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FORESTS AND TREES

OF ISLE ROYALE NATIONAL PARK

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FORESTS AND TREES

OF ISLE ROYALE NATIONAL PARK

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Isle Royale is a patchwork of many kinds of forest: spruce-fir forests, paper birch forests, pine forests, aspen forests, maple forests, bog forests and swamp forests. Each kind has a history of its own and there are definite demonstrable reasons why so many kinds exist side by side. There are also reasons that are not so demonstrable and some that are not even known about or suspected.

THE ENVIRONMENT

The environment of a plant (or of most anything else) is a complex of many, many things. For example, temperature and its variations and ranges; moisture: its abundance and seasonal variation, and its availability to the plant in question; soil: its composition, depth, moisture holding ability; topographic situation: steepness, levelness, direction of slope, drainage; sunlight (solar radiation): angle of insolation at various times of the year, length of day versus length of night at various times of the year; latitude and its manifestations in temperature, winds, seasonal variations, etc.; altitude and its manifestations in temperature, winds, atmospheric density and composition; gravity; fire; other plants; animals. It's complex!

Let's fit some of these factors into the Isle Royale situation. First of all, latitude: 48° north, an area of short, cool summers — temperatures ranging from about 40°f. to 90°f., and long, cold winters — temperatures ranging from about -25°f. to 30°f. The angle of the sun's rays at this latitude at mid summer is 65° on level surfaces and during winter these decrease to 18°. Some of the north-facing slopes on the ridges of Isle Royale never see the direct rays of the sun. Some of the south-facing slopes are exposed to very intense, direct sun rays during the summer months. Mid summer days are much longer than days at the equator and mid winter days are much shorter.

Altitude ranges from 602' at the edge of Lake Superior to 1396' at the top of Mount Desor. The altitude is, therefore, moderate with a moderate range and it is reasonable to suppose that atmospheric composition and density is not abnormally different from any other low-altitude area at this latitude.

Topography is rugged in a small way. Innumerable ridges run from end to end of the long, narrow island. Drainage into the valleys between the ridges is rapid and drainage from the valleys to Lake Su-

perior is poor and sometimes non-existant. Soil ranges from a well developed mixture of organic and inorganic particles in the mature climax maple forest of southwestern Isle Royale to thin, organic layers of the spruce-fir forest on northeastern Isle Royale to bare rock ridge crests containing no soil at all.

Fire has probably always been a part of the natural environment. Since man entered the scene, the occurance of fires increased. At different times, in different ways, in different intensities fire has created a patchwork of forest stands all differing, at least slightly, from one another. Some areas have burned-many times, a few areas not at all in the last several centuries.

This is an island. The character of the body of water surrounding it has profound influence on the character of the island itself. Lake Superior is the largest body of fresh water in the world. The water is cold, reaching a high of only about 60°f. on the surface in protected areas. There's enough water to prevent the whole lake from freezing during the long, cold winter and enough water to keep the temperature lowered during mid summer. Lake Superior is, therefore, a modifying influence. Its cold waters cool the hot continental winds of summer and give up warmth to the arctic blasts of winter. In addition to Lake Superior's modification of temperature, its waters modify the moisture content of the winds which pass over its surface. Cold, dry arctic blasts of winter are warmed and moistened by surface waters producing snowclouds and snowfall which are in addition to the general, normal snowfall of the latitude. Hot continental winds of summer are cooled by the lake waters to such an extent that moisture precipitates into the many fogs of early summer. The island's shores are most profoundly influenced by these factors; the island's central-upland areas are least influenced. Bearing in mind only the factors of temperature and humidity, the island's periphery is cool and moist while the island's interior, by comparison, is warm and dry.

Augmenting the results of Lake Superior's presence, the island's topography, being more abrupt in the interior portions, allows greater drainage in the interior portions, producing still drier soil conditions in upland areas and more moist conditions in the valleys below. The more abrupt topography (i.e. generally steeper and higher) creates temperature differences also—warm air moving up the slopes and cool air moving down the slopes — producing still warmer conditions on ridge tops, cooler conditions below them. Topography is responsible for still another augmenting factor. The south-facing ridge slopes are heated intensely by the sun's rays in mid summer. This creates not only hotter surface temperatures (measured as high as 140°f.), but creates a greater evaporation rate as well, leaving these ridge slopes even hotter and drier.

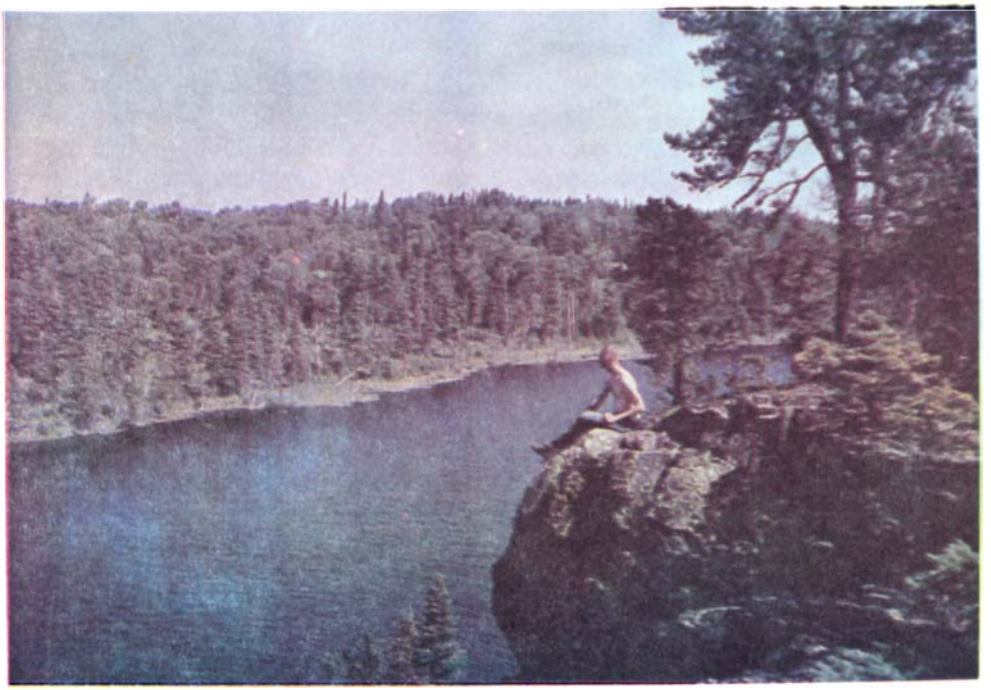
The general result of these general factors is two rather different climatic types; one being comparatively hot and dry at the island's interior, the other comparatively cool and moist at the island's periphery.

There are innumerable other factors which combine with the climatic factors and with each other to produce an innumerable variation of plant habitats and forest sites.

Plants affect one another. One rather simple and obvious illustration of this is that in the mature paper birch forest stands on Isle Royale one will discover very few paper birch seedlings in the deep shade of the forest interior. At the edge of the stand where the adjoining area has been burned-over or blown down, as the case may be, considerably more paper birch seedlings may be found growing. The paper birch seedling seems to require abundant light for growth, therefore, in the shade of its parents it does poorly, but in the open area where no shade from adult trees is present, the seedlings thrive. Paper birch seedlings are able to withstand the direct sunlight and open, bare ridge slopes, but, as a general rule, white spruce seedlings are not able to withstand the direct heat of the sun and the dryness. Therefore, white spruce does not generally grow in dry, open areas. Instead, it flourishes in the moister, cooler shade of the mature paper birch forest. We can conclude, then, that the mature birch trees are "helpful" to the growth of some plants and are a hindrance to the growth of others.

Animals affect plants, as do plants affect animals. Consider the moose who browses dearly on the tops of young balsam fir to create a dearth of balsam fir trees whenever the moose population is high.

There are, of course, so many factors influencing the growth of the plant that it is impossible to discuss them all in detail. It is impossible even if space should permit, for the simple fact is that all the factors are not known. All of the factors affecting the growth of a plant are not necessarily independent of one another. There is most certainly a tremendous interaction of many of the factors involved. For example, there is not, to the knowledge of the writer, a single sugar maple tree within 1/5-mile of Lake Superior's shores on Isle Royale. None of the small islands surrounding Isle Royale contains a single sugar maple tree. It is possible that temperature alone excludes this species, doubtful that moisture alone excludes it, and doubtful that soil type alone excludes it. Very possibly, however, all of these factors (and possibly others) combine to exclude it. Likewise, as the northeastern tip of Isle Royale is reached, white spruce trees — a major species of the boreal forest — become fewer. Going furthur to Passage Island, 4 miles northeastward from Isle Royale, white



PAPER BIRCH, BALSAM FIR AND WHITE SPRUCE FOREST AT LAKE JOHN

spruce fails to show up at all. Why? Possibly an interaction of too many unfavorable factors. In all honesty, this writer doesn't know.

Chance, alone, must be considered as a factor determining what plant will grow in a particular site. It is possible that of the billions of white spruce seeds produced in the Lake Superior area over the past 10,000 years, not one viable white spruce seed ever reached Passage Island in such a way as to fall in a suitable spot for growth. Another product of chance, it is possible that a moose never swam, walked on ice, or was blown on drifting ice in such a way as to reach Passage Island, thereby allowing balsam fir a free hand (as well as Canadian yew), thus accounting for the very dense forest stands of fir there.

Environment is complex!

FORESTS

In the light of all the factors involved, it becomes obvious that innumerable types of forests exist, even on a small island such as Isle Royale. But it is possible to combine these into several general types, and this is the purpose at hand.

Successional Forests

A forest which by some method or other prohibits or discourages the growth of its own seedlings beneath the canopy of the mature forest and which creates an environment suitable for the growth of some OTHER species can be considered a successional forest. For example, the birch forest mentioned a moment ago which produced abundant shade in which the birch seedlings seemed to do poorly and in which white spruce and balsam fir seedlings did quite well.

Most successional forests can be thought of as resulting from fire or from some other destructive force such as wind; the area becomes denuded in some fashion. Sometimes when an area is denuded by fire, the soil is also lost, either because it gets burned off in the fire or because it subsequently washes away due to the absence of roots holding on to it, or because both things happen.

When the soil is lost, soil must be formed again before a forest can grow. Mosses and lichens and climatic factors combine to break up the bare rock surfaces and mix the rock particles with dead organic material and to, eventually, form soil. An inch of such soil may take a century or more to form. In the meantime, of course, grasses, herbs, and small woody plants may be adding to and accelerating the accumulation of soil.

When enough soil has been formed to hold enough moisture for the growth of forest trees and to supply enough physical support for these trees, a forest will grow. This is also roughly the stage at which the denuded forest finds itself in the first place if the soil is not lost in the denudation.

INTERIOR OF A PAPER BIRCH-ASPEN SUCCESSIONAL FOREST

The first trees to live in this forest will be those whose seeds and seedlings can tolerate the usually warm, dry conditions present in such an area. On Isle Royale the following fit this type of situation and they are the successional forest trees: paper birch, quaking aspen, red maple, jack pine, white pine, red oak, pin cherry and various willows. There are others, but these are the major ones. Of these, some are better suited than others for very dry conditions: paper birch, red maple, red oak and the pines. These form the majority of the successional forest stands found in interior locations. Paper birch, aspen, sometimes jack pine and sometimes white pine

form the successional forests of the cooler, more moist areas near the periphery of Isle Royale. Some of these trees are of short duration, such as quaking aspen, red maple, pin cherry and willows. Others, such as paper birch and the pines, are capable of great age and last well into the climax stage. All of these species produce an environment, eventually, which is more suitable to the growth of other species.

In the interior upland section, a growth of mature pines will, after many years, perhaps after hundreds of years, produce an environment which will support sugar maple and yellow birch. In peripheral Isle Royale, the aspen-birch forests give way to the balsam fir and white spruce whose seedlings find the cool, moist forest a perfect environment in which to grow.

The Climax Forests

INTERIOR OF A CLIMAX SUGAR MAPLE-YELLOW BIRCH FOREST ON SUGAR MOUNTAIN

A forest in which the seedlings of the parent trees find the shade a welcome place to grow and which do grow to maturity thus continu-

ing the same species century after century in the same area is called a climax forest. A climax forest can be destroyed by fire, wind, desease or man, of course, but barring these kinds of catastrophe, only a change in the prevailing climate of the region will change the composition of the climax forest. Often, the term "climatic climax" is used to denote this dependance upon the prevailing climate.

There being two somewhat different climates on Isle Royale, two different climatic climax forests also exist. The spruce and fir seedlings which find the cool, moist shade of the paper birch forest a good place to live, mature, produce seed, live to old age and die, being replaced by their own offspring. The aspen dies out quickly, usually within a century; the paper birch may last much longer than a century and indeed may always find a niche in the climax forest itself. However, it too, often dies out, eventually leaving an essentially pure white spruce-balsam fir forest. This is the climatic climax forest of the cool, moist, peripheral parts of Isle Royale.

In the central upland areas of Isle Royale where the climate is essentially warmer and drier, sugar maple and yellow birch finally assume climax status after starting in the shade of pines, red oaks and red maples. Sugar maple, however, can and sometimes does grow in open areas eventually forming mature climax forest all on its own.

Between the two climax forest types is a transition zone where spruce and fir thrive in the more moist areas. These moist areas are valley bottoms and northward facing ridge slopes. Sugar maple, on the other hand exists throughout the transition area in the drier, warmer sites which are located on southward facing ridge slopes and on the dry ridge crests.

In very wet areas such as swamps and bogs, climatic climax species are unable to succeed, giving rise to the typical wet-land forests of black spruce, northern white cedar and tamarack.

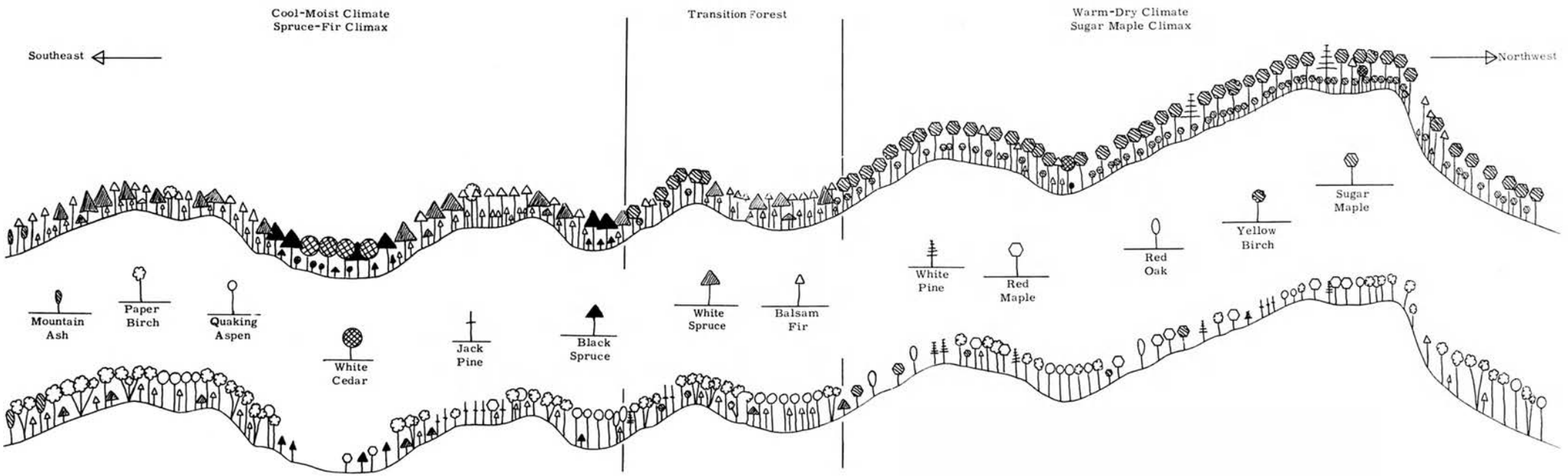
VEGETATIONAL DIAGRAM OF A PARTIAL CROSS-SECTION OF ISLE ROYALE, showing central Isle Royale to the right and peripheral, southeast-facing Isle Royale to the left.

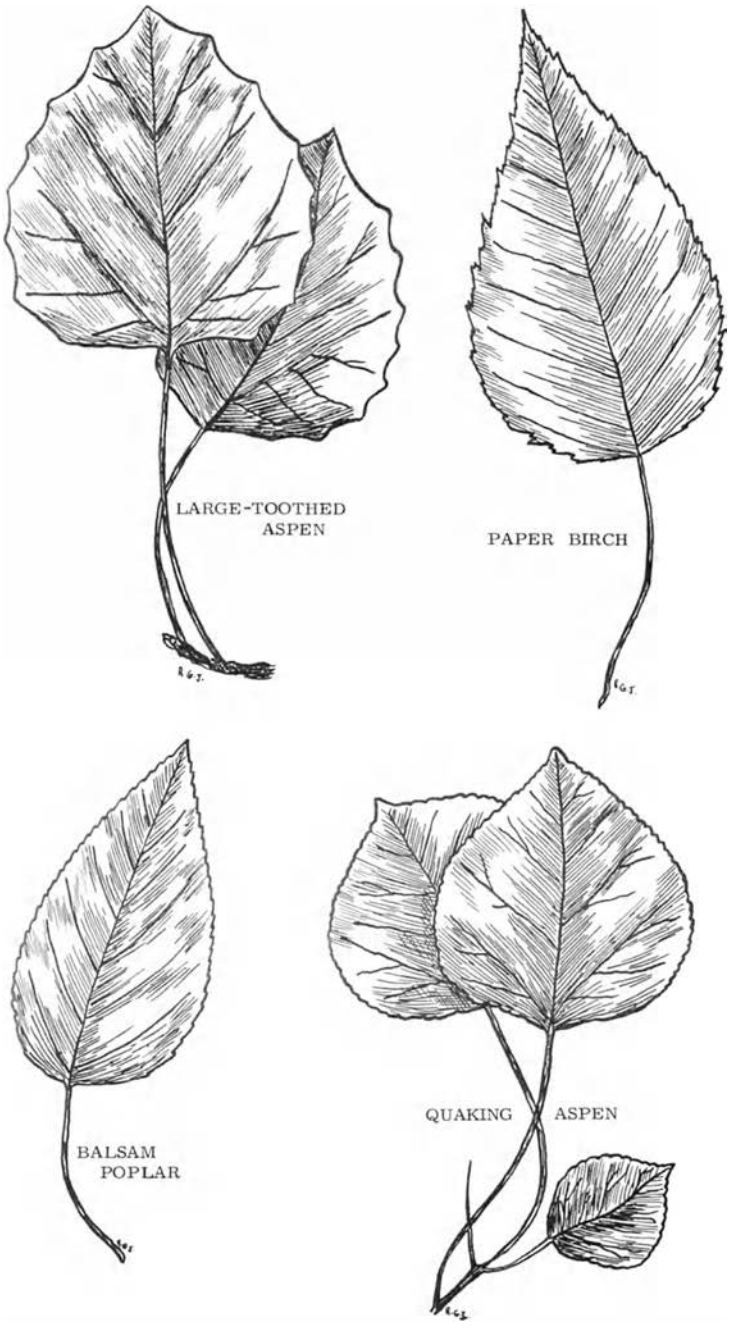
Upper figure: Climax vegetation of the Spruce-Fir Climax, Transition, and Sugar Maple Climax Forests.

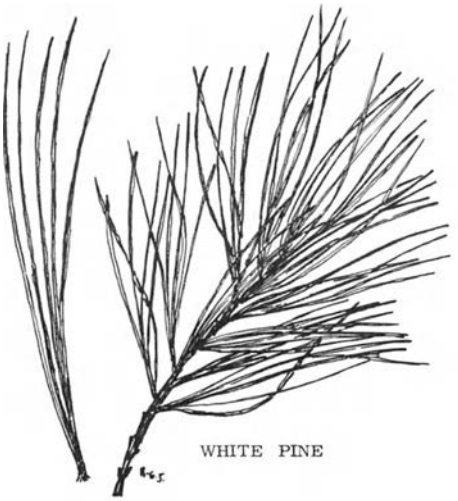
Lower figure: Successional (subclimax stage) vegetation of the Spruce-Fir Climax, Transition, and Sugar Maple Climax Forests.

Only the major tree species are represented; the symbols for these are illustrated between the two figures. Shrubs, herbs, grasses and lower plants are omitted.

The two figures represent a composite of sites from various areas of Isle Royale; however, the upper figure is similar to the actual vegetation found along a line extending from the southwest end of Siskiwit Bay to the top of Sugar Mountain — an area traversed by the Island Mine Trail; and the lower figure is roughly similar to the actual vegetation found along the Mount Ojibway Trail from the Daisy Farm Campground to Mount Ojibway.

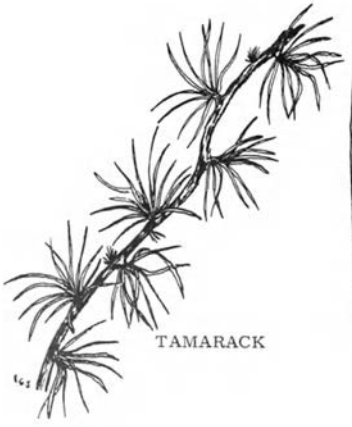

Cool-Moist Climate
Spruce-Fir Climax
Transition Forest
Warm-Dry Climate
Sugar Maple Climax
Southeast
Northwest
Mountain Ash
Paper Birch
Quaking Aspen
White Cedar
Jack Pine
Black Spruce
White Spruce
Balsam Fir
White Pine
Red Maple
Red Oak
Yellow Birch
Sugar Maple


LARGE-TOOTHED
ASPEN
PAPER BIRCH
BALSAM
POPLAR
QUAKING ASPEN

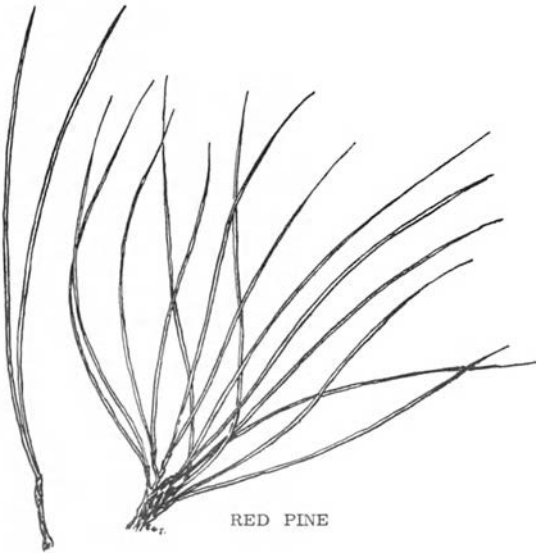


WHITE PINE

NORTHERN
WHITE
CEDAR



TAMARACK



RED PINE

YELLOW BIRCH

SUGAR MAPLE

RED MAPLE

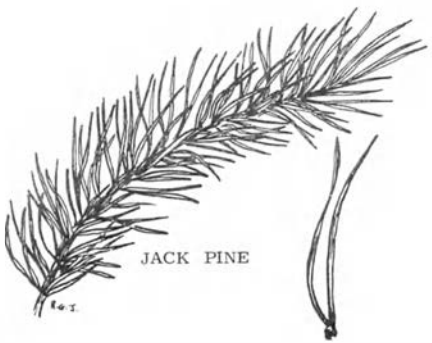
NORTHERN RED OAK

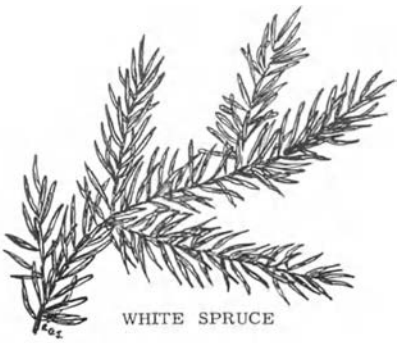
COMMON TREES

CHOKE CHERRY

MOUNTAIN ASH

BLACK ASH


JACK PINE


WHITE SPRUCE


BALSAM FIR


BLACK
SPRUCE

A KEY TO THE WOODY PLANTS

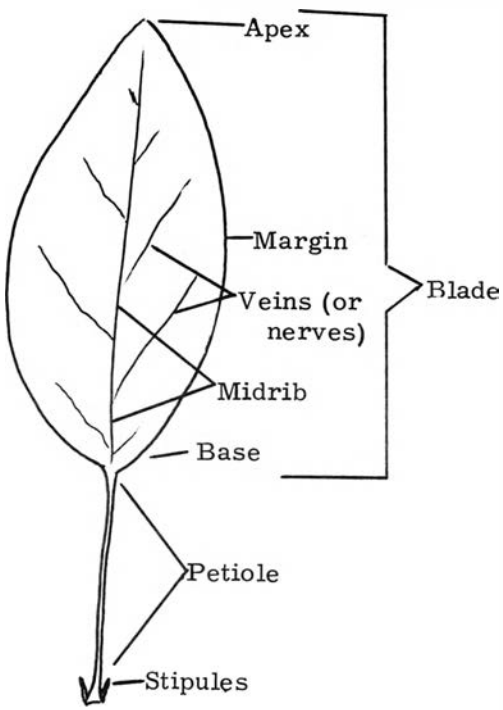
First of all, no key is perfect. This one, to be sure, will prove no exception. Keys take practice and patience, and they are not "easy" until practice is had. But, if you're interested in learning the woody plants of Isle Royale, plunge right in, get embroiled in it and you'll find it a great source of satisfaction.

The author not only will not discourage constructive criticism, but will more than welcome it for an improvement of the next revision.

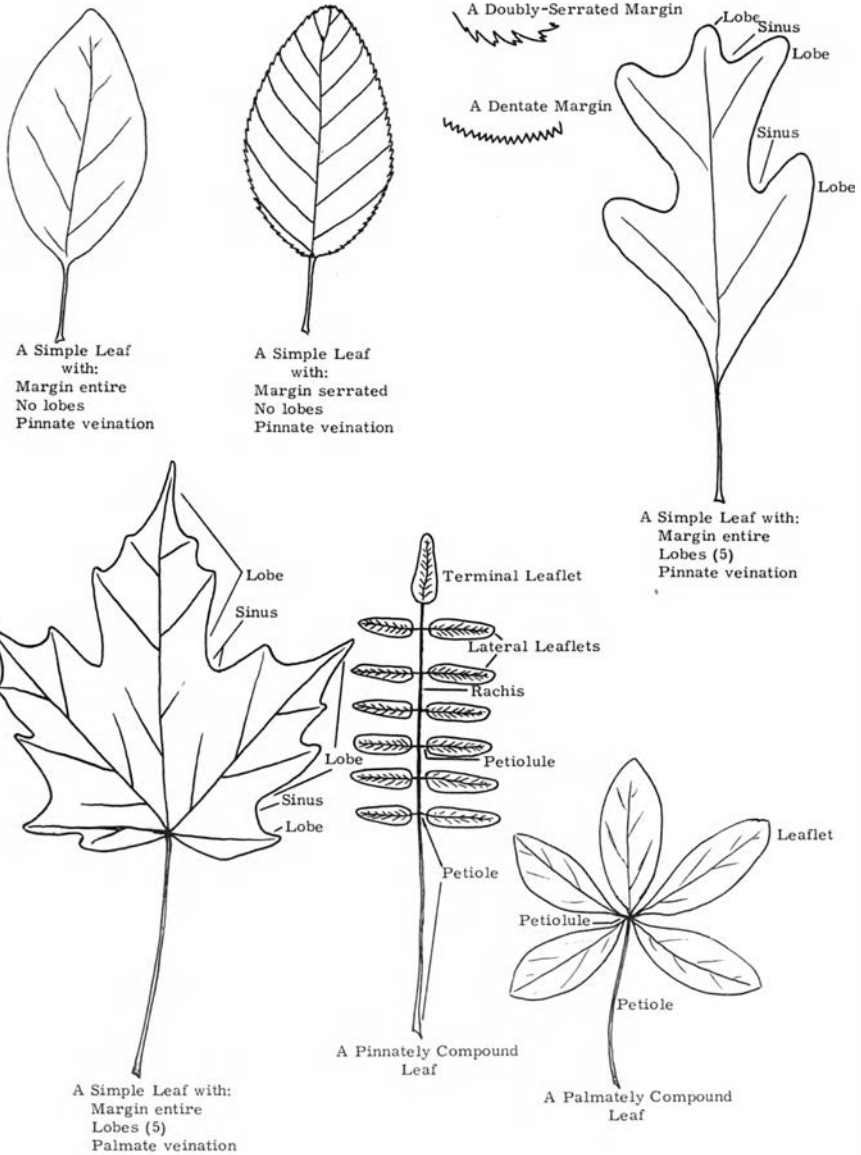
LET'S GET ORIENTED

Before you attempt to use the following key to the woody plants of Isle Royale, study this section on terminology — then refer to it as much as necessary while "keying out" a specimen.

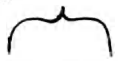
LEAF ANATOMY



LEAF SHAPES, MARGINS AND VEINATION



Acuminate: tapering gradually to the apex
Acute: sharp, with a point.
Cordate: heart-shaped. In leaves the apex of the leaf representing the point of the heart.
Cuneate: wedge-shaped.
Lanceolate: much longer than broad, lance-shaped, tapering to the apex of a leaf from below or at the middle.
Mucronate: a sharp, abrupt tip:



Obcordate: Inverted heart-shaped. In leaves the point of the heart would be at the base of the blade at the point where the petiole is attached to the blade.
Oblanceolate: the inverse of lanceolate.
Oblong: Longer than broad with nearly parallel sides.
Obtuse: blunt, or rounded.
Ovate: shaped like a hen's egg.
Ovoid: shaped like a hen's egg.
Peltate: shield-shaped.
Reticulate veination: netted, or net-like, veination.
Subcordate: somewhat heart-shaped.

LEAF TEXTURE AND HAIRYNESS

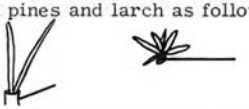
Glabrate: nearly, or almost, without hairs.
Glabrous: having no hairs. smooth.
Gland: a cell or group of cells which secrete. Usually very small, but visible as a kind of wart-like object.
Glaucous: covered with a bluish or white bloom, sometimes rub-off-able.
Pubescent: with hairs; usually soft hairs.
Puberulent: with very short hairs.
Scurfy: covered with very small, membranous scales.
Stellate pubescent: star-shaped or formed hairs.
Tomentose: wood-like, dense, sometimes matted, hairs.

LEAF ARRANGEMENT

Alternate: Leaves arranged alternately on stem, not occurring in pairs.
Opposite: Leaves arranged oppositely on stem; hence, in pairs.
Ternate: Leaves arranged in threes on stem; 3 leaves arising from the same node.
2-ranked: leaves arranged on 2 sides of stem.
4-ranked: leaves arranged on 4 sides of stem.

STEM TERMINOLOGY

Bud scale: one of the scales surrounding and enclosing the bud of a woody plant.
Bundle scar: small dots, crescents, etc., which appear within a leaf scar
Dwarf branches: very short branches, sometimes forming a thorn as on some apple trees, or in pines and larch as follows:

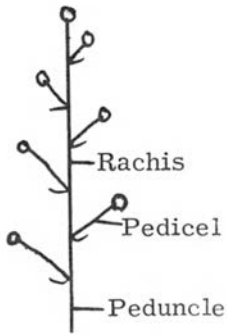


Internode: part of a stem between two successive nodes.
Node: the place where two internodes join, normally with a single leaf or more being attached at the node.
Leaf scar: scar left by a leaf severed from a stem.
Pith: the central portion of twig or stem; may be soft, hollow, with a series of diaphragms, or fairly hard and wood-like.
Terete pith: round in cross-section.

FRUIT TERMINOLOGY

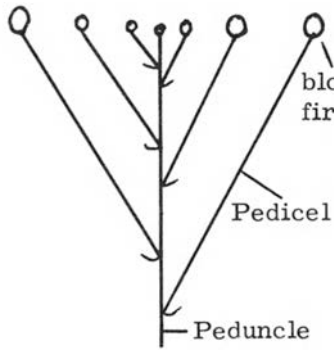
Berry: a fruit with a fleshy or pulpy wall.
Berry-like: looks like a berry; but it may not be.
Cone: a primitive flower, as the cone of the pine.
Drupe: a simple fruit with fleshy exocarp and bony endocarp (e.g., a peach).
Globose: spherical, or nearly so.

FLOWER TERMINOLOGY

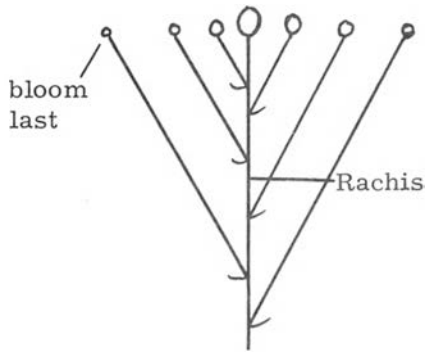


RACEME

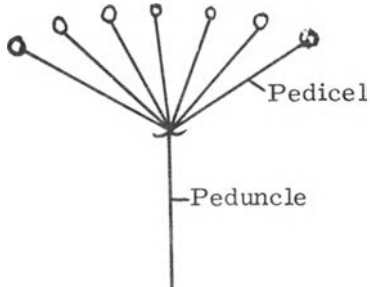
SPIKE



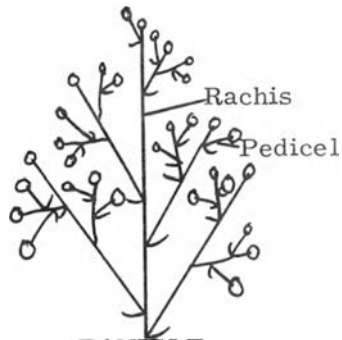
CORYMB



CYME



UMBEL



PANICLE

HOW TO USE THE KEY

The first section of the key will enable you to determine the genus (pronounced jee' nus) of the plant with which you are working. (In two instances, several genera — the plural of genus, pronounced jen' er a— are grouped together). Normally there are 2 choices to make from a pair of statements. For example, if you have found a CLOCK for the first time in your life and have a "key to common objects" to determine what this thing is, the first pair of statements might read:

1. Object is a living thing----------40
1. Object is non-living ---------- 2

Obviously, the correct choice is the second. The statement is followed by a number, 2. So you proceed to the pair of statements preceeded by the number 2, thusly:

2. Object is mechanical ----------25
2. Object is inert, without moving parts---------- 3

You make the first choice, I hope, and proceed to pair number 25, thusly:

25. Object has numbers or words upon it which apparently are important to the function of the object ----------26
25. Object possesses no such numbers or words -----400

et cetera, until you get to CLOCK

Several times in the key, there will be 3 or 4 statements to choose from instead of only 2. Be sure you always read all the statements in the group before making your choice.

Finally, you will arrive at a name followed by a number in parentheses, thusly: ROSA (22). Rosa is the genus name. 22 is the number of the genus as listed in the second part of the key.

You needn't worry too much about pronouncing the genus name, but if you want to, try pronouncing EACH LETTER except for something like ph, which is still an F sound. A diphthong such as oi can be pronounced as o-i like in "Oh, I don't know" or as oi like in "oink".

THE SECOND PART OF THE KEY

In the second part of the key, the genus names are centered on the pages in numerical order (theoretically, beginning with the most primitive on the first page and proceeding to the "higher plant forms" toward the end of the key).

Below each genus name, there will be either a key similar to the first part of the key, or the species of that genus will be listed with descriptions from which you should be able to make a choice.

Hence, under genus ROSA (22), if the rose you have has no thorns, you quickly determine that it's a SMOOTH or MEADOW ROSE. This is the common name. Following the common name is the "scientific" name (in italics) composed of two words: *Rosa*, which is the genus name, and *blanda*, which is the species name.

HAVE FUN

!

1. Leaves needle-shaped, evergreen, coniferous. Tree or shrub. ---2
1. Leaves broad, not needle shaped, deciduous. Tree, shrub or vine. ---8

2. With dwarf branches (needles arising from very short, woody protuberances). ---3
2. Without dwarf branches. ---4

3. Dwarf branches small, self-pruned (are shed upon loss of leaves), with 2 to 5 foliage leaves. ---PINUS (5)
3. Dwarf branches thick, wart-like, persistent (remain after leaves are shed), with numerous (more than 5) deciduous needle-shaped leaves. ---LARIX (4)

4. All leaves are needle-shaped, or fairly long and narrow, sometimes flattened. ---5
4. At least some of the leaves scale-like in appearance. ---7

5. Twigs covered with scales representing the leaf bases. ---6
5. Twigs not covered with scales. Leaves flat. A tree. ---ABIES (2)

6. Leaves flat, all of about the same length, mucronate at the tips. A shrub.--TAXUS (1)
6. Leaves more or less 4-sided, spreading in all directions from the stem. A tree. ---PICEA (3)

7. Foliage leaves small, scale-like, appressed, opposite, 4-ranked (arising from 4 sides of the stem), closely covering the twigs which are decidedly flattened and fan-like; leaves of two shapes, the dorsal and ventral (top and bottom ones) broader and less acute than the lateral ones. Cone bearing. A tree. ---THUJA (6)
7. Shrubs. Leaves either scale-like OR awl-shaped, opposite or in threes; the scale-like leaves arising from four sides of the twig (4-ranked) causing the twig to appear quadrangular; the awl-shaped leaves spreading and rather sharply pointed. Both types forming more or less dense mats. In both species the female cones are bluish and berry-like. ---JUNIPERUS (7)

8. Leaves alternate on the stem. ---9
8. Leaves opposite on the stem. ---40
8. Leaves ternate on the stem (in threes), pinnately compound. Low shrub.-ACTAEA (16)

9. Leaves simple. ---10
9. Leaves compound. ---36

10. Leaves palmately veined, or at least with two or more prominent side ribs coming from near the base of the blade. ---11
10. Leaves pinnately veined with one main midrib. ---14

11. Leaves not lobed. Leaves serrate; ovate or ovate-oblong; 1" to 3" long, $\frac{1}{2}$" to 1" wide; acute or acuminate at the apex; obtuse or sub-cordate at the base; strongly 3-nerved (three main veins arising from base of blade). ---CEANOTHUS (28)
11. Leaves with lobes. ---12

12. Shrubs densely prickley, leaves irregularly serrate. Prickles along veins on underside of leaves. ---OPLOPANAX (31)
12. Shrubs with prickles on stems, but not along veins on underside of leaves--R-R (21)
12. Shrubs without prickles. ---13

13. Bark of the shrub peeling off in thin strips. Leaves about 1" to 2" long (larger on the younger shoots). The central lobe larger than the other two.---PHYSOCARPUS (17)
13. Bark not peeling. All lobes about the same size. ---R-R (21)

14. Leaves revolute margined (margins curled under). --- 15
14. Leaves without revolute margins. --- 18

15. Underside of leaves densely brown tomentose (heavy "fuzz"). --- LEDUM (33)
15. Underside of leaves without brown tomentose. --- 16

16. Underside of leaves glaucous (whitish), 1" to 2½" long. --- ANDROMEDA (35)
16. Leaves typically shorter than 1 inch. --- 17

17. Leaf margins strongly revolute. Leaves 0.2" to 0.35" long and about 0.05" wide. Leaves densely arranged on stems. Duffusely branching, the branches 2" to 10" long. Leaves dark green on both sides. --- EMPETRUM (24)

17. Leaf margins only slightly revolute. Leaves dark green above, paler beneath. Stems creeping, roots forming at the nodes of the stems. Fruit a berry. -- VACCINIUM (37)

18. Leaves not lobed; may be serrate, dentate, or entire. --- 19
18. Leaves with 7 to 13 lobes; 4" to 7" long, deep green and dull above, paler beneath. QUERCUS (15)

19. Lateral veins which arise from the midrib more or less straight and parallel, may or may not end in the teeth or serrations at the leaf margin. --- 20
19. Lateral veins not straight and parallel. --- 26
19. Lateral veins curving to become parallel with midrib, veins never reaching leaf margin. --- CORNUS (32)

20. Majority of the leaves 2-ranked (arising from two opposite sides of the stem). --- 24
20. Leaves not 2-ranked. --- 21

21. Leaves dentate at the obtuse tips only; the cuneate (wedge-shaped) bases being entire. Short petiole (or even apparently none at all). --- MYRICA (10)
21. Leaves not as above; i.e., more or less dentate or serrate all around. --- 22

22. Cross-section of pith is 3-angled. --- ALNUS (14)
22. Cross-section of pith is cylindrical or nearly so. --- 23

23. With thorn-like dwarf branches. Leaves irregularly dentate or serrate. -- S-P-A (19)
23. Without thorn-like dwarf branches, or thorns of any kind. Leaves serrate-dentate. --- AMELANCHIER (20)

24. Lateral veins which arise from the midrib do not end in any of the serrations or teeth at the leaf's margin. --- AMELANCHIER (20)
24. Lateral veins do end in some of the serrations or teeth. --- 25

25. Bark of the larger branches and tree trunk appearing as paper-like sheets which may be uncurling from the branches or trunk. Twigs may have glandular warts. Trees. --- BETULA (13)
25. Bark not paper-like, but scaly and fine furrowed. The small twigs pubescent. --- OSTRYA (12)

25. Bark not paper-like, nor scaly and fine-furrowed. Rather the bark is smooth. Shrubs. --- CORYLUS (11)

26. Leaves with disc-like, wart-like, or tooth-like glands on the petiole, on the base of the blade, or on the upper side of the midrib. --- 27
26. Leaves without distinct glands as above, but may be glandular-dotted. --- 30

27. Pith 5-angled. Leaves deltoid. --- POPULUS (9)
27. Pith cylindrical or nearly so. --- 28

28. Tooth-like glands at the base of the midrib or along the upper side of the midrib. --- S-P-A (19)
28. Glands not along midrib, but only on base of blade or on petiole. --- 29

29. Rounded or tooth-like glands or toothed edges or leaves gland-tipped. Terminal bud absent on mature twigs; also twigs with brittle zones. --- SALIX (8)
29. Glands various, twigs without brittle zones. Terminal buds present or absent. --- PRUNUS (23)

30. Leaves oblanceolate or oblong, covered with minute-membranous, peltate scales. Evergreen. --- CHAMAEDAPHNE (36)
30. Leaves without peltate scales. Deciduous. --- 31

31. With thorn-like dwarf branches. --- S-P-A (19)
31. Without thorn-like dwarf branches --- 32

32. With stipules (minute, leaf-like structure at the base of the petiole) or stipular scars (scar indicating a stipule had once been attached). --- 33
32. Without stipules or stipular scars. --- 34

33. Two or more outer bud scales on winter buds. --- 35
33. 1 outer bud scale. Twigs with brittle zones. Terminal bud of mature branches absent. Bundle scars 3 (bundle scar: carefully sever leaf from twig and observe dots, crescents or other shapes included in exposed area). --- SALIX (8)

34. Leaves dentate at the obtuse tips only; the cuneat (wedge-shaped) bases being entire. Short petioled or apparently no petiole at all. --- MYRICA (10)
34. Leaves not as above; i.e.: more or less dentate or serrate all around. --- 21

35. A small shrub, the young branches puberulent (finely pubescent; tiny, fuzzy hairs). Leaves oval to elliptic, 2" to 4" long, 1" to 2" wide, obtuse to acuminate at the apex, mainly acute at the base, 6 to 7 pairs of lateral veins not ending in the irregular serrations. --- RHAMNUS (27)

35. Branches not pubescent or if so, the leaves much smaller (1" to $1\frac{1}{2}$" long, 0.4" to 0.8" wide). Typically the older stems finely white speckled; or granulated; or green, warty and glabrous (smooth, without hairs). --- VACCINIUM (37)

35. Yellowish-brown stems with pubescence on younger twigs. Shrub 2' to 5' high. More or less sharply serrate. 7 to 9 pairs of lateral veins, the ends of which commonly meet the next lateral vein toward the leaf tip. --- SPIRAEA (18)

36. Leaflets 11 or more. --- 37
36. Leaflets less than 11. --- 38

37. Base of petiole surrounds lateral bud. Bark milky or resinous, pith very large. Leaflets 11 to 31. --- RHUS (25)
37. Base of petiole not surrounding lateral bud. Pith cylindrical, but not abnormally large. Leaves with stipules. 11 to 17 leaflets. Trees. --- S-P-A (19)

38. Vines. Palmately compound with 5 leaflets. Tendrils or flower clusters on stems opposite of alternately spaced leaves. Berries blue. --- PARTHENOCISSUS (29)
38. Not vines, but shrubs and pinnately compound leaves. --- 39

39. Large stipules adhering to the base of the petiole. The two stipules taken together appear spade-like. Leaflets 5 to 9 on mature leaves. Stems cylindrical. --- ROSA (22)
39. Leaves stipuled but not spade-like in appearance. Leaflets 3 to 5. Stems cylindrical or angled. --- R-R (21)

40. Leaves simple. --- 41
40. Leaves compound. --- 51

41. Leaves palmately veined and lobed, or with both lobed and unlobed leaves on the same plant. ---42
41. Leaves pinnately veined and not lobed (or if lobed, then not distinctly so). ---43

42. Large pith (50% or more of diameter of wood twigs). Shrubs. Fruit a drupe. ---VIBURNUM (43)
42. Pith inconspicuous. ---ACER (26)

43. Leaves entire. ---45
43. Leaves serrate. ---44

44. Twigs with conspicuous pubescent ridge along stems, decurrent from the middle of the line connecting the petiole bases. ---DIERVILLA (40)
44. No such pubescent, decurrent ridge. Leaves dentate to serrate with the nerves ending in the serrations. ---VIBURNUM (43)
44. No such pubescent, decurrent ridge. Leaves more or less entire, inconspicuous serrations if any. ---SYMPHORICARPOS (42)

45. Twigs and leaves white, or brown-scurfy, or stellate-pubescent. ---SHEPHERDIA (30)
45. Not as above. ---46

46. Leaves revolute margined. Evergreen and coriaceous. ---KALMIA (34)
46. Leaves not revolute margined, not evergreen. ---47

47. Outer lateral veins of leaves more or less parallel with midrib. ---CORNUS (32)
47. Outer lateral veins not parallel with midrib. ---48

48. Upper pair of leaves perfoliate(their bases meeting and joining around the stem, forming a cup-like structure). ---LONICERA (41)
48. Upper leaves not perfoliate. ---49

49. Petiole meeting around the stem or at least connected by a conspicuous ridge. Shrub or vine. ---50
49. Petioles not meeting and not connected by a ridge. Leaves more or less heart-shaped, being truncate or cordate at the base. ---SYRINGA (39)

50. Bundle scar 1. Leaves ovate, oval, or orbicular. Not heart-shaped at the base. Shrub. ---SYMPHORICARPOS (42)
50. Bundle scars 3. Leaves lanceolate, oval-lanceolate or oblong, often with heart-shaped base. Twining or shrubby. ---LONICERA (41)

51. Shrub. Pith large, wood rather soft. ---SAMBUCUS (44)
51. Tree. Pith small, wood HARD. ---FRAXINUS (38)

GYMNOSPERMS

TAXUS (1)

1. Leaves flat, abruptly pointed, dark green, 1/2 to 1 inch long. Fruit a cup-shaped, berry-like cone, red, about 0.3" in diameter. A shrub 1 to 2 feet high, but may be much lower because of sever browsing by the moose. AMERICAN YEW or GROUND HEMLOCK, *Taxus canadensis*

ABIES (2)

1. Leaves dark green above, paler beneath, 1/2" to 1" long, flattish. Cones cylindrical, 2" to 4" long, 1" to 1 1/2" thick, standing upright in rows along upper surface of branches, reddish-purple when young. Bark quite smooth even on older branches, rather large conspicuous blisters containing resin on older branches and trunk. Fairly large tree usually smaller than the white spruce. Very common.
BALSAM FIR, *Abies balsamea*

PICEA (3)

1. Leaves needle-shaped, light green and sometimes with a bluish cast, somewhat glaucous, 1/2" to 3/4" long. Cones nearly cylindrical, about 2" long, the scales entire (not dentate), about 3/4" thick when unopened. Branchlets glabrous. Bark on small branches smooth, on larger branches and trunk becoming quite harsh to the touch; but not deeply furrowed. A large tree, very common. WHITE SPRUCE, *Picea glauca*

2. Leaves needle-shaped, dark green, short (usually less than 1/2") and stout. Cones about 1" long and ovoid. Cone scales dentate. Bark slightly rough, gray-black, branchlets pubescent. A medium sized tree, usually quite slender, not profusely branched. Swamps and bogs. BLACK SPRUCE, *Picea mariana*

LARIX (4)

1. Leaves 1/2" to 1" long, arranged in clusters of more than 5 on short dwarfed branches, pale green, delicate, deciduous in late fall. Cones 1/2" to 3/4" long, ovoid, composed of 10 to 12 thin scales, borne on very short lateral branches. Bark smooth or slightly scaley, gray. Bogs. LARCH or TAMARACK, *Larix laricina*

PINUS (5)

1. Leaves in sets of 5. Leaves 3" to 5" long, and quite slender, light green. Cones when mature about 4" to 6" long, slightly curving, about 1" to 1 1/2" thick at the center, do not have spines or spine remnants near tips of cone scales. Bark smooth on the branches and remaining smooth in comparatively large patches on older trunks, light gray-brown. A large tree having a delicate, fine appearance. WHITE PINE, *Pinus strobus*

1. Leaves in sets of 2. ----2

2. Leaves 4" to 6" long, not "quite slender" as above, dark green. Cones 1" to 3" long, straight, about an inch thick at the center, oval-conic before scales open. A large tree having a more bold appearance than white pine. Bark reddish, flaky on older branches and trunk. RED or NORWAY PINE, *Pinus resinosa*

2. Leaves 1/2" to 1" long, stout, light green. Cones 1" to 2" long, many times curving upwards, commonly closely pressed to the branch, spines on young cones, leaving minute spine scars on the scales of older cones. Bark flaky, not in large patches as the above 2, gray. A small tree usually found on dry, rocky hillsides or on dry cliffs in small groves. JACK PINE, *Pinus banksiana*

THUJA (6)

1. Leaves very short, scale-like, pressed closely to branches, 4-ranked, of 2 types; 1) keeled (folded lengthwise) appearing in opposite ranks, and 2) flat, not keeled, appearing in the other 2 opposite ranks. The 2 types giving the branches a flattened appearance. Cones about 1/2" long, scales pointless. Bark light brown, slight reddish tinge, shreddy. A tree common along harbors, bays, swamps, moist places. Occasionally found near shore-rock pools. NORTHERN WHITE CEDAR or ARBORVITAE, *Thuja occidentalis*

JUNIPERUS (7)

1. Leaves needle-shaped, not pressing close to the twig, not scale-like, densely covering the twig, stout, spine-tipped, a white stripe on upper surface. Cones berry-like, blue to whitish blue. A shrub seldom over 2 to 3 feet high and growing in a mat sometimes covering many square feet. GROUND JUNIPER, *Juniperus communis*

2. Leaves scale-like, pressing closely to the twigs, four ranked (arising from 4 sides of the stem), very stout and very short (0.2 to 0.4 inches long). Cones berry-like, glaucous, light blue. A shrub rarely over 3 feet high, trailing or creeping and forming mats. Less common than the above, but definitely not rare.
LOW-LYING JUNIPER or CREEPING SAVIN, *Juniperus horizontalis*

ANGIOSPERMS

SALIX (8)

1. Branchlets brittle at base, snap off easily. ----2
1. Branchlets not brittle at base. ----3

2. Twigs reddish-green. Leaves lanceolate, green on both sides, coarsely undulate-serrate. Not native; planted on Barnum Island, Washington Harbor. CRACK WILLOW, *Salix fragilis*
2. Twigs reddish-brown. Leaves short oval to ovate, slightly crenulate-serrate, dark green above, glaucous and reticulate veined beneath. A balsamiferous-resiniferous fragrance is characteristic.
BALSAM WILLOW, *Salix pyrifolia*

3. Leaves entire or nearly so. ----4
3. Leaves with conspicuous serrations or dentations. ----8

4. Leaves slightly revolute; linear oblong, elliptic, oblanceolate, or obovate; entire; bright green above, pale or glaucous beneath. Twigs light brown, and circular in cross-section. BOG WILLOW, *Salix pedicellaris*

4. Leaves not revolute ----5

5. Leaves bright green above, paler green or whitish beneath. ----6
5. Leaves dull green. Twigs gray. ----7

6. Twigs reddish to olive-brown. Leaves bright green, glabrous above; pale beneath; oblong, lanceolate, or oblanceolate; entire. SATINY WILLOW, *Salix pellita*

6. Twigs glabrous, dark purple-green. Leaves darker green and shining above, pale and glaucous beneath; oblong, lanceolate, or elliptic. TEA-LEAVED WILLOW, *Salix planifolia*

7. Leaves dull green above, reticulate veined beneath. Twigs gray. BEAKED WILLOW, *Salix bebbiana*

7. Leaves barely reticulate veined beneath, and glabrous when mature. (*Salix bebbiana* var perrostrata)

8. Leaves shining green on both sides, broadly lanceolate to ovate-oblong, lightly serrated, and slightly coreaceous. Twigs lustrous. BAY-LEAVED WILLOW, *Salix pentandra*

8. Leaves not shining green on both sides. ----9

9. Twigs glabrous (and dull reddish-purple). Leaves glabrous and bright green above, glaucous, nearly white beneath. Irregularly serrate; especially near center; sometimes nearly entire.
PUSSY or SILVER WILLOW, *Salix discolor*

9. Twigs pubescent. Leaves dull dark green above, gray tomentose beneath. ---10

10. Leaves oblanceolate, 2" to 6" long, 0.4" to 0.8" wide, sparingly denticulate and slightly revolute.
PRAIRIE WILLOW, *Salix humilis*

10. Leaves more than 0.4" to 0.8" wide, but less than 2" to 6" long; the gray tomentose on the underside becoming quite thick so as to hide the lateral veins. KEWEENAW PRAIRIE WILLOW, *Salix humilis*

POPULUS (9)

1. Petioles flattened laterally. ----2
1. Petioles round in cross-section; leaves dark green, shining above, pale beneath. Rather common on beaches and old beach lines. BALSAM POPLAR or HACKMATACK or TACCAMAHAC, *Populus balsamifera*

2. Leaves smooth, dark green and lustrous above, dull yellowish-green below; finely crenulate all around. Petioles very much flattened. Very common tree. QUAKING ASPEN, *Populus tremuloides*

2. Leaves smooth dark green above, smooth and glaucescent beneath; petioles slender and flattened, coarsely and irregularly denticulate margins. Not common. LARGE-TOOTHED ASPEN, *Populus grandidentata*

MYRICA (10)

1. The one species of this genus on the island. Leaves dentate at the obtuse tips, cuneate and entire at the bases. Little or no petioles. Dark green glabrous above, pale beneath. Fruit from pistillate aments ovoid to oblong, the 2 wing-like bracts imbricated, resinous and waxy. SWEET GALE, *Myrica gale*

CORYLUS (11)

1. The only species of this genus found on Isle Royale. Very prevalent in rock-openings and old burns; sometimes forming almost impenatrable shrub zone. Leaves thin, doubly-toothed, rather broad.
BEAKED HAZELNUT, *Corylus cornuta*

OSTRYA (12)

1. The only species of this genus represented in Eastern North America. Leaves oblong-ovate, sharply double-serrate, hairy on the underside. Very rare on Isle Royale. reported only from the central Greenstone Ridge area. AMERICAN HOP-HORNBEAM or IRONWOOD, *Ostrya virginiana*

BETULA (13)

1. Leaves serrate. Trees. ----2
1. Leaves coarsely dentate. Shrubs. Young twigs brown. Leaves obovate, broadly oval or orbicular, dull green above, pale beneath, smooth on both sides. Bog edges. LOW or SWAMP BIRCH, *Betula glandulosa*

2. Trees. Bark orange brown on young twigs; creamy-white on trunk and older branches, exfoliating in large sheets, smooth. Extremely common. PAPER or CANOE BIRCH, *Betula papyrifera*

2. Trees. Bark of trunk and older branches a yellowish-silvery-gray, exfoliating in horizontal strips, not in large sheets, rough. Common in sugar maple forest. YELLOW or GRAY BIRCH, *Betula lutea*

ALNUS (14)

1. With fine, distinct, crowded teeth on the somewhat ruffled leaf margins. Leaves round-oval, glabrous (sometimes pubescent veination beneath). Very common along harbors (especially on low banks) and many times found overhanging the water. Also found at high altitudes in rock-openings. GREEN ALDER, *Alnus crispa*

2. Doubly serrate or serrate-dentate leaves with pubescence underneath (at least along veins). Conspicuous horizontal whitish lenticels as long as 1/4" on the gray bark. Common along edges of bogs and delta swamps. SPECKLED ALDER, *Alnus rugosa*

QUERCUS (15)

1. The only species of oak reported for the island. Found almost exclusively on the Greenstone Ridge southwest from Mt. Ojibway to Sugar Mountain and on the Red Oak Ridge. BOREAL RED OAK, *Quercus borealis*

ACTAEA (16)

(note: actually herbaceous plants, but due to their size and growth form, are included here)

1. With cherry red fruits only (no white fruits on plant). Low, bushy herb. RED BANEBERRY, *Actaea rubra*

2. With white fruits (may also have some red). Pedicels of fruits less than 1mm thick. Same species as the above, but designated as "forma n e g l e c t a".

3. With white fruits (never any red). Pedicels of fruits more than 1mm thick. WHITE BANEBERRY, *Actaea alba*

PHYSOCARPUS (17)

1. A shrub, 2 to 8 feet high, leaves obscurely 3 lobed and somewhat cordate. Along shores and sometimes in gravelly, rocky places of low altitudes. Flowers white in corymbs. NINEBARK, *Physocarpus opulifolius*

SPIRAEA (18)

1. Shrub, 2 to 5 feet high. Leaves narrow, oblanceolate, pubescence on the veins beneath. Finely serrated, especially near the tip Found along creeks on moist to wet soil, and margins of swamps. MEADOW SWEET, *Spiraea alba*

S-P-A (Sorbus, Pyrus and Aronia) (19)

1. Leaves simple. ----2
1. Compound leaves odd-pinnate. A small tree with smoothish bark. Leaflets 11 to 17, sharply serrate, lanceolate, glabrous when mature, yellow-green above. Flowers in June are white and very conspicuous becoming orange-red masses of fruits in fall. AMERICAN MOUNTAIN ASH, *Sorbus americana*

2. Leaves somewhat cordate and wooly beneath. Young leaves and branchlets with gray tomentose. On Isle Royale reported by Brown to be "on gravel bar, northeastern end of Grace Island"; also at the Daisy Farm. Escaped from cultivation. COMMON APPLE, *Pyrus malus*

2. Leaves not cordate at the base, but narrowed. Glabrous or nearly so on both surfaces. Fruit (fall) purplish-black. A shrub. Bogs. BLACK CHOKEBERRY, *Aronia melanocarpa*

AMELANCHIER (20)

1. Leaves narrowly oval. A shrub with dull green leaves occuring mainly in rock openings and near rocky shores. Flowers white, 5 petals, 1 to 4 occuring near the end of the branches. A number of hybrid variations may be present. MOUNTAIN JUNEBERRY, *Amelanchier bartramiana*

2. Leaves broadly oval, nearly round. ROUNDLEAF JUNEBERRY, *Amelanchier sanquinea*

R-R (Rubus and Ribes) (21)

1. Shrubs with prickles, spines or thorns. ----7
1. Shrubs without prickles, spines or thorns. ----2

2. With compound leaves. ----3
2. With simple leaves. ----4

3. Leaves membranaceous, opaque. Leaflets more or less pointed at the tips, sharply and often doubly serrated. Lateral leaflets many times partially lobed on their outer sides. Flowers white. Fruit reddish-purple. DWARF RED BLACKBERRY, *Rubus pubescens*

3. Leaves subcoriaceous, sublustrous above. Leaflets more or less rounded-tipped, with coarse, usually simple serrations. Flowers pinkish. Fruit red. ARCTIC RED RASPBERRY, *Rubus acaulis*

4. Most leaves less than 4" wide. ----5
4. Most leaves 4" to 8" wide. Leaves simple, cordate at the base, 3 (rarely 5) lobed with coarse and unequal serrations. Flowers white. Fruit salmon red. THIMBLEBERRY or SALMONBERRY, *Rubus parviflorus*

5. Stems mostly not erect. Berries red. ----6
5. Stems mostly erect. Berries black. WILD BLACK CURRANT, *Ribes hunsonianum*

6. Leaves deeply lobed with 5 to 7 lobes. Racemes usually quite erect. SKUNK CURRANT, *Ribes glandulosum*

6. Leaves mostly 5-lobed, the sinuses not cutting more than about 1/3 through the leaf. Racemes commonly drooping. WILD CURRANT, *Ribes triste*

7. Leaves compound. ----8
7. Leaves simple. ----9

8. Spines obviously broadening at the base. Leaflets 3 to 7. Lateral leaflets sessile; white or gray beneath. Flowers white. Fruit red. RED RASPBERRY, *Rubus strigosus*

8. Spines straight and awl-shaped, not broadening at the base. Leaflets 3 to 5. Lateral petiolules very short or nearly lacking; the terminal one longer. Flowers white. Fruit black. Rare.
LEAFY-FLOWERED BLACKBERRY, *Rubus pensilvanicus*

9. Leaves longer than broad, sinuses between lobes cutting more than 1/2 way to base of leaf blade. Fruit dark purple or black. SWAMP CURRANT, *Ribes lacustre*

9. Leaves longer than broad, sinuses not cutting so deeply as above. Fruit reddish purple
WILD GOOSEBERRY, *Ribes oxyacanthoides*

9. Leaves as wide as long or wider, the sinuses usually less than 1/2 way to base of leaf blade, the leaves normally pubescent. Fruit red to black. WILD GOOSEBERRY, *Ribes setosum*

ROSA (22)

1. Armed with straight thorns, not wide at the base. ----2
1. Unarmed, or if so, very slightly with hooked, thick-based thorns. Flowers pink.
SMOOTH or MEADOW ROSE, *Rosa blanda*

2. Thorns straight, slender, found mostly only at the base of petiole on stem.
LOW or PASTURE ROSE, *Rosa virginiana*

2. Thorns slender, straight and very dense covering the entire stem. The most common species on Isle Royale. PRICKLY ROSE, *Rosa acicularis*

PRUNUS (23)

1. Leaves rather broad with widest part at or just above the center, the tips rather abrupt, sharply serrate (often doubly serrate), dark green above, pale beneath, glabrous on both sides. Flowers white in racemes which terminate short leafy branches. Fruit: globose drupe, purplish, reddish-black, or black; sweet, but rather astringent (like alum). CHOKE CHERRY, *Prunus virginiana*

2. Leaves narrow with widest part below the center, fine-sharp serrations, teeth incurved, yellow-green above, pale beneath, glabrous on both sides, but sometimes tufts of pubescence beneath in the axils of the veins. Flowers white in corymbs. Fruit: globose drupes, light or bright red; sour. FIRE CHERRY, *Prunus pensylvanica*

EMPETRUM (24)

1. A very small, evergreen shrub. Branches 2 to 10 inches long lying on the ground. Leaves dark green, strongly revolute. Flowers very small, purple. Fruit a drupe, black.
BLACK CROWBERRY or HEATHBERRY, *Empetrum nigrum*

2. Very similar to the above, but with red or purple fruit. PURPLE CROWBERRY, *Empetrum rubrum*

RHUS (25)

1. A shrub, 1 to 12 feet high, the leaves glabrous to puberulent. Drupes covered with very short red hairs.
NORTHERN SMOOTH SUMAC, *Rhus glabra*

2. A shrub similar to above, but with younger branches covered with dense, soft hairs.
STAGHORN SUMAC, *Rhus typhina* ‹X

ACER (26)

1. Leaves with three or more main lobes, irregularly sinuate, without serrations.
SUGAR MAPLE, *Acer saccharum*

1. Leaves with three or more main lobes, with serrations or dentations. ----2

2. Main lobes of leaves irregularly sinuate and with irregular serrations, twigs red, upper side of petiole red. Leaves bright (not shining) above; paler, nearly whitish, beneath; may have slight pubescence beneath. A tree with smoothish gray bark usually found only on high ridges and assuming a "struggling existence" appearance. RED MAPLE, *Acer rubrum*

2. Main lobes of leaves not sinuate, twigs not red. ----3

3. Leaves 3 lobed, the outer two lobes nearly as long as the central one, with very fine serrations all around. Bark greenish or reddish brown striped with bands running vertically. Last reported in 1908 by W. P. Holt as "rare on the island". STRIPED MAPLE or MOOSEWOOD, *Acer pensylvanicum*

3. Leaves 3 to 5 lobed with large rounded serrations, the teeth being gland tipped; glabrous above, densely pubescent beneath. Petioles long and slender which may turn red during summer. Usually only a shrub occurring in moderately shaded forest. MOUNTAIN MAPLE, *Acer spicatum*

RHAMNUS (27)

1. A small shrub, 1 to 3 feet high. Leaves oval with even serrations; 6 to 7 pairs of veins. Flowers green, 1 to 3 in axils of leaves on fruiting branches. Fruit a drupe.
ALDER LEAVED BUCKTHORN or DWARF ALDER, *Rhamnus alnifolius*

CEANOTHUS (28)

1. Leaves strongly 3-nerved, acute tips and rounded or cordate at the base; green and smooth above, grayish and slightly pubescent beneath; serrated. Small white flowers in clusters.
NEW JERSEY TEA, *Ceanothus americanus*

PARTHENOCISSUS (29)

1. A vine, adhering by means of discs terminating branched tendrils. Five leaflets with distinct petiolules, powdery dark green above and paler beneath. One species only. Cultivated at Belle Isle and probably found only there. VIRGINIA CREEPER, *Parthenocissus quinquefolia*

SHEPHERDIA (30)

1. A shrub 1 to 5 feet high. Leaves ovate, medium green above, silvery beneath with rusty scales. Fruit orange or yellow. One species only. CANADIAN BUFFALO-BERRY, *Shepherdia canadensis*

OPLOPANAX (31)

1. A dense shrub very heavily armed with prickles, 2 to 6 feet high. Leaves cordate at the base and very large with 3 to 13 lobes and prickles on both sides, especially along veins underneath, unevenly serrate. Fruit red or brownish-red. One species only. Found on the northeasternmost end of Isle Royale and on Passage Island; these being the only locations for the species east of the Rocky Mountains.
DEVIL'S CLUB, *Oplopanax horridum*

CORNUS (32)

1. Leaves opposite. Mature twigs reddish-purple and glabrous. Leaves ovate to oblong-lanceolate with 5 to 7 pairs of veins. Fruit globose and white to very slightly bluish. RED OSIER DOGWOOD, *Cornus stolonifera*

2. Leaves opposite. Mature twigs greenish and warty. Leaves broad, ovate, with 7 to 9 pairs of veins and wooly beneath. Flowers white in cymes. Fruit globose, bluish.
ROUND-LEAVED DOGWOOD, *Cornus rugosa*

3. Leaves mostly alternate in rather tight clusters near tips of branchlets. Tall shrub up to 12 to 15 feet tall.
ALTERNATE-LEAVED DOGWOOD, *Cornus alternifolia*

LEDUM (33)

1. Low shrub. Leaves green above and heavily rusty tomentose beneath with strongly revolute margins. Flowers white in dense clusters. Evergreen. LABRADOR TEA, *Ledum groenlandicum*

KALMIA (34)

1. A shrub 6 inches to 24 inches high. Leaves green above, glaucous beneath, glabrous on both sides, the margins revolute. Flowers reddish or purplish in umbels at the branch tips. Fruit a capsule. One species only.
SWAMP LAUREL, *Kalmia polifolia*

ANDROMEDA (35)

1. A shrub 6" to 36" high. Leaves long and narrow, dark green above, glaucous beneath, margins revolute. Flowers white, fruit a capsule with persistent style. BOG ROSEMARY, *Andromeda glaucophylla*

CHAMAEDAPHNE (36)

1. A shrub 1 to 4 feet high. Leaves oblong, coriaceous; covered with very small scales, especially beneath. Flowers white. Fruit a capsule, also with persistent style. LEATHER LEAF, *Chamaedaphne calyculata*

VACCINIUM (37)

1. Leaf margins entire, not revolute. ----2
1. Leaf margins with serrations (large or minute), not revolute. ----4
1. Leaf margins revolute, leaves quite small. Bog habitat. ----6

2. Leaves conspicuously reticulate veined underneath; pale green, dull green above, coriaceous, obovate, oblong or roundish. Young twigs glabrous to very slightly pubescent. Flowers: corolla urceolate, white, sometimes trimmed with pink. Fruit blue to black, sweet. ALPINE BLUEBERRY, *Vaccinium uliginosum*

2. Leaves not conspicuously reticulate veined beneath. ----3

3. Leaves with black dots on under side. Stems glabrous. Leaves coriaceous, evergreen, smooth and lustrous above, paler beneath. Extensively creeping. Fruit red, tart. MOUNTAIN CRANBERRY, *Vaccinium vitis-idaea*

3. Leaves without black dots on underside. New branchlets densely velvety. Leaves not coriaceous, not evergreen, downy underneath and often downy above. Berry blue with a heavy "bloom".
VELVET LEAF BLUEBERRY, *Vaccinium myrtilloides* XXXX

4. Leaves with black dots on under side. Stems glabrous. Leaves coriaceous, etc., see number 3, 1st choice.
4. Leaves without black dots on underside. ----5

5. Branches green-warty. Leaves bright green, glabrous, 8 to 15mm broad. Stoloniferous. Fruit blue with a "bloom", sweet. LATE SWEET BLUEBERRY, *Vaccinium angustifolium* and *Vaccinium lamarckii*, the tetraploid derivitive. Features may be somewhat larger in *Vaccinium lamarckii*

5. Branches not green warty, but may have a greenish-brown tinge. Leaves pale or dull; pubescent underneath; 15 to 30mm broad. Fruit blackish without bloom, very sweet. EARLY SWEET BLUEBERRY, *Vaccinium vacillans*

6. Leaves more or less pointed-tipped, ovate-oblong to ovate or triangular, 3 to 8mm long, 1 to 3mm wide, strongly revolute. Fruit 5 to 8mm in diameter. SMALL CRANBERRY, *Vaccinium oxycoccos*

6. Leaves with or without pointed-tips, but must be 6 to 17mm long and 2 to 8mm wide. May be slightly, but not strongly revolute. Fruit usually more than 8mm in diameter. ----7

7. Leaves more or less pointed-tipped, 6 to 15mm long, 2 to 8mm wide. Fruit globose, 8 to 10mm in diameter. SMALL OVAL-LEAVED CRANBERRY, *Vaccinium oxycoccos*

7. Leaves more or less rounded-tipped, oblong-elliptic, 6 to 17mm long, 2 to 8mm wide. Fruit 10 to 20mm in diameter and more or less pyriform. LARGE CRANBERRY, *Vaccinium macrocarpon*

FRAXINUS (38)

1. 5 to 7 stalked leaflets of the compound leaf. Rare, if at all present. WHITE ASH, *Fraxinus americana*

2. 7 to 11 leaflets, lateral ones being sessile. Moist places. BLACK ASH, *Fraxinus nigra*

SYRINGA (39)

1. Leaves ovate-cordate with acuminate tips. Flowers purple. Cultivated at Belle Isle and known only from there. COMMON LILAC, *Syringa vulgaris*

DIERVILLA (40)

1. Leaves acuminate-tipped, and rounded base, serrate, glabrous, turning reddish towards mid-summer. In patches on south-facing, rocky slopes. Flowers yellow to reddish yellow.
BUSH HONEYSUCKLE, *Diervilla lonicera*

LONICERA (41)

1. Straggling or ascending shrub. Upper-most pair of leaves not united around the stem (i.e., not perfoliate). ----3
1. Twining or climbing vine. At least uppermost pair of leaves perfoliate. ----2

2. Leaves glabrous above, pubescent beneath; sessile or nearly so; margins ciliate; oblong or elliptic; deep green. Branches glabrous. DOUGLAS' or LIMBER HONEYSUCKLE, *Lonicera dioica*

2. Leaves appressed-setulose above, downy-hairy beneath; broadly oval, short petioles or nearly sessile; margins ciliate. Branches hirsute. HAIRY HONEYSUCKLE, *Lonicera hirsuta*

3. Branches hollow. Leaves thin, glabrous, cordate-oval, more or less pointed tips, short petioled. Flowers pink. Fruit red or sometimes yellowish, globose, and the two ovaries united at the base.
TARTARIAN HONEYSUCKLE, *Lonicera tatarica*

3. Branches not hollow. ----4

4. Margins ciliate. ----5
4. Leaf margins not ciliate. ----6

5. Branches glabrous, four-angled. Leaves glabrous above, paler and pubescent beneath, obovate or oval, acuminate-tipped, strongly ascending on the branches. Fruit purple-black.
INVOLUCRED-FLY HONEYSUCKLE, *Lonicera involucrata*

5. Branches not four-angled. Leaves glabrate on both sides, oblong-ovate or sometimes cordate. Flowers yellow-green. Fruit red; ovoid; the two ovaries not united, but adjacent at the base.
CANADIAN FLY HONEYSUCKLE, *Lonicera canadensis*

6. Leaves reticulate-veined. ----7

6. Leaves not conspicuously reticulate-veined. Branches glabrous and 4-angled. Leaves glabrous above, paler and possibly pubescent especially on veins beneath, obovate or oval, acuminate-tipped, and strongly ascending the branches. Same as 5 above, 1st choice. INVOLUCRED-FLY HONEYSUCKLE, *Lonicera involucrata*

7. Mature leaves glabrous on both sides, minutely downy beneath on new leaves, oblong to narrowly obovate. Branches minutely pilose. Flowers yellowish. Fruit orange to red, the two distinct OR united. SWAMP-FLY HONEYSUCKLE, *Lonicera oblongifolia*

7. Mature leaves strigose to glabrate above, pilose beneath, oblong to oblanceolate or oval. Tips very rounded. Branches puberulent. Flowers yellowish. Fruit blue, ovaries united to form one berry per peduncle. MOUNTAIN-FLY HONEYSUCKLE, *Lonicera villosa*

SYMPHORICARPOS (42)

1. Leaves light, dull, green, paler and/or pubescent beneath, irregularly undulating, entire, blunt at both ends. Flowers in axils of upper leaves or in terminal clusters, pinkish. Fruits one to several, large, globose, and white. SNOWBERRY, *Symphoricarpos albus*

VIBURNUM (43)

1. Petioles stipulate, leaves deeply lobed. Fruit red and quite bitter to the taste, but edible. CRANBERRY TREE or HIGHBUSH CRANBERRY, *Viburnum opulus*

2. Petioles extipulate, leaves not lobed or if so are quite shallowly so. Fruit light red, not as bitter as the former, edible. SQUASHBERRY or HIGHBUSH CRANBERRY, *Viburnum edule*

SAMBUCUS (44)

1. Shrub. Twigs glabrous, the pith large and white. Rare. AMERICAN ELDER, *Sambucus canadensis*

2. Shrub. Twigs pubescent, the pith reddish-brown. Leaves downy underneath. Some leaves inequilateral at the base. Fruit in cymes, red, a drupe. Not edible. RED BERRIED ELDER, *Sambucus pubens*

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by Vance Zink, IRNHA member.

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