing at the end. 27.
27. Samara circular, oval, or broader than long. 28.
27. Samara elongated. 29.
28. Wing extending around the fruit, very veiny, glabrous; long-peduncled, calyx not present or very inconspicuous; cavities 2, 1 usually empty. **Ptelea.** (18).
28. Wing notched at the apex, usually veiny; fruit long-peduncled, calyx present; cavity with 1 seed.
Ulmus. (48).
28. Wing on the two sides of the fruit, with 2 stigmas at the apex; fruit sessile, small. **Betula.** (59).
29. Wing extending as far below the central seed as beyond it. **Ailanthus.** (19).
29. Wing terminal or extending along the sides of the seed but not beneath it. **Fraxinus.** (74).
30. Fruit a dehiscent bean, follicle, or capsule, usually with several seeds. 31.
30. Fruit an indehiscent nut, achene, or dry drupe with 1 cavity and 1-2 seeds; often partly or completely enclosed in a cup or husk. 47.
31. Fruit a bean or legume with 1 cavity and 2 sutures; seeds not winged. 32.
31. Fruit a capsule; if bean-like then with 2 cavities. 35.
32. Bean an inch or more broad, mostly with pulp. 33.
32. Bean about $\frac{1}{2}$ in. broad, without pulp. 34.
33. Bean very hard and thick, seed $\frac{3}{4}$ in. long.
Gymnocladus. (31).
33. Bean not very woody, thin, seed less than $\frac{1}{2}$ in. long. **Gleditsia.** (30).
34. Bean with a prominent ridge on each side of one suture, apex long-acute. **Cercis.** (25).
34. Bean with the 2 sutures nearly alike, apex mucronate, or with a slender point, sometimes bristly.
Robinia. (33).
34. Bean usually irregular and somewhat constricted into joints, apex abruptly acute, calyx containing long filaments. **Cladrastis.** (32).
35. Seed with wings or a tuft of cottony hairs. 36.

35. Seed without wings or hairs. 39.
36. Seed with a tuft of hairs, capsule small. 37.
36. Seed with wings, the wings sometimes with a fringe of long hairs. 38.
37. Capsule with a little cup at the base. **Populus.** (64).
37. No cup at the base of the capsule but 1 or 2 little glands may be present. **Salix.** (65).
38. Capsule very long, wings of seed with a fringe of hairs. **Catalpa.** (77).
38. Capsule short, wing of seed without hairs.
Paulownia. (76).
39. Seeds very large, $\frac{1}{2}$ -2 in. in diameter. 40.
39. Seeds much less than $\frac{1}{2}$ in. in diameter. 41.
40. Seed smooth with a large light spot at one end, without ridges or angles. **Aesculus.** (40).
40. Seed with two or more vertical ridges, without a special light spot—a nut in an enclosing husk which may be mistaken for a capsule. **Hicoria.** (61).
41. Seeds with a fleshy, scarlet aril, capsule lobed.
Euonymus. (35).
41. Seeds without an aril. 42.
42. Seeds 1 or 2, capsule not bladderly. 43.
42. Seeds several to many. 44.
43. Capsules small without a cup at the base.
Zanthoxylum. (17)
43. Capsule woody, $\frac{1}{2}$ in. long, with prominent cup at the base; seeds 2, oblong. **Hamamelis.** (45).
43. Capsule splitting tardily, with the prominent calyx persistent at the tip. **Cephalanthus.** (82).
44. Capsule triocular, large, bladderly. 45.
44. Capsule with 5—many cavities, small. 46.
45. Capsule 3-lobed at the tip, with 3 styles, usually widest at the middle or toward the outer end.
Staphylea. (37).
45. Capsule with a long, acute tip, with a single style, widest below the middle. **Koelreuteria.** (39).
46. Capsules mostly woody, oblong, puberulent; in corymbose or umbellate clusters. **Rhododendron.** (66).
46. Capsules depressed-globose, somewhat 5-lobed; in corymbose or umbellate clusters. **Kalmia.** (67).

46. Capsules ovoid-pyramidal, 5-angled; in large panicle racemes. **Oxydendrum**. (68).
47. Fruit a dry drupe, or drupe-like; exocarp softer than the bony endocarp. 48.
47. Fruit a nut or achene, the pericarp not in 2 layers; often partly or completely enclosed in a cup or husk. 49.
48. Fruit globose, $\frac{1}{2}$ in. or more in diameter, on winged peduncles. **Tilia**. (20).
48. Fruit obliquely ovoid, compressed, ridged on the back and covered with prominent soft processes.
Planera. (49).
48. Fruit subglobose, nearly symmetrical, $\frac{1}{8}$ in. long, pubescent, red. **Rhus**. (42).
48. Fruit subglobose, nearly symmetrical, $\frac{1}{2}$ in. long; light gray, stone striate. **Toxicodendron**. (43).
48. Fruit obliquely oblong or oval, compressed, gibbous, $\frac{1}{8}$ in. long, reticulate-veined. **Cotinus**. (44).
49. Nut sharply 3-angled; usually 2 together in the 4-valved bur. **Fagus**. (54).
49. Nut not 3-angled. 50.
50. Nut less than $\frac{1}{2}$ in. long, somewhat compressed. 51.
50. Nut large, more than $\frac{1}{2}$ in. long, or if not then circular in cross-section. 52.
51. Nut with ridges; fruiting bract 3-cleft and incised.
Carpinus. (57).
51. Ridges of the nutlet inconspicuous, fruiting bract bladder-like. **Ostrya**. (58).
52. Nut with 2 or 3 prominent ridges, sometimes with rough wrinkles. 53.
52. Nut not with ridges. 54.
53. Nut rugose or sculptured; husk indehiscent.
Juglans. (62).
53. Nut smooth or angled, husk at length splitting into segments. **Hicoria**. (61).
54. Nut ovoid-oblong or subglobose; cup with imbricated, more or less united bracts. **Quercus**. (56).
54. Nut plano-convex or rounded; bur globose and very prickly. **Castanea**. (55).

54. Seed, which may be mistaken for a nut, not showing a style, large and shining; capsule splitting into 3 valves. **Aesculus.** (40).

—55—

55. Fruit a pome, the carpels enclosed by an adnate, perigynous disk or hypanthium. 56.
55. Fruit a berry, or berry-like, with several seeds. 60.
55. Fruit a drupe, or drupe-like, with a stone or pit and with 1 or rarely 2 seeds. 66.
56. Ripe carpels of the pome papery or leathery. 57.
56. Ripe carpels bony. **Crataegus.** (26).
57. Pome small and berry-like. 58.
57. Pome large, fleshy like the apple. 59.
58. Pome scarlet when ripe, cavities not more than 5.
Sorbus. (21).
58. Pome purplish-red to purplish-blue when ripe, cavities usually 10. **Amelanchier.** (25).
59. Seeds not more than 3 in each cavity; pome tapering into the peduncle; flesh with grit-cells. **Pyrus.** (22).
59. Seeds not more than 3 in each cavity; pome sunk in at both ends, its flesh without grit-cells. **Malus.** (23).
59. Seeds many in each cavity, flesh of pome hard.
Cydonia. (24).
60. Berry large, very much elongated, green with yellow pulp and large brown seeds. **Asimina.** (14).
60. Berry ovoid or globose. 61.
61. Berry about 1 in. in diameter, reddish-yellow, with 4-12 large, flat, hard seeds and with the enlarged calyx at the base. **Diospyros.** (70).
61. Berry not over $\frac{3}{8}$ in. in diameter. 62.
62. Fruit inferior, showing scars or parts of the perianth and stamens at the tip. 63.
62. Fruit superior, showing only the style at the tip, with scars or perianth parts if present at the base. 64.
63. Fruit scarlet, cavities 5. **Sorbus.** (21).
63. Fruit purplish-red to purplish-blue, cavities usually 10. **Amelanchier.** (25).
63. Fruit black, small, cavities 5. **Aralia.** (78).
64. Fruit really a berry-like blue cone, showing the carpel tips on the sides, on close inspection. **Juniperus.** (11).

64. Fruit not a modified cone, but a true berry. 65.
65. Berry-like drupe usually red or yellowish, with 4-8 bony or crustaceous nutlets. **Ilex.** (36).
65. Berry-like drupe black, with 2-4 seed-like nutlets.
Rhamnus. (34).
65. Berry very saponaceous, dark; seeds 1-3, crustaceous, globose. **Sapindus.** (38).
65. Berry black, with 1 erect, shining seed. **Bumelia.** (69).
65. Berry dark blue with 1 seed, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter.
Persea. (15).
66. Fruit large, usually 2 in. or more in diameter; stone or nut deeply pitted, corrugated, or sculptured, usually $1\frac{1}{2}$ in. or more long. 67.
66. Stone not deeply pitted, corrugated, or sculptured, not more than $\frac{3}{4}$ in. long; if reticulated, then less than $\frac{1}{2}$ in. long. 68.
67. Flesh of fruit black or greenish, hard, with strong odor; seed in the nut much wrinkled. **Juglans.** (62).
67. Drupe pubescent, its flesh sweet; seed in the stone smooth. **Amygdalus.** (28).
68. Drupe white-waxy, less than $\frac{1}{4}$ in. in diameter, globose, tuberculate. **Myrica.** (63).
68. Drupe not white-waxy, if somewhat resinous then much larger. 69.
69. Fruit superior, showing only a style or its scar at the tip but usually the remains of a calyx below. 70.
69. Fruit inferior, showing sepals, petals, and stamens or their remains or scars at the tip. 75.
70. Drupe with red acid hairs, small. **Rhus.** (42).
70. Drupe light gray, small, stone striated.
Toxicodendron. (43).
70. Drupe not with red acid hairs nor gray with striated stone. 71.
71. Drupe narrowly oblong, about 1 in. long.
Forestiera. (75).
71. Drupe globose, oval, or globose-oblong. 72.
72. Stone ridged and reticulated, showing prominent teeth in cross-section. **Celtis.** (50).
72. Stone smooth, or if somewhat roughened then with a prominent suture all around. 73.

73. Fruiting pedicel much thickened below the prominent calyx base, red; drupe oblong-globose, blue.
Sassafras. (16).
73. Fruiting pedicel somewhat thickened, red or reddish, the drupe-like berry dark blue, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter. **Persea.** (15).
73. Fruiting pedicel not thickened below the calyx or if so the fruit not blue. 74.
74. Fruit light greenish-yellow; flesh with a sickening-sweet odor and a sticky juice; embryo in a large kernel; a gymnospermous seed. **Ginkgo.** (1).
74. Drupe often large and sweet, stone with a suture all around, often flattened. **Prunus.** (27).
74. Drupe with a 4-6 lobed calyx; oblong-ovate, blue; endosperm large with a small embryo in the center. **Chionanthus.** (73).
74. Fruit really a small black berry; seed shining, with the hilum at the base. **Bumelia.** (69).
75. Stone with 2 cavities and 2 seeds. 76.
75. Stone usually with 1 seed. 77.
76. Drupe white or blue. **Cornus.** (79).
76. Drupe red. **Cynoxylon.** (80).
77. Stone with 1 cavity and 1 seed, grooved and somewhat compressed; drupe glabrous, blue or nearly black. **Nyssa.** (81).
77. Fruit with prominent nerves and ridges, with 5 sepal-tips, oblong-ovate, pubescent, nearly dry, nut-like. **Symplocos.** (71).
77. Stone 1-seeded, sometimes flattened; drupe with a prominent styler beak, blue, black, or red.
Viburnum (83)

A GENERAL CLASSIFICATION OF THE WOOD OF TREES INCLUDED IN THE MANUAL.

- A. Wood without annual rings, but with scattered vascular bundles. **Monocotylae.**
(No trees in our region).
- B. Wood in a growing cylinder, showing annual rings, with a central pith.
 1. Wood non-porous, the cells not visible or conspicuous in cross section even with a hand lens, there being no wood vessels; annual rings distinct by denser dark-colored bands of late wood. **Ginkgoeae** and **Coniferae.**
 1. Resin-ducts present in cross section.
 - a. Without distinct heartwood. **Picea.**
 - b. with distinct heartwood. **Larix, Pinus.**
 2. Resin-ducts not present in the wood.
 - a. Resin-ducts in the pith. **Ginkgo.**
 - b. Pith without resin-ducts.
 - (a) Without distinct heartwood. **Abies, Tsuga.**
 - (b) With distinct heartwood, either of a different color or of a deeper shade than the sapwood.
 - (a) Without a sharp demarcation in color between the heartwood and sapwood, the one fading gradually into the other. **Taxodium, Chamaecyparis, Thuja.**
 - (b) With a clear demarcation in color between the heartwood and sapwood. **Libocedrus, Juniperus.**
 11. Wood porous; the pores, or true wood vessels, being visible in cross section with a hand lens or to the naked eye. **Dicotylae.**
 1. Wood diffuse-porous; pores numerous and usually not plainly visible in cross section

without a hand lens; annual rings distinct by a fine line of denser late wood cells, often quite indistinct; pores scattered thru the annual ring; no zone or no very definite ring of collected pores in the early wood. *Magnolia*, *Liriodendron*, *Persea*, *Tilia*, *Sorbus*, *Pyrus*, *Malus*, *Cydonia*, *Amelanchier*, *Crataegus*, *Prunus*, *Amygdalus*, *Euonymus*, *Ilex*, *Staphylea*, *Aesculus*, *Acer*, *Hamamelis*, *Liquidambar*, *Platanus*, *Fagus*, *Carpinus*, *Ostrya*, *Betula*, *Alnus*, *Juglans*, *Myrica*, *Populus*, *Salix*, *Rhododendron*, *Kalmia*, *Oxydendrum*, *Symplocos*, *Halesia*, *Forestiera*, *Cornus*, *Cynoxylon*, *Nyssa*, *Cephalanthus*, *Viburnum*.

- a. Among the above, those having highly colored or dark heartwood are the following: *Persea*, *Prunus*, *Amygdalus*, *Liquidambar*, *Fagus*, *Juglans*, *Oxydendrum*, *Halesia*.
2. Wood ring-porous, the pores or wood vessels numerous and usually visible in cross section without a hand lens; annual rings distinct by a zone or ring of large pores in the early wood alternating with a denser zone of late wood containing fewer or smaller pores. *Asimina*, *Sassafras*, *Zanthoxylum*, *Ptelea*, *Ailanthus*, *Cercis*, *Gleditsia*, *Gymnocladus*, *Cladrastis*, *Robinia*, *Rhamnus*, *Sapindus*, *Koeleruteria*, *Rhus*, *Toxicodendron*, *Cotinus*, *Ulmus*, *Planera*, *Celtis*, *Morus*, *Toxylon*, *Papyrius*, *Castanea*, *Quercus*, *Hicoria*, *Bumelia*, *Diospyros*, *Chionanthus*, *Fraxinus*, *Paulownia*, *Catalpa*, *Aralia*.
 - a. Among the above, those having highly colored or dark heartwood are the following: *Asimina*, *Cercis*, *Gleditsia*, *Gymnocladus*, *Robinia*, *Rhus*, *Toxicodendron*, *Cotinus*, *Morus*, *Toxylon*, some species of *Quercus*, *Hicoria*, *Diospyros*, *Catalpa*, *Aralia*.

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.

Diecious. Having the microsporangiate or staminate flowers and the megasporangiate or carpellate flowers on separate plants.

Digitate. Diverging like the spread fingers.

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 anthophyta.

Entire. Without teeth, serrations or lobes.

Ephemeral. Continuing for only a day or less.

Epigynous. Having the calyx, corolla, and andrecium 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.

Gynecium. 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.

Hypanthium. Any enlargement or special development of the torus, in a flower, on which the sepals, petals, and stamens are borne; a perigynous disk.

Hypogynous. Having the calyx, corolla, and andrecium below the gynecium.

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.
- Introrse. Facing inwards.
- Involucere. 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 non-sexual 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.
- Monecious. 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.
- Obcordate. Inversely heart-shaped.
- Ob lanceolate. 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 in a flower cluster.
- Peduncle. The stalk of a flower or flower cluster.
- 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.
- Perigynous. Having the sepals, petals and stamens borne on a disc surrounding the gynecium.
- 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*.
- Scarious. 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 or sperm. 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 but a leaf or part of a leaf, 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 pedicels 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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