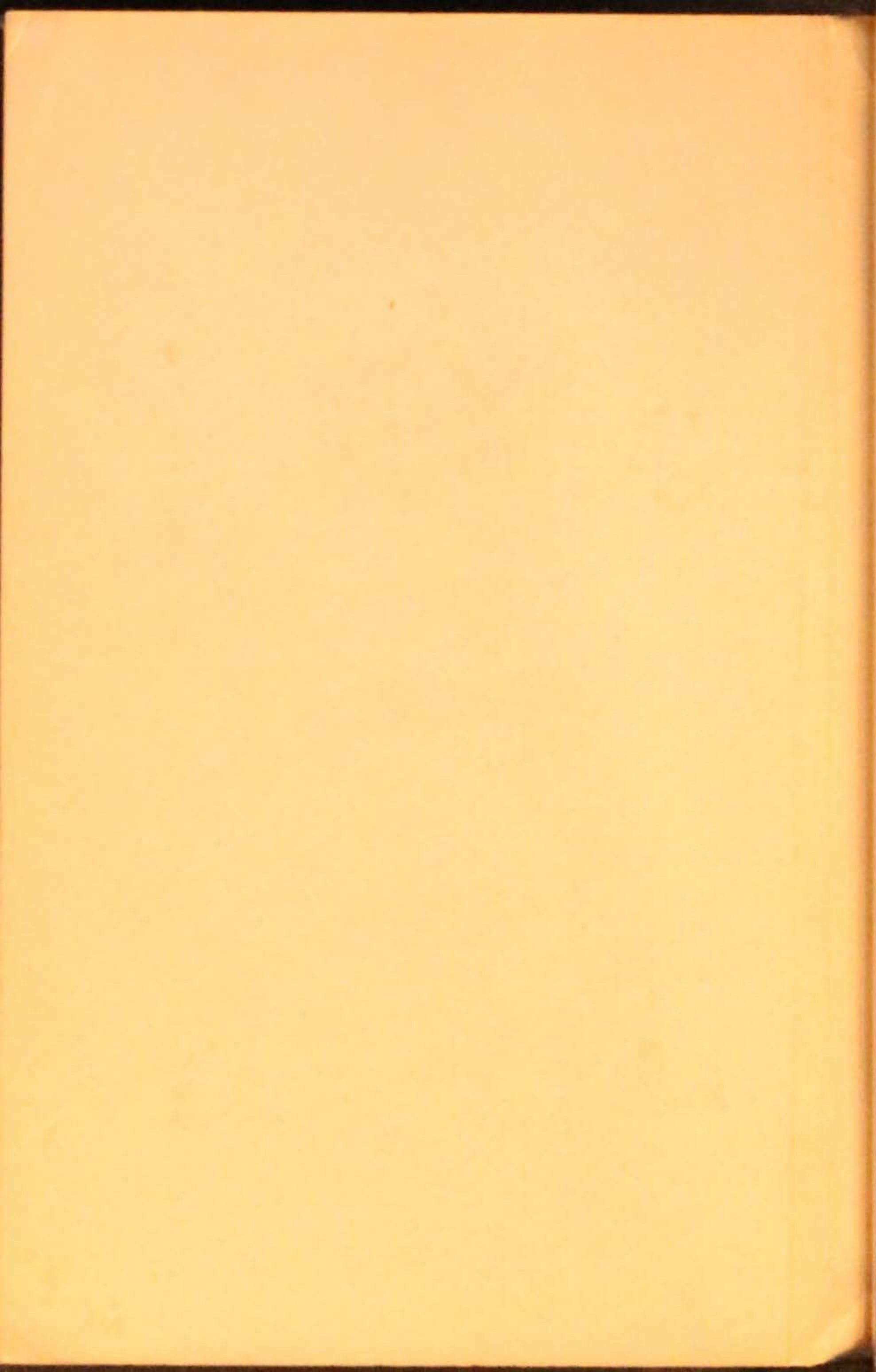


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Iowa Trees in Winter

J. M. Aikman

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The book cover features a repeating pattern of dark brown tree branches with small, rounded buds. A central rectangular box with a dark background and a light border contains the title in large, white, serif capital letters. At the bottom of the cover, there is a faint, light-colored illustration of a forest of bare trees.

IOWA TREES
IN WINTER

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January, 1938

Extension Circular 246

Iowa Trees in Winter

By

J. M. AIKMAN and ADA HAYDEN

IOWA STATE COLLEGE

EXTENSION SERVICE

R. K. Bliss, Director

Ames, Iowa

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Iowa Trees in Winter

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INTRODUCTION

The native vegetation of Iowa was predominantly prairie before the coming of the white man. Forests were present only on the broken lands bordering the Mississippi and Missouri rivers and their tributaries. The type of plant cover in Iowa stood in marked contrast to the chiefly forest cover of the states to the north and south and to the prairie-plains vegetation of the states immediately westward.

A map of the original forest cover of Iowa, begun in 1832 and completed in 1859, shows that only 12 percent of the area was covered with trees. This tree growth which covered the valleys and slopes along the streams in the eastern part of the state for a distance varying from 1 or 2 miles to 30 miles, was fragmentary along streams in the central part of the state and was almost entirely lacking, except along the Missouri and Little Sioux rivers, in the northwestern corner of the state. The principal cause of the absence of trees in certain localities along our chief water courses where they grow today was the common occurrence of prairie fires.

The presence of at least a few trees in almost all portions of a prairie state would seem to be of more interest and importance than their absence from certain localities. Although the vegetation covering the upland areas of Iowa was originally prairie, the complex of environmental conditions under which the prairie developed was only slightly less favorable than is necessary for the development of forests. For this reason, the slight decrease in rate of evaporation and in available soil moisture on the flood-plains and on the protected slopes bordering streams makes possible the development of forests along these streams. It is only in northwestern Iowa, where the topography is little modified by stream courses, and the general environmental conditions are more severe, that trees did not develop to any extent.

The forests of Iowa are a westward extension of the deciduous or hard wood forests of the eastern United States. A few eastern red cedars from the same source are scattered throughout the state. The white pine from the Great Lakes coniferous forest extends in scattered stands as far as Eldora, and the balsam fir and the ground hemlock occur only in the northeast corner of the state.

Upon his arrival in the territory now known as Iowa, the white man did not find any beech; he found sugar maple in stands of importance only in what is now the eastern two tiers of counties. The virgin forests of Iowa were composed chiefly of elm, ash and walnut on the floodplains of the chief water courses with a cover of oak-hickory woods, containing considerable linden, on the adjacent protected slopes.

According to Richman, the white tide of immigrants into the "Ioway

settlement" really broke in 1833. By 1840 there had come to the state by wagon 38,000 farmers. "The purpose of the farmer was to acquire land, and to do this two things were essential—occupancy and a living. The living he could no wise defer. He must have it at once. He must break, plant and cultivate.

"For the pioneer the light of the prairie was so strong that it blinded his eyes. He could face the prairie only with woodland at his back. Woodland meant water; it meant food; it meant shelter. In Illinois the settlements in 1830 were entirely within the timbered tracts; in 1840 the settlers still clung to the timber, not till 1850 was the settlement of the open prairies to be accomplished. Said Charles Mason (Iowa's first chief justice) speaking in 1858 of Iowa conditions as he knew them in 1837: 'Skirting the timber land. . . might be seen a continuous series of incipient farms, each adorned with a settlers' cabin. Occasionally, some one more adventurous than the rest had launched boldly out from the shore. . . into the open ocean prairie and had fixed his home where the storms of summer and the wintry winds might approach him on all sides, and in defiance also of the distance whence the materials of fire and shelter and fences were to be procured.' Another Iowa pioneer said ' . . . there seemed to be something of kinship, something of welcoming of protection about the woods, to those who came pouring out of the forests of the East. There was companionship in the woods—even in their deep mystery . . .' In any event the forest comer would snuggle up to them." *Richman*

"The well-worn paths of these early inhabitants of the wild groves and boundless prairies were found along the wooded banks of the rivers and creeks. There was a charm in choosing a home in the wild, unsettled country as the family journeyed on day after day in the solitude of the vast rolling prairies, fording the streams, winding along the trackless ridges, exploring the fringe of woodland that bordered the creeks and rivers; passing beautiful groves that in the distance slowly loomed up like islands in the ocean, where earlier immigrants had camped and staked out their claims; . . . finding a spring in an unoccupied grove and taking possession for a home; . . . exploring the thickets for wild plums, grapes, crabapples, hazel and hickory nuts; choosing the site for the cabin, cutting the logs which the neighbors helped to raise into a rude house." *Gue*

The pioneer period in that portion of Iowa which had sufficient wooded streams and lakes to insure building and fencing material within hauling distance of the new homes extended through the "'30's", "'40's" and "'50's" and through the "'60's" in northwestern Iowa where forests were almost entirely lacking, because of the difficulty of establishing homes without timber.

An added incentive to the settlement of the northwestern part of the state at this time was the enactment of the homestead act, which enabled the head of a family to secure for the sum of \$14 a quarter section of government land as a home. The successful building and use of sod houses and stables by the first of these "homesteaders" made possible the establishment of homes.

The settlers of northwestern Iowa and many others in the state, who were located on the upland at some distance from adequate supplies of logs and lumber, generally placed a higher value on trees than did those settlers in the more completely forested areas of eastern Iowa. As valuable as trees were for occasional logs or a few boards, they were even more valuable in the form of a

grove for protection and shade around the new home. As one early prairie settler said, "A tree meant more to us than the number of board-feet which it contained." They seemed more anxious to establish and care for adequate shelterbelts around their homes than are some few of their descendants among the present-day inhabitants. Many trees were set out around the new house from planting stock brought on the first or subsequent trips from the east, and many long journeys were made to the nearest forested streams to bring back cuttings and saplings for home planting.

Much of the original forest cover of eastern and southeastern Iowa was cleared for the purpose of farming the land and for logs and lumber. The forests of limited width occurring along streams farther west in some cases were cleared for farming or were badly depleted because of the great demands made upon them for logs, lumber and wood supplies. The development of second growth timber and the elimination of prairie fires, however, has contributed to a gradual increase in the total forest cover of the state during the past few decades. While many of the forests are poorly developed and fragmentary, in many localities they occupy broken land for a greater distance back from the streams than they did at the time of the settlement of the state by the white man. For example, at Ames, Iowa, on the Skunk river, a burn-scar on a pioneer red oak 185 years old shows that a severe fire occurred 90 years ago. The oak-hickory woods, none of the trees of which are 90 years old, now extends for about a mile beyond the site of this tree which stood at the top of the slope bordering the flood-plain of the river.

The number of trees native to Iowa, excluding all but four of the most important species of hawthorn, is 74. Many trees foreign to the state (exotic) have been planted in Iowa; because of their common occurrence, 52 of these exotic trees are included in this circular.

More valuable species and varieties of trees grow in the eastern than in the western half of the state. For the purpose of showing the relative number of species in each portion of the state, it may be divided into four approximately equal parts: the northeastern, the southeastern, the southwestern and the northwestern parts. The number of native species for each portion of the state (based on a total of 74 for the entire state) are: northeastern 60, southeastern 59, southwestern 45, northwestern 43. There are more important species of forest trees in the southeastern portion of the state than elsewhere because of the presence there of more species of oaks and hickories which make up the dominant tree association of the state. The presence in the northeastern part of more conifer species and of more willows, poplars and birches accounts for the increase in number of species there, although the oak-hickory woods are not so well developed in that portion of the state. The extreme northwestern corner of the state has few species of native trees, but several species occurring on the eastern and southern borders of that area increase the number for the entire quarter to 43.

Although not generally recognized, the relationship of trees to agriculture has significance. The value of the protection afforded crops by the presence of groups of trees was definitely established by the early work of C. G. Bates. The reduction in yield of the crop close to the trees caused by the lack of water is more than balanced by the increased yield of the crop because of the protection afforded at a greater distance from the trees. Even though the pro-

tection of trees is quite local in effect, the presence of many groves of trees in a given farming area aids materially in reducing the rate of water loss from crop plants.

Few of the early settlers were content to live for any length of time on a homesite which was not protected by a grove of trees. Those who were not able to build their homes within the continuous forested tracts bordering streams or in native groves, planted shelterbelts. After the home was built, the protection (both imaginary and real) afforded by the trees was valued more than the returns in the form of fuel and occasional logs and poles.

It is difficult to measure the value to homesteads of a well-developed permanent shelterbelt. Wind velocity in the vicinity of the house, garden, orchard and barnyard is materially decreased, and the value of the shade alone to man and animals is important. Small groups of trees in pastures are considered by most farmers to be necessary for the proper care of stock.

The value of trees and other woody plants in the control of erosion has come to be fully appreciated by Iowans only in recent years. Faulty land-use planning accounted for the idea held in early years that the southern one-third of the state could become a great cattle-feeding area with the corn being raised locally. This idea was abandoned only after the thin top soil on thousands of cleared acres of steep land in this part of the state had been almost entirely removed by erosion. The farmers of this and other parts of the state where steep slopes are common have become convinced that not all Iowa land is good corn land and that steep land must be developed into pastures or be allowed to revert, or be planted to woody plants of economic value.

The Soil Conservation Service is making an important contribution to permanent agriculture in the state by demonstrating that soil conserving crops can be planted, portions of farms can be taken out of cultivation and planted to trees and shrubs, and gullies can be controlled and at the same time the farm can be made to pay. Iowa farmers are beginning to realize the value of erosion control.

Although Iowa trees are of much greater value for other purposes than for lumber, there are at present a few small saw-mills in the state which saw lumber from Iowa logs. Some of the lumber, especially the black walnut, is being used for interior finish and in cabinet work. However, most of it is being used locally, especially on the farms. Proper management of existing forests, and the necessary protection and planting of other areas will no doubt bring about an increase in the supply of lumber, at least for local use. Most native and planted wood-lots, with proper care, will furnish a steady supply of fire-wood and poles for local use.

Most persons have an appreciation of trees which goes beyond that which is based on practical values. This value of trees to man, for want of better name, we call the aesthetic value. Difficult as it is to define or describe, it is probably more real to us than all other values. It is largely the appreciation of this almost indefinable value which has furnished the motive for the planting of thousands of beautiful trees around our homes and in our streets and city parks.

To most persons the beauty of trees in the native state far surpasses that of planted trees. Though they may not fully analyze their feelings toward the native woodland, they keenly enjoy spending an afternoon of leisure under

the shade of trees. The people of Iowa are fortunate in the foresight of their legislators who for a number of years have been setting aside one primitive area after another for state parks, until now we have 72 such areas well distributed over the state.

The popularity of these retreats is attested by the fact that some of them have as many as 10,000 visitors on a Sunday afternoon in midsummer. With few exceptions no living thing is disturbed in these parks; no special amusement is planned; lunch in the shade of the trees, rest, relaxation and hikes through the woods, in many instances over well-planned nature trails, are the order of the day. Many of these parks have been selected chiefly because of the beauty of the native vegetation. Others have been set aside as state monuments because the site has some historical significance. But in every park there is natural beauty, and in most of them it is the beauty of undisturbed or restored native timber.

The beauty of native woodland areas has provided much of the incentive to planting trees and shrubs around our homes and along our streets. With few exceptions the general plan in these plantings has been to reproduce as nearly as possible natural effects. This is evident in the natural groupings around homes and gardens. In street planning, where the trees must be placed in rows, the natural effect is to a certain degree gained by the selection of native species and by allowing the trees to grow with a limited amount of trimming. While some exotics are used, the plantings are chiefly of species which grow naturally not far removed from the place of planting.

Within the last few years the highway commission has taken the initiative in planting trees and shrubs along our highways. The hearty response of the people of the state to this enterprise and the cooperation of conservation groups will result, no doubt, in a well-planned general program of highway beautification.

The interest which has been aroused in all forms of wildlife shows that most of us need only to give a little thought to the rapidity with which our song birds and other native animals are disappearing under our present day conditions, to cause us to attempt to make conditions more favorable for their survival. Natural forested areas constitute the most important sanctuaries for wildlife. Undisturbed or re-established plant cover along streams and on rough land offers adequate protection for birds and other small animals. Under these conditions, and with reasonable protection, the natural balance between species of wild animal life can be at least partially re-established.

Many species of trees and shrubs, in addition to furnishing protective cover, supply each year an abundance of food. Food for song birds, game birds and small animals is produced in the form of fruits by such woody plants as the wild black cherry, choke cherry, osage orange, hackberry, mulberry, June berry, eastern red cedar, wild grape, wild plum, wild crab, hawthorn, wild rose, gooseberry, raspberry, coral berry, wolf berry, dogwood, lead plant, bittersweet, Viburnum, redbud and sumac. Food for squirrels is supplied chiefly by such trees and shrubs as the hickories, walnuts, oaks and hazelnuts. The tender growing parts of trees and shrubs as well as those of the herbaceous plants growing on the border of woods are used as food by rabbits, field mice, shrews, ground squirrels and like animals. The plants of the native grassland which naturally grow among the shrubs bordering forested areas

bear an abundance of seeds for song and game birds. The most difficult lesson which Iowans are learning is that fence-rows, grown up to prairie plants, shrubs and some trees are beautiful rather than unsightly and that the protection thus afforded wildlife, especially song and game birds, is much worth while.

Throughout almost the entire state the quantity of weed seeds and waste grain is sufficient to support a large population of quails and pheasants. Especially during the winter months do these birds need additional cover. The protection afforded these game birds, song birds and other wildlife by planted woodlots and shelterbelts furnishes an additional incentive to the planting and care of such groups of trees. The cooperation of farmers with the conservation groups of the state and with the fish and game commission indicates that in the near future Iowa may rank high among the states in its population of song and game birds.

In many portions of our own state, it is necessary to plant and care for trees in order to establish them and keep them growing. Most homeowners on farms and in the towns in Iowa take pride in growing trees around their homes. Even in those portions of the state originally covered with prairie grasses, reasonable care will give surprising results in tree establishment. While some of the farm woodlots and the home and street plantings, especially in northern Iowa, are made up of temporary tree species, chiefly cottonwoods, willows, soft maple and boxelder, many of them are of more permanent trees such as the elms, ashes, walnuts, hickories, oaks and linden.

Children in the grades and in high school now have a better opportunity than ever to become acquainted with the names, characteristics and growth qualities of trees in connection with various science courses in the schools. These young citizens of the state generally far surpass the older in their knowledge of trees. Junior Academy of Science clubs, Boy Scouts, Camp Fire Girls and other organizations of young people are taking a real interest in trees. The more we learn about them the more we appreciate them.

While trees are extremely interesting during the growing season, when leaves, flowers and fruits are present, they also are attractive during the winter condition when, upon close observation, they are seen to have many differences. The chief purpose of this circular is to make it possible for tree lovers of the state, especially high school boys and girls, to become better acquainted with trees during a time in the yearly cycle when tree study has been considered difficult or impossible. Certain facts may be learned about trees in winter which may be acquired at no other time. In addition to the ability which one may gain by identifying trees from keys, it is hoped that many interesting facts about them may be learned by the comparison of the characteristics of different trees and by reading the short descriptive account of each tree.

The chief characteristics which may be effectively used to distinguish trees in the winter condition are the bark, twigs, buds, leaf-scars and lenticels. These characteristics of trees are largely obscured during the summer by the presence of the leaves and are usually overlooked. A list of definitions of the few botanical terms used in the keys is presented.

This circular, "Iowa Trees in Winter," consists of three parts: (1) A key to the groups (genera); (2) keys to the species in the groups (genera) with certain illustrations of twigs and fruits and (3) a brief summary of each tree. The illustrations of twig characteristics are from the original drawings by Dr. Ada

Hayden. The plate of illustrations of each group is placed for convenience following the key concerned. The pictures of tree contours in winter are included as an aid to the identification of the trees. In the second part the groups of species are listed in the botanical order used in Gray's Manual, 7th edition. The tree species are arranged in alphabetical order in the third part, so that they may be readily found in the absence of an index. The distribution data given in the summary of each tree should be of added interest and be useful in the final identification.

A tree may have several common names, or two or more trees may have the same common name. The botanical name must therefore be used in order to be certain of the identity of any particular tree. In this circular the botanical name, which includes the abbreviation of the name of the man first naming the tree, is given for each species. The common name of each tree is the one which is most commonly used. The botanical names, with very few exceptions, are those of Gray's Manual of Botany, 7th edition, for native trees and those of Rehder's Manual of Cultivated Trees and Shrubs for the cultivated trees.

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In preparing this circular use was made of most of the tree books listed below which will be found valuable in identifying and studying the trees found in Iowa. Included in the list are the books referred to in the introduction.

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THE USE OF THE KEYS

The most satisfactory results are obtained from the keys when they are used in the field in the presence of the tree. When it is not possible to work in the field, however, satisfactory results may usually be obtained by the use of selected branchlets and other tree parts in the laboratory or in the home.

The proper use of the included tree keys may be compared to road signs where a choice of two directions must be made at each intersection. We have before us a tree which has characters more definite than most road signs. In every case we begin with the first choice on page one of the key; if the tree is evergreen we choose between the two statements marked "1" under the first "A"; if it is not an evergreen tree, our choice is between the two 1's under the second "A". Let us stand before a well-known street tree and make our series of decisions.

A. (The second "A"). The tree is not evergreen.

1. (The second "1"). The leaf scars are one at each place (node).
2. (The second "2"). The leaf scars not surrounding the buds.
3. (The second "3") The tree has no thorns.
4. (The first "4") The third leaf-scar on the branch is located above the first.
5. (The first "5") The bundle scars in each leaf scar are three or less in number.
6. (The second "6") There are exactly 3 bundle scars and there are more than three bud scales showing.
7. (The second "7") The pith is not partitioned and the bark of the trunk is not ridged like the hackberry.
8. (The second "8") There is no bud situated directly at the end of the branch (terminal).
9. (The second "9") The twigs are brownish gray, not speckled and the leaf scars are at an angle.
10. (The second "10") There are no pollen-bearing catkins.

There are no further choices under 10, so we turn to the elm group on page 28. Since our tree is the American elm, we must make three more correct decisions based on a study of the characters. We then turn to page 71 to compare our tree with the description to check our results and to learn something of its distribution, its requirements and its use in the state.

DEFINITIONS OF BOTANICAL TERMS USED

- Alternate. Not opposite, but arranged singly at different heights on the stem.
 Appressed. Lying close and flat against something.
 Axillary. Placed in the angle formed by a leaf or a branch with the stem.
 Axis. The central line of an organ to which the other parts are attached.

- The leaflets are attached to the axis or rachis of a compound leaf.
- Bract.** A modified leaf, usually leaf-like.
- Branchlets.** Small branches.
- Bundle-scars.** The marks within a leaf scar left by the breaking of the tubes which previously carried water and dissolved food into and from the leaf.
- Catkin.** A group of flowers attached by short stems to a central axis; a slender, flexible spike.
- Compound leaf.** A leaf made up of one or more separate leaflets.
- Conduction bundle.** Fibrovascular bundle; the collection of tubes or vessels held together by fibers, through which water and dissolved food is conducted.
- Crown of a tree.** The part made up of the stem above the first branches, and the branches, twigs and leaves.
- Cylindrical.** Shaped like a cylinder.
- Dentate.** Toothed, with the teeth pointing straight outward.
- Downy.** Covered with down, or fine soft hairs.
- Glabrous.** Smooth; without hair or down.
- Gland.** A structure or surface which secretes; usually a rounded structure with an opening.
- Habitat.** The place where a plant or animal lives.
- Leaf scar.** The mark or scar remaining on the stem after the falling of a leaf.
- Lenticels.** A small rough spot on the bark of woody plants through which gases are being or have been exchanged.
- Linear.** Long and narrow with parallel edges or margins.
- Lobe (of a leaf).** A part or segment of a leaf resulting from the partial dividing of the leaf blades.
- Margin of leaf.** Outer edge or border of the leaf.
- Mucilaginous.** Slimy, gummy, mucilage-like.
- Opposite.** The location of two structures across from each other on an axis.
- Pendulous.** Hanging by an attached end or part so as to swing.
- Persistent.** Long continuous, as leaves staying on during the winter.
- Petiole.** The stalk or support which bears the blade of the leaf.
- Pollen.** Fine, dust-like grains shed by the stamens of the flower.
- Pome.** An apple-like fruit.
- Pubescent.** Finely hairy; covered with soft, fine, somewhat short hairs.
- Saw-toothed.** With an edge like a row of sharp teeth, pointing forward; serrate.
- Species.** A group of animals or plants which very closely resemble each other; of the same kind.
- Sessile.** A leaf seated without a stalk.
- Stipule.** A leaf-like structure sometimes present in pairs at the base of a leaf.
- Stomate.** The minute openings in the outer walls of leaves or young stems.
- Superposed.** Placed over some part.
- Terminal.** Located at the end of a branch.
- Two-ranked.** The condition where the third structure is placed on the axis above the first.
- Zigzag.** With a series of sharp turns from side to side.

A KEY TO THE GENERA OF THE TREES OF IOWA IN THE WINTER CONDITION

- A. Leaves present and green throughout winter (evergreens); fruit a dry cone or berry.
1. Leaves linear, needle-like; fruit a dry cone.
 2. Leaves in bundles of two to five. THE PINES. *Pinus*. (Page 17)
 2. Leaves not in bundles, one in a place.
 3. Leaves four-sided, pointed, not two-ranked on the stem but spreading in all directions; twigs covered with woody, peglike leaf bases following the shedding of the leaves.

THE SPRUCES. *Picea*. (Page 19)
 3. Leaves flat and not sharp-pointed; two-ranked and not spreading in all directions from the stem; twigs not covered with woody, peg-like leaf bases following the shedding of the leaves.
 4. Leaves about $\frac{1}{2}$ inch long, with a short petiole; leaves whitish on the under side and shiny green above; cones less than $\frac{3}{4}$ inch long.

THE HEMLOCKS. *Tsuga*. (Page 19)
 4. Leaves an inch or more long, green on both sides except for stomate lines; cones at least 2 inches long.
 5. Buds cigar-shaped, pointed, only one at tip of twig, brown; cones (hanging down, pendulous), 2 to 4 inches long, with three-pointed bracts extending beyond the scales.

THE DOUGLAS FIR. *Pseudotsuga*. (Page 19)
 5. Buds round, more than one at the tip of the twig, greenish yellow; cones upright, 3 to 5 inches long, with bracts shorter than the scales.

THE FIRS. *Abies*. (Page 20)
 1. Leaves scale-like or awl-shaped; fruit a berry or cone
 2. Leafy branchlets flat; leaves all scale-like and two-ranked; fruit a dry cone, $\frac{1}{3}$ to $\frac{1}{2}$ inch long. THE ARBOR VITAE. *Thuja*. (Page 20)
 2. Leafy branchlets not flat; leaves awl-shaped or both awl-shaped and scale-like on the same tree; fruit a bluish berry.

THE CEDARS. *Juniperus*. (Page 20)
- A. Leaves not persistent and green throughout the winter.
1. Leaf-scars two or more at each node (opposite or whorled).
 2. Leaf-scars three or more at each node (whorled), large, almost round; twigs stout; tree cultivated in the state.

THE CATALPA. *Catalpa*. (Page 38)
 2. Leaf-scars only two at each node (opposite); large or small, not round.
 3. Buds less than $\frac{1}{3}$ inch long; leaf-scar not large or heartshaped; chiefly native trees.
 4. Buds dark brown or black, usually rough and dry; leaf-scars circular to horse-shoe shaped. THE ASHES. *Fraxinus*. (Page 38)
 4. Buds not dark brown or black (reddish or greenish), neither rough nor dry; leaf-scars V-shaped. THE MAPLES. *Acer*. (Page 33)
 3. Buds more than $\frac{1}{3}$ inch long; leaf-scar large and heartshaped.

THE BUCKEYES AND HORSECHESTNUTS. *Aesculus*. (Page 35)
 1. Leaf-scars one at each node (alternate).
 2. Leaf-scar surrounding the bud (bud previously covered by base of

petiole); bark greenish white exposed by scaling off of outer darker layers.

THE SYCAMORE. *Platanus*. (Page 30)

2. Leaf-scars not surrounding the buds; no exposure of greenish white bark by scaling.

3. Trees with thorns, prickles or spines.

4. Stems with superficial thorns (peeling off with the bark) located on the branch at each side of the leaf-scar.

THE BLACK LOCUST. *Robinia*. (Page 33)

4. Thorns which connect with the wood.

5. Twigs with lateral thorns but without thorns at the ends of branches.

6. Young twigs cottony white; buds silvery white.

THE RUSSIAN OLIVE. *Elaeagnus*. (Page 38)

6. Young twigs smooth, not covered with cottony material; buds not silvery white.

7. Lenticels showy on older bark; thorns above the axils of the leaves and usually on the trunk; fruit a bean-like pod flat, twisted, 6-12 inches long.

THE HONEY LOCUST. *Gleditsia*. (Page 33)

7. Lenticels not showy on older bark; thorns not above the axil of the leaf; fruit not a bean-like pod.

8. Thorns in the axils of the leaves; twigs gray to reddish brown; fruit a small pome.

THE RED HAWK. *Crataegus*. (Page 32)

8. Thorns beside the axillary buds; twigs greenish buff; fruits forming a large green ball.

THE OSAGE ORANGE. *Maclura*. (Page 28)

5. Twigs with thorns at the ends of branches or with spur-like branches ending in thorns; with or without lateral thorns.

6. Terminal bud absent, leaving scar; twigs smooth.

THE PLUMS. *Prunus*. (Page 32)

6. Terminal bud present; twigs and terminal bud pubescent.

THE APPLES AND PEARS. *Pyrus*. (Page 30)

3. Trees without thorns, prickles or spines.

4. Leaf-scars quite regularly two-ranked (the third scar situated on the branch above the first).

5. Bundle-scars three or less.

6. Bundle-scars one; visible bud scales two; pith sometimes with cavities.

THE PERSIMMON. *Diospyros*. (Page 38)

6. Bundle-scars three; visible bud scales more than three.

7. Pith interrupted by partitions, with or without cavities; bark of older branches and trunk with narrow, steep-sided, layered ridges.

THE HACKBERRIES. *Celtis*. (Page 28)

7. Pith solid; bark of older branches or trunk without narrow steep-sided, layered ridges.

8. Terminal bud present, slender, long-pointed, leaf-scar narrow, contracted between the bundle-scars.

THE JUNE BERRY. *Amelanchier*. (Page 32)

8. Terminal bud absent, or if present the leaf-scar is oval or semi-circular.

9. Twigs dark reddish brown, speckled, often zigzag; buds reddish to purplish brown, often one above the other and clustered. THE REDBUD. *Cercis*. (Page 33)
9. Twigs dark brown or gray, not speckled; leaf scars set at an angle on twig.
10. Pollen-bearing catkins present in winter.
11. Bark of trunk gray, smooth and not breaking into papery layers; trunk of the small tree irregularly fluted or ridged.
THE BLUE BEECH. *Carpinus*. (Page 25)
11. Bark of trunk and older branches rough or forming thin papery layers; trunk not fluted.
12. Bark of trunk and larger branches rough but not forming papery layers; no terminal buds; a small shade-loving tree with slender twigs.
THE IRONWOOD. *Ostrya*. (Page 24)
12. Bark of tree forming papery layers; terminal buds present; larger, less shade-loving trees.
THE BIRCHES. *Betula*. (Page 25)
10. No pollen-bearing catkins present; bark gray to grayish brown. THE ELMS. *Ulmus*. (Page 28)
5. Bundle-scars more than three, usually scattered.
6. Pith partitioned, solid; bundle-scars five to seven; bark with disagreeable odor; terminal bud elongated, naked, silky.
THE PAPAWE. *Asimina*. (Page 30)
6. Pith not partitioned; bark without a disagreeable odor; bud scales present on all buds.
7. Winter-buds about 1 inch long, slender, long-pointed.
THE BEECH. *Fagus*. (Page 25)
7. Winter-buds less than $\frac{1}{4}$ inch long.
8. Visible bud-scales one to three; twigs usually zigzag; bark light gray, fibrous; buds rather fleshy, usually bright red, fruits in clusters attached to bracts.
THE LINDENS. *Tilia*. (Page 35)
8. Visible bud scales more than three; twigs not zigzag; bark brownish orange, not especially fibrous; buds neither fleshy nor bright red; fruits not attached to bracts.
9. Bark brownish orange; leaves saw-toothed or lobed; fruits borne in short catkin-like structures.
THE MULBERRIES. *Morus*. (Page 28)
9. Bark brownish gray; leaves saw-toothed but never lobed; fruits winged but not borne in short catkin-like structures. THE RED ELM. *Ulmus*. (Page 28)
4. Leaf-scars not two-ranked (the third scar not situated on the branch above the first).
5. Bundle-scars one or two; leaf-scars, except on young shoots, chiefly densely clustered on short, stout, wart-like dwarf branches.
6. All bundle-scars single; leaf-scars minute, very numerous on dwarf branches, twigs slender; fruit a cone, generally present

in winter. THE LARCHES, TAMARACKS. *Larix*. (Page 19)

6. Bundle-scars two; leaf-scars larger and less numerous; twigs stouter; naked seed plum-like, usually absent since pollen-bearing trees are chiefly planted.

THE MAIDENHAIR TREE. *Ginkgo*. (Page 17)

5. Without this combination of characters.
6. Pith with partitions, air cavities between (diaphragmed).
7. Twigs thick; leaf-scars large; bundle-scars three, prominent.

THE WALNUTS. *Juglans*. (Page 24)

7. Twigs not especially thickened; leaf-scars not large; bundle-scars one. THE PERSIMMON. *Diospyros*. (Page 38)

6. Pith without partitions, continuous.
7. Buds sunken, one or more buds above the axillary bud; these superposed buds usually small; twigs thick with large leaf-scars; pith large and reddish.

THE COFFEE TREE. *Gymnocladus*. (Page 33)

7. Buds not sunken, axillary buds single or two or more side by side, usually not superposed.
8. Buds covered only by leafy structures (stipules) which, upon shedding, leave a ring around the twig at the base of each leaf.

9. Terminal buds light gray, silky; twigs gray.

THE MAGNOLIA. *Magnolia*. (Page 30)

9. Terminal buds reddish brown, not silky; twigs reddish brown.

THE TULIP TREE. *Liriodendron*. (Page 30)

8. Buds with scales and with no ring around the base of each leaf.
9. Outer bud-scale one; twigs usually with brittle zones near the base; stipular scars present, bundle-scars three.

THE WILLOWS. *Salix*. (Page 20)

9. Outer bud-scales more than one; twigs without brittle zones near the base; stipular scars usually absent.
10. Outer bud-scales two; pith sometimes with cavities; twigs zigzag at tip; bundle-scar one.

THE PERSIMMON. *Diospyros*. (Page 38)

10. Outer bud-scales more than two; pith without cavities; twigs usually not zigzag; bundle-scars more than one.

11. Pith more or less five-angled.

12. Buds clustered at the tip of the twig; fruit an acorn. THE OAKS. *Quercus*. (Page 25)

12. Buds not clustered at the tip of the twig; fruit not an acorn.

13. Bundle-scars numerous, usually scattered; lateral buds usually one above another; buds not gummy.

14. Terminal buds prominent and larger than the lateral buds; twigs do not resemble

red oak twigs; pith brown; nut enclosed in a smooth husk divided into segments.

THE HICKORIES. *Carya*. (Page 24)

14. Terminal buds not larger than the lateral buds or wanting; twigs resembling red oak twigs; pith whitish; nut enclosed in a large very prickly bur.

THE CHESTNUT. *Castanea*. (Page 25)

13. Bundle-scars three; lateral buds not one above another; buds often gummy.

THE POPLARS, COTTONWOODS. *Populus*.
(Page 22)

11. Pith round in cross section or nearly so, not five-angled.

12. Pith very large, light brown; bark ill-smelling; leaf-scars very large with about nine bundle-scars along the lower edge; tall, quick growing trees.

THE TREE OF HEAVEN. *Ailanthus*. (Page 33)

12. Pith small; bark sometimes pungent but not ill-smelling; leaf-scars not large; trees not especially tall or quick growing.

13. Sap milky; bark yellowish brown.

THE MULBERRIES. *Morus*. (Page 28)

13. Sap not milky; bark not yellowish brown.

14. Terminal bud absent.

THE PLUMS. *Prunus*. (Page 32)

14. Terminal bud normally present.

15. Twigs usually red above and green beneath, glabrous; bark bitter.

THE PEACH. *Prunus (Amygdalus)*.
(Page 32)

15. Twigs not green or red and green but gray, brown-black or reddish.

16. Bundle-scars five or more in a broad V-shaped leaf scar; tips of buds downy

THE MOUNTAIN ASH. *Pyrus (Sorbus)*
(Page 30)

16. Bundle-scars three; tips of buds not downy unless entire bud is downy.

17. Buds glabrous or slightly pubescent; twigs usually glabrous and slender, some shade of black, brown or reddish, often with two or three axillary buds.

THE CHERRIES. *Prunus*. (Page 32)

17. Buds downy or with dense fine hairs, twigs smooth or finely hairy.

THE PEAR AND APPLES. *Pyrus*.
(Page 30)

A KEY TO THE SPECIES OF THE TREES OF IOWA IN THE WINTER CONDITION

Ginkgo. THE MAIDENHAIR TREE. The bark is ashy gray on the branches and young trunks, becoming seamy, roughened and dark on old trunks. The branches are straight and are attached to the tree at an angle of about half a right angle. The leaf-scars are crowded on heavy cone-shaped dwarfed branches which increase in age and length from the end to the base of each true branch. *Ginkgo biloba*.* (Page 51)

Pinus. THE PINES. Evergreen trees with needle-shaped leaves at least 1 inch long, two to five leaves in a cluster. The cone is woody and matures at the end of 2 years. Resin ducts may easily be observed in cross sections of leaves and in the bark region of twigs.

a. Leaves five to each cluster, with one conduction bundle running through the center of the leaf; cone scales not thickened to any extent at the ends. SOFT PINE

b. Leaves soft, silky, with teeth which may be felt in passing the fingers back from the tip, leaves on young branches not pointing toward the end. WHITE PINE. *Pinus strobus*. (Page 57)

b. Leaves stiffer, not silky but shorter, curved, without teeth, leaves on young branches pointing outward.

LIMBER PINE. *P. flexilis*.* (Page 57)

a. Leaves two or three in each cluster, with two conduction bundles through the center of each leaf; cone scales thickened at the ends.

HARD PINES

b. Leaves two in a cluster.

c. Leaves more than 3 inches long.

d. Leaves stiff, heavy, not brittle; bark on trunk dark tannish gray with low broad ridges; cones 2-3 inches long with short dull spine near the tip when mature.

AUSTRIAN PINE. *P. nigra austriaca*.* (Page 58)

d. Leaves not stiff, slender, brittle (breaking across the back when bent forward); bark on trunk light reddish brown forming lower, broader ridges which are more flaky on top; cones usually about 2 inches, slenderer and with no spines.

RED PINE, NORWAY PINE. *P. resinosa*.* (Page 58)

c. Leaves less than 3 inches long (Scotch pine to 3 inches especially on young trees).

d. The two leaves spread apart at the tip to form a wide angle, only slightly if at all twisted, mostly less than 1½ inches long; cones pointing forward. JACK PINE. *P. Banksiana*.* (Page 58)

d. Leaves not forming a wide angle, twisted "once around" mostly more than 1½ inches long; cones pointing backward.

SCOTCH PINE. *P. sylvestris*.* (Page 58)

b. Leaves more than two in at least some of the clusters.

c. Leaves in clusters of three spreading and with pointed tips; an eastern tree with a few leaves borne at intervals on the trunk.

PITCH PINE. *P. rigida*.* (Page 58)

c. Leaves in clusters of two and of three, not spreading and without

*species of trees not native to Iowa.



White Pine



Pitch Pine



Loblolly Pine



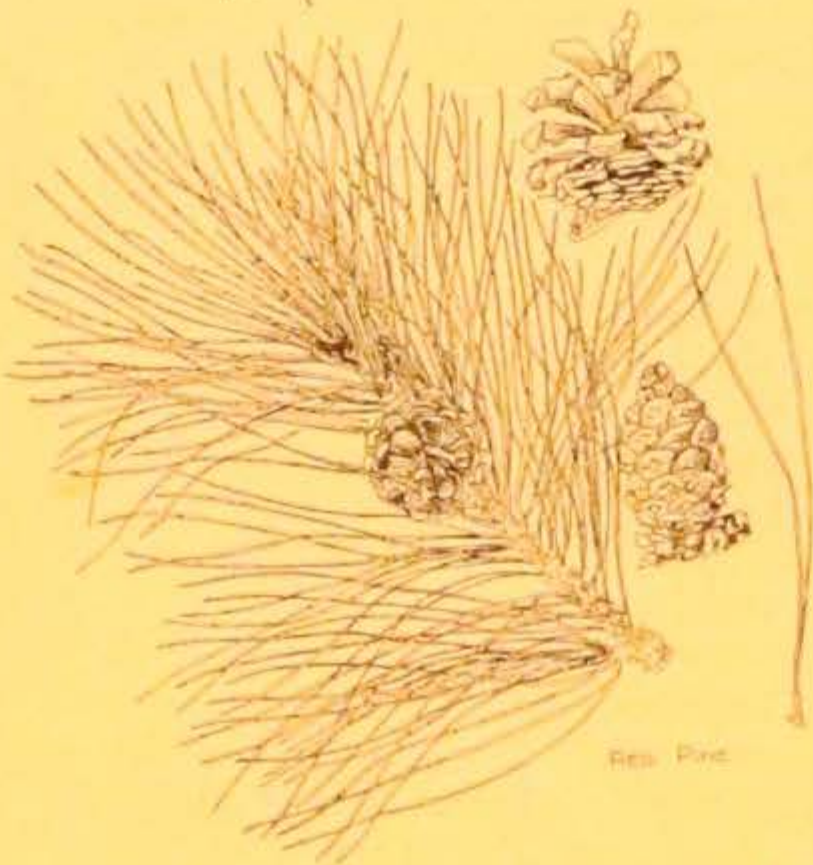
Jack Pine



Western Yellow Pine



Short Pine



Red Pine



Austrian Pine

pointed tips; a western tree.

WESTERN YELLOW PINE *P. ponderosa*.* (Page 60)

Larix. THE LARCHES, TAMARACKS. These trees are the only cone-bearing trees in the state which lose their leaves in the fall. The trees are broad, spire-shaped like most evergreens and have many cones which are present during the winter. The twigs are numerous and very slender and are covered with many dwarf branchlets, each of which during the summer bears at its end 20 to 40 silky needle-like leaves.

a. Cones about 1 inch long with finely hairy scales.

EUROPEAN LARCH. *Larix decidua*.* (Page 54)

a. Cones about $\frac{1}{2}$ inch long; with smooth shiny scales.

AMERICAN LARCH, TAMARACK. *L. laricina*.* (Page 54)

Picea. THE SPRUCES. Evergreen trees with four-sided leaves one in a place and not usually over 1 inch long. Each leaf is borne on a small peg-like projection which remains on the tree after the leaf falls. The spruces are cone-shaped and have both pollen-bearing and papery fruiting cones on the same tree.

a. Twigs smooth or nearly so; cones cylinder-shaped.

b. Leaves yellowish green; more leaves on the upper side than on the lower side of twig, pointing forward; open cones stiff, 4-7 inches long.

NORWAY SPRUCE. *Picea abies*.* (Page 56)

b. Leaves whitish green or bluish green; leaves more evenly distributed around twig, pointed outward; cones not over 2 inches or very papery.

c. Cones 1 to 2 inches long, very slender when closed; cone scales rounded, not ragged; leaves usually less than 1 inch long, of an unpleasant odor when crushed, not sharp pointed.

WHITE SPRUCE. *P. canadensis*.* (Page 56)

c. Cones 2 to 4 inches long, not extremely slender but papery; cone-scales ragged; leaves usually more than 1 inch long, of a not unpleasant odor, sharp pointed.

COLORADO SPRUCE. *P. pungens*.* (Page 56)

a. Twigs downy to hairy; cones not cylinder-shaped except those of Norway spruce.

b. Cones cylindrical, more than 3 inches long.

NORWAY SPRUCE. *P. abies*.* (Page 56)

b. Cone egg-shaped or slightly more elongate, less than 2 inches long.

c. Cones brown, scales with dentate edges, cones staying on the tree for 2 or more years; leaves bluish green, usually $\frac{1}{2}$ inch or less in length.

BLACK SPRUCE. *P. mariana** (Page 57)

c. Cones light brown, scales without dentate edges, cones falling earlier; leaves green, over $\frac{1}{2}$ inch long. RED SPRUCE. *P. rubra** (Page 57)

Tsuga. THE HEMLOCK. Large shade-loving evergreen trees with flat, round-tipped leaves about $\frac{1}{2}$ inch long. The leaves have a short petiole and are shiny green above and whitish underneath. The cones are about $\frac{3}{4}$ inch long. The eastern species is the only one planted to any extent in Iowa.

Tsuga canadensis.* (Page 70)

Pseudotsuga. THE DOUGLAS FIR. An evergreen tree with flattened needle-like leaves, one in a place and broadly pointed. The leaves are an inch or slightly less long and are not borne on a raised projection, but the leaf-scar is slightly raised at the bottom and is neither as large nor as well-formed as

that of the firs. The buds are brown, cigar-shaped and pointed. The cone matures in one season and has three-pointed bracts which extend out beyond the scales. *Pseudotsuga taxifolia*.* (Page 63)

Abies. THE FIRS. Evergreen trees with flat-linear leaves borne one in a place and rounded at the outer end. The leaf-scars are prominent and circular. Bark smooth, gray except on older trunks and covered with resin blisters.

a. Leaves commonly 1 inch or less long; tree green in appearance.

BALSAM FIR. *Abies balsamea*. (Page 40)

a. Leaves commonly 2 to 2½ inches long; tree bluish white in appearance.

WHITE FIR. *A. concolor*.* (Page 40)

Thuja. THE ARBOR VITAE. An evergreen tree with small scale-like leaves flattened on the twigs, an entire spray of twigs with the appearance of having been pressed. The small leaves are arranged opposite each other in pairs and are closely overlapping. The fruit is a small, dry cone with 6-12 thin scales. There are only two native species of arbor vitae in North America. The other species is western and not adapted to planting in Iowa.

Thuja occidentalis.* (Page 70)

Juniperus. THE CEDARS. The Iowa cedars are evergreen trees and shrubs with scale and awl-shaped leaves on the same plant. The twigs are round rather than flat as in the genus *Thuja*. The cedars differ from all other Iowa evergreens in that pollen-bearing and fruit-bearing flowers are on different trees, and the fruit is a berry rather than a cone.

a. A small tree or shrub with broadly awl-shaped leaves.

COMMON JUNIPER. *Juniperus communis*. (Page 54)

a. A tree which may attain a height of 50 feet, with slender awl-shaped needles and small scale-like leaves on the same tree.

EASTERN RED CEDAR. *J. virginiana*. (Page 54)

Salix. THE WILLOWS. Rapidly growing trees found where there is an abundance of soil water at some time during the year. The twigs are slender with leaf-scars more than two-ranked and with brittle zones near the base. There is only one outer bud-scale on each bud. A stipule-scar usually shows on the twig at each side of the scar where the leaf has dropped off.

a. Twigs long, slender and hanging down around the edge of tree (weeping); twigs yellow and branches yellowish green.

WEeping WILLOW. *Salix babylonica*.* (Page 68)

a. Twigs not "weeping"; twigs and branches of various colors.

b. Young twigs pubescent or silky.

c. Young twigs pubescent.

d. Terminal buds about 1 inch long.

MISSOURI WILLOW. *S. missouriensis*. (Page 68)

d. Terminal buds 3/8 inch long or less.

e. Lateral buds more or less flattened against twig; buds becoming large and fuzzy in late winter.

PUSSY WILLOW. *S. discolor*. (Page 69)

e. Lateral buds very little flattened; buds less enlarged and not fuzzy. HEART-SHAPE LEAVED WILLOW. *S. cordata*. (Page 69)

c. Young twigs silky.

d. A small slender native tree; twigs orange-brown, slender, sometimes purplish. SANDBAR WILLOW. *S. longifolia*. (Page 69)



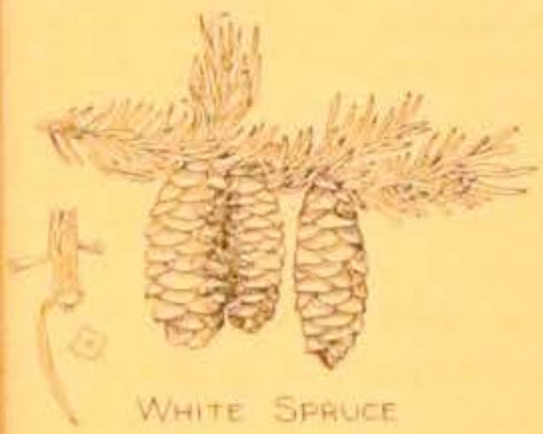
AMERICAN LARCH OR TAMARACK

RED CEDAR

MAIDENHAIR TREE

ARBOR VITAE

EUROPEAN LARCH



WHITE SPRUCE



NORWAY SPRUCE



RED SPRUCE



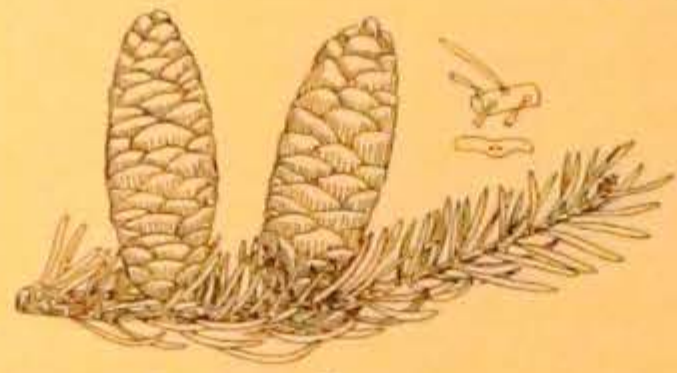
BLACK SPRUCE



COLORADO SPRUCE



HEMLOCK



BALSAM FIR



DOUGLAS FIR



WHITE FIR

- d. A large tree planted or escaped; twigs greenish gray, not especially slender. WHITE WILLOW. *S. alba*.* (Page 69)
- b. Young twigs smooth.
 - c. Twigs golden yellow. GOLDEN WILLOW. *S. alba vitellina*.* (Page 69)
 - c. Twigs not golden yellow.
 - d. Small trees.
 - e. Tree slender with short, slender little-spreading branches; twigs orange-brown, purplish, not shining; wetter habitats than most willows. SANDBAR WILLOW. *S. longifolia*. (Page 69)
 - e. Tree not slender; branches heavier and wide-spreading; twigs orange-colored, shining; drier habitat than the sandbar willow. SHINING WILLOW. *S. lucida*. (Page 69)
 - d. Larger trees.
 - e. Leaf-scars straight or only slightly curved; buds usually smooth. BLACK WILLOW. *S. nigra*. (Page 69)
 - e. Leaf-scars definitely U-shaped; buds usually somewhat hairy. PEACH-LEAVED WILLOW. *S. amygdaloides*. (Page 70)

Populus. THE POPLARS. A group of trees varying in habit, growth and appearance but generally quick growing trees with light bark on the upper part of the tree, with brittle branches and soft, light-weight wood. Bark on young branches usually smooth, light gray, greenish gray, buff or reddish color. The leaf-scars are usually large, triangular and divided into three parts or lobes. The pollen-bearing flowers and the fruit-bearing flowers are in separate catkins on separate trees.

- a. Twigs covered at least toward the end with white cottony felt quite easily removed; bark on larger branches whitish to white with large lenticels.
 - b. Tree broad with spreading branches. WHITE POPLAR. *Populus alba*.* (Page 60)
 - b. Tree tall and narrow with branches pointing upward. BOLLE'S POPLAR. *P. alba pyramidalis*.* *P. Bolleana*. (Page 60)
- a. Twigs not covered with white felt; bark on larger branches light brownish gray, buff or reddish brown.
 - b. Twigs yellowish; buds elongate, gummy.
 - c. Tree broad with spreading branches. COTTONWOOD. *P. deltoides*. (Page 60)
 - c. Tree, tall and narrow with branches pointing upward; buds smaller than those of cottonwood and flattened. LOMBARDY POPLAR. *P. nigra italica*.* (Page 61)
 - b. Twigs not yellowish, mostly reddish brown.
 - c. Buds covered with dusty very fine hairs. LARGE-TOOTHED ASPEN. *P. grandidentata*. (Page 61)
 - c. Buds smooth.
 - d. Terminal buds about $\frac{1}{2}$ inch long; buds very shiny but only slightly gummy and not fragrant; leaf petioles flat. QUAKING ASPEN. *P. tremuloides*. (Page 61)
 - d. Terminal buds about 1 inch long, buds gummy and very fragrant; leaf petioles not flat. BALM OF GILEAD. *P. canadensis*.* (Page 61)

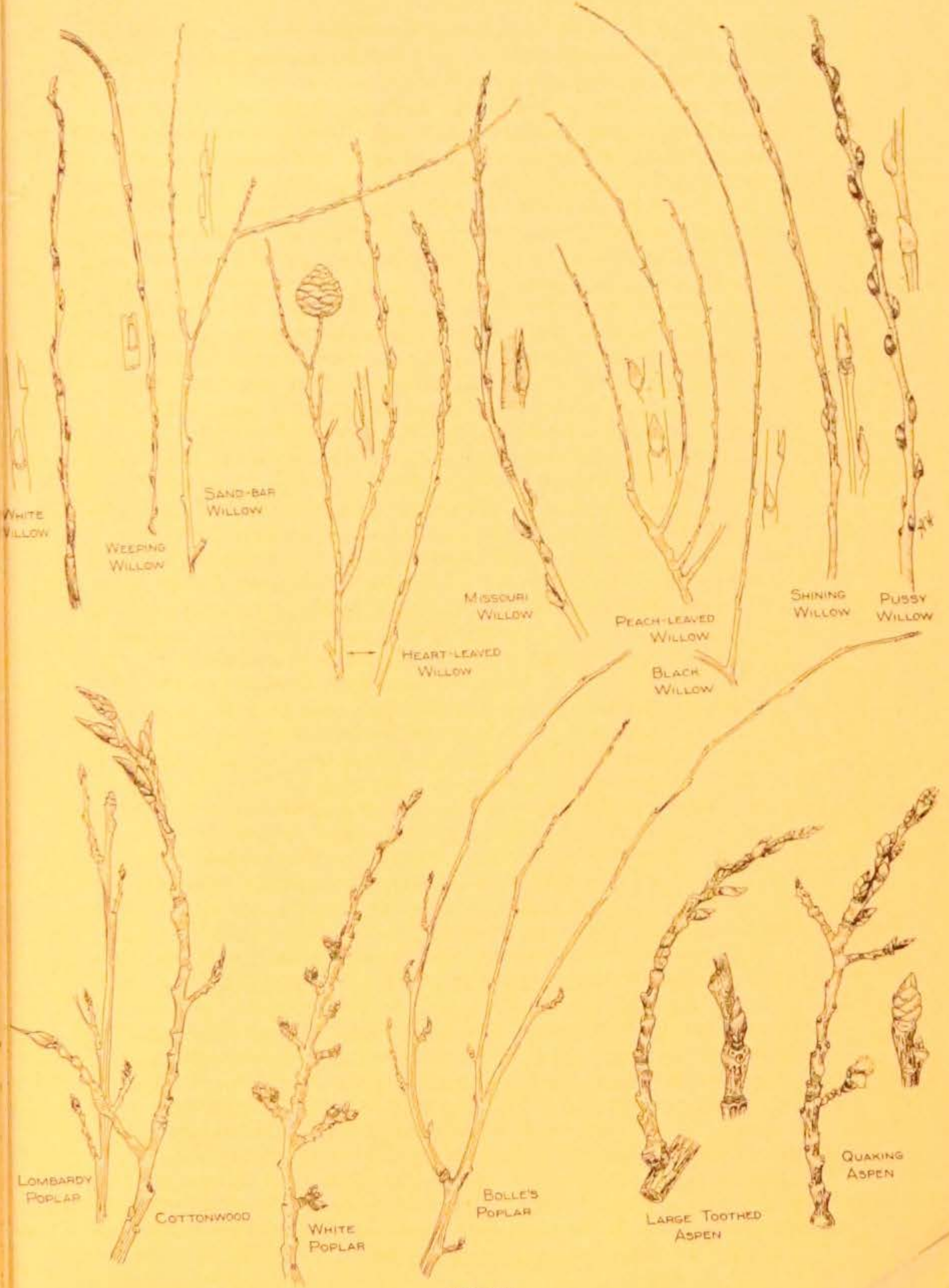


Plate III.

Juglans. THE WALNUTS. Medium to large trees with rather stout twigs, pale downy buds and partitioned pith with air cavities between the partitions. The rough, sweet nut is enclosed in a smooth, one-piece husk.

- a. Pith of normal twig dark brown, narrow, with the partitions about as thick as the space between the partitions; downy buds of light color and longer than in black walnut; bark of trunk medium gray with whitish flat ridges.

WHITE WALNUT, BUTTERNUT. *Juglans cinerea.* (Page 52)

- a. Pith of normal twig light brown, wider, with the partitions much thinner than the space between; downy buds darker and shorter; bark of trunk dark, no whitish ridges.

BLACK WALNUT. *J. nigra.* (Page 52)

Carya. THE HICKORIES. Tall, usually slender trees, chiefly with medium gray bark, shaggy in some species. The white nut has a husk with divisions joined together along the margins. The husk is of at least moderate thickness, except in *C. glabra* and *C. cordiformis*. The wood is hard and tough and is much used for tool handles.

- a. Terminal buds yellow, narrow, elongate, with scales joined together along the margins; nut not angled.

- b. Terminal buds covered with scale-like glands; terminal bud usually less than $\frac{1}{2}$ inch long and very slender; bark on large trunks slightly ridged but with a smooth appearance. Nut not elongated, kernel of nut bitter. BITTERNUT HICKORY. *C. cordiformis.* (Page 45)

- b. Terminal buds covered with clustered yellow hairs; terminal bud $\frac{3}{4}$ or more inches long, not slender; bark on large trunks ridged and with a rough appearance; nut elongated, kernel of nut sweet.

PECAN. *C. illinoensis.* (Page 45)

- a. Terminal buds not elongate, but gray, brown, or brownish green, large and broad; nut angled except in pignut hickory.

- b. The bark of older trunks not peeling off into long irregular strips, which gives a shaggy appearance to the tree.

- c. Buds brownish green; buds and twigs somewhat waxy; both shell and husk of nut of only medium thickness.

PIGNUT HICKORY. *C. glabra* (Page 46)

- c. Buds grayish brown; buds and twigs not waxy but covered with fine hairs; shell and husk of nut each at least $\frac{1}{8}$ inch thick; shelled nut $1\frac{1}{2}$ inches or more long.

MOCKERNUT, WHITE HICKORY. *C. alba.* (Page 46)

- b. The bark of older trunks peeling off into long irregular strips which gives a shaggy appearance.

- c. Shelled nut 1 inch or less long; husk thick but shell somewhat thin.

SHAGBARK, SHELLBARK HICKORY. *C. ovata.* (Page 45)

- c. Shelled nut $1\frac{1}{2}$ inches or more long; husk thick and shell thick (about $\frac{1}{4}$ inch).

HIGNUT HICKORY, KINGNUT. *C. laciniosa.* (Page 46)

Ostrya. THE HOP-HORNBEAM, THE IRONWOOD. A small tree of shady places having long slender branches and very slender, much-divided twigs. The bark is light grayish brown, thin and flaky, broken by shallow furrows into long slender flat-topped strips. It has no terminal buds and the pollen-bearing catkins are usually in threes and present in winter. The fruits are

small nutlets enclosed in closed sacs and form hop-like clusters; often present in winter. *Ostrya virginiana.* (Page 56)

Carpinus. THE BLUE BEECH. Small trees with dull smooth medium gray bark and fluted or broadly ridged trunk. Pollen-bearing catkins present in the winter. Fruit-bearing catkins of several fruits borne on elongate lobed bracts. *Carpinus caroliniana.* (Page 45)

Betula. THE BIRCHES. Trees with shiny reddish brown bark on the twigs and persistent lenticels on the branches. The bark on the smaller trunks and larger branches of the common Iowa species is papery. Pollen-bearing catkins are present during the winter and fruit-bearing catkins are present in early winter.

- a. Papery bark bright yellow or cinnamon-colored; trees of lower flood-plains subject to overflow.

BLACK BIRCH, RIVER BIRCH. *Betula nigra.* (Page 44)

- a. Papery bark not bright yellow or cinnamon-colored; not lower flood-plain trees.

- b. Papery bark dull yellowish, or silvery gray.

YELLOW BIRCH, GRAY BIRCH. *B. lutea.* (Page 44)

- b. Papery bark white, creamy or pinkish white.

- c. Small branches not slender and drooping.

- d. Bark shiny, creamy or pinkish white, freely splitting into papery layers. PAPER BIRCH. *B. papyrifera.* (Page 44)

- d. Bark dull, chalky or ashy white, bark not freely splitting into papery layers.

GRAY BIRCH, OLD FIELD BIRCH. *B. Populifolia.** (Page 44)

- c. Small branches very slender and drooping.

- d. Leaves not deeply cut (incised).

WEeping BIRCH. *B. pendula.** (Page 44)

- d. Leaves deeply cut (incised)

CUT-LEAVED WEeping BIRCH. *B. pendula*

*dalecarlica.** (Page 44)

Fagus. THE BEECH. A large shade-loving tree with smoothish light gray splotched bark on the large branches and trunks. Leaf-scars clustered on short lateral branchlets which are located towards the ends of the branches. The buds are elongate-pointed, somewhat shiny brown but very faintly finely hairy and about 1 inch long. The fruit is a bur about 3/4 inch long containing triangular nuts. The species, native in Illinois and eastward, is occasionally planted in the state, especially in the eastern part.

*Fagus grandifolia.** (Page 50)

Castanea. THE CHESTNUT. A large tree somewhat resembling the red oak except the bark on the trunk is usually dark brown, the wood is softer, and the winter buds are reddish. The fruit is a prickly bur usually 2 inches or more across containing flattened nuts with thin tough shells. This eastern species is planted in the state. *Castanea dentata.** (Page 46)

Quercus. THE OAKS. A large group of somewhat slow-growing trees with hard, durable wood and with acorn fruit. Leaf-scars are usually more than two-ranked, the bundle-scars are scattered and the pith is five-angled. The buds are clustered at the ends of the twigs. The yearly rings laid down in the wood are very evident because the inside of each ring is made up of pores. The oaks are readily divided into two definite groups.



BUTTERNUT

WALNUT



SHAGBARK HICKORY

BIGNUT HICKORY

MOCKERNUT HICKORY

PIGNUT HICKORY

PECAN

BITTERNUT HICKORY



HOP HORNBEAM OR IRONWOOD

BLUE BEACH OR HORNBEAM

BLACK OR RIVER BIRCH

YELLOW BIRCH

PAPER BIRCH

WEEDY WHITE BIRCH



Plate IV.

- a. Bark on medium-sized branches greenish black, smooth; on trunks, ridged and almost black; acorns maturing in two seasons so next year's acorns are present on the tree during winter. THE BLACK OAK GROUP
- b. Buds covered with fine hairs.
- c. Twigs smooth; large well-formed tree with straight branches.
BLACK OAK. *Quercus velutina*. (Page 64)
- c. Twigs finely hairy; low-spreading tree with irregular branches.
BLACK JACK OAK. *Q. marilandica*. (Page 64)
- b. Buds smooth or with few hairs on margin of bud scales only.
- c. Inner bark a light yellow color; acorn usually slender and elongated and the cup covering 1/3 to 1/2 of the acorn.
YELLOW OAK, HILL'S OAK. *Q. ellipsoidalis*. (Page 66)
- c. Inner bark of a brownish red color; acorn not slender and elongated; cup usually covering less than 1/3 of acorn.
- d. Acorns usually at least 3/4 inch long, with a shallow cup; buds 1/5 inch and over in length.
- e. Acorns bulging near the middle.
RED OAK. *Q. borealis maxima*. (Page 66)
- e. Acorns not bulging near the middle.
NORTHERN RED OAK. *Q. borealis*. (page 66)
- d. Acorns usually 1/2 inch or less in length, with shallow cup; buds 1/7 inch or less in length.
- e. Acorns with very flat saucer-shaped cup; trees usually with dwarf branches. PIN OAK. *Q. palustris*. (Page 66)
- e. Acorns larger and with a deeper cup; trees without dwarf branches; some of the unlobed leaves usually hanging on the tree in winter. SHINGLE OAK. *Q. imbricaria*. (Page 67)
- a. Bark on medium-sized branches light gray; on trunk and larger branches flaky or ridged or both and light to dark gray; acorns maturing in one season, so there are no immature acorns on the tree during winter. THE WHITE OAK GROUP.
- b. Acorn with a stalk at least 1 inch long.
- c. Bark of larger twigs smooth and not peeling off in curling layers; stalk of acorn slender; acorn long; cup of acorn shallow and top-shaped. Cultivated tree. ENGLISH OAK. *Q. robur*.* (Page 67)
- c. Bark of larger twigs peeling off in curling layers; stalk of acorns stout; cup of acorn medium shallow and not top-shaped. Native tree.
SWAMP WHITE OAK. *Q. bicolor*. (Page 67)
- b. Acorns not long stalked, chiefly not stalked; bark of larger twigs not peeling off in curling layers.
- c. Twigs and buds finely hairy.
- d. Branches usually with corky ridges; acorns with large fringed cups usually almost closed. BUR OAK. *Q. macrocarpa*. (Page 67)
- d. Branches without corky ridges; acorns with smaller unfringed cups which cover only about 1/2 of the acorn.
POST OAK. *Q. stellata*. (Page 67)
- c. Twigs and buds smooth or nearly so.
- d. Lenticels on the twigs numerous and showy; bark on trunk flaky;

buds blunt; dead leaves on tree most of winter.

WHITE OAK. *Q. alba*. (Page 67)

- d. Lenticels on the twigs not showy; twigs mostly reddish brown; bark on trunk ridged; dead leaves not remaining on tree during winter.

CHESTNUT OAK. *Q. Muhlenbergii*. (Page 68)

Ulmus. THE ELMS. Native trees; the most common street trees in Iowa. They are broad-topped with no terminal buds and with leaf-scars set at an angle on the medium gray or brownish gray twigs. The leaf-scars are two-ranked with three bundle scars. The bark on the trunks is brownish gray and is rather deeply fissured.

- a. Buds very small (about 1/16 inch) and brown, with fine hairs of a light color around the border of the visible scales usually not more than four in number.

CHINESE ELM. *Ulmus pumila*.* (Page 71)

- a. Buds larger with darker hairs if present and with more than four visible scales.

- b. Buds rusty brown, hairy, not pointed; twigs dark gray; inner bark slippery when chewed.

RED ELM, SLIPPERY ELM. *U. fulva*. (Page 71)

- b. Buds not rusty brown, hairy, pointed; twigs lighter brownish gray; inner bark not slippery when chewed.

- c. At least some of the small branches with corky ridges; end buds about 1/4 inch, only slightly hairy.

CORK ELM, ROCK ELM? *U. racemosa*. (Page 71)

- c. None of the small branches with corky ridges; end buds less than 1/4 inch, smooth shiny brown.

AMERICAN ELM, WHITE ELM. *U. americana*. (Page 71)

Celtis. THE HACKBERRIES. The leaf-scars are arranged one in a place and are usually two-ranked. The twigs are slender, somewhat rough and often contorted and increased in number by a disease known as witches' broom. The bark has narrow, crowded, steep-sided ridges.

- a. Twigs almost entirely without soft fine hairs.

COMMON HACKBERRY. *Celtis occidentalis*. (Page 48)

- a. Twigs covered with soft fine hairs.

ROUGH-LEAVED HACKBERRY. *C. occidentalis crassifolia*. (Page 48)

Maclura. THE OSAGE ORANGE. This small thorny hedge-tree has tough, heavy, yellow wood, milky juice and unbranched thorns at the side of the buds at almost every node. The twigs are greenish buff, the thorns smaller on the smaller branches and twigs. The so-called fruit, "hedge-apple," is really a close ball of fruits and is 2 to 4 inches in diameter.

Maclura pomifera.* (Page 55)

Morus. THE MULBERRIES. Trees with brownish orange bark, milky juice, white pith, no terminal bud and alternate two-ranked leaf-scars, bordered by narrow scars left by the stipules. The red mulberry is native to Iowa, but the white mulberry was introduced from Asia.

- a. Buds longer than broad, slightly if at all flattened, large (usually more than 5 cm. long); bud scales greenish brown with darker margins.

RED MULBERRY. *Morus rubra*. (Page 55)

- a. Buds about as broad as long, more or less flattened or appressed, small (usually under 4 cm. long); bud-scales reddish brown without darker



Plate V.

margins.

WHITE MULBERRY. *M. alba*.* (Page 55)

Magnolia. THE CUCUMBER TREE, MAGNOLIA. An erect, cone-shaped tree, somewhat rounded at the top and at the bottom of the crown. The twigs are gray and are surrounded by a ring at the base of each leaf which is a scar remaining after the shedding of the leaf-like structures (stipules) which serve as bud-scales. The terminal buds are oblong, long-pointed and thickly covered with long shiny white hairs.

Magnolia acuminata.* (Page 55)

Liriodendron. THE TULIP TREE. A narrow, cone-shaped tree which may grow to a height of 70 feet in favorable sites in the southeastern part of the state. The twigs are reddish brown and smooth and are surrounded at the base of each leaf by a ring. The terminal buds are elongate-oblong, flattened, reddish brown and smooth. The bark is thin, scaly and medium gray on young trees becoming deeply furrowed and brownish gray on old trunks.

Liriodendron tulipifera.* (Page 55)

Asimina. THE PAPAWE. A small tree with smooth dark gray bark and medium stout nodding young branches with two-ranked leaf-scars. The buds are naked and silky, and the bark has an unpleasant odor.

Asimina triloba. (Page 42)

Platanus. THE SYCAMORE. A large flood-plain tree with an open crown; a large part of the bark on the upper trunk and the branches of a greenish-white color. The bud is almost entirely surrounded by the leaf-scar and has a single cap-like scale.

Platanus occidentalis. (Page 60)

Pyrus. THE PEARS, CRABAPPLES AND APPLES. The trees are mostly small; some of them shrub-like. Some of the species may or may not have thorn-like spurs. The fruits are pears, crabapples or apples and are usually borne in clusters; the smaller fruit in larger, better formed flat-topped clusters. Leaves of one blade except the mountain ash which has many leaflets arranged opposite each other with an odd one at the end.

a. Branches curving and growing upward, forming a tall slender tree; with or without thorn-like spurs; fruit a pear.

PEAR. *Pyrus communis*.* (Page 63)

a. Branches not curving and growing upward, but spreading, forming a more or less broad crown; with the exception of the Iowa crab, without thorn-like spurs; fruit a small to large pome.

b. Small, shrubby native trees usually with some short thorn-like branches; fruit a yellowish green crab, 1 inch or less in diameter.

WESTERN CRAB, IOWA CRAB. *P. ioensis*. (Page 63)

b. Not a small shrubby tree; short thorn-like branches not present; fruit if a crab, bright colored.

c. Buds smooth, sticky; branches of tree yellowish green and slender; leaves compound (of many leaflets); fruit $\frac{1}{2}$ inch or less in diameter, many and orange-red.

WHITE ASH. *P. americana*. (*Sorbus americana*.) (Page 63)

c. Buds not smooth and resinous, but finely hairy; branches of tree darker color; leaves not compound; fruit 1 inch or more in diameter, and not orange-red.

d. Lenticels showy, whitish; buds blunt; fruit an apple.

APPLE. *P. malus*.* (Page 64)

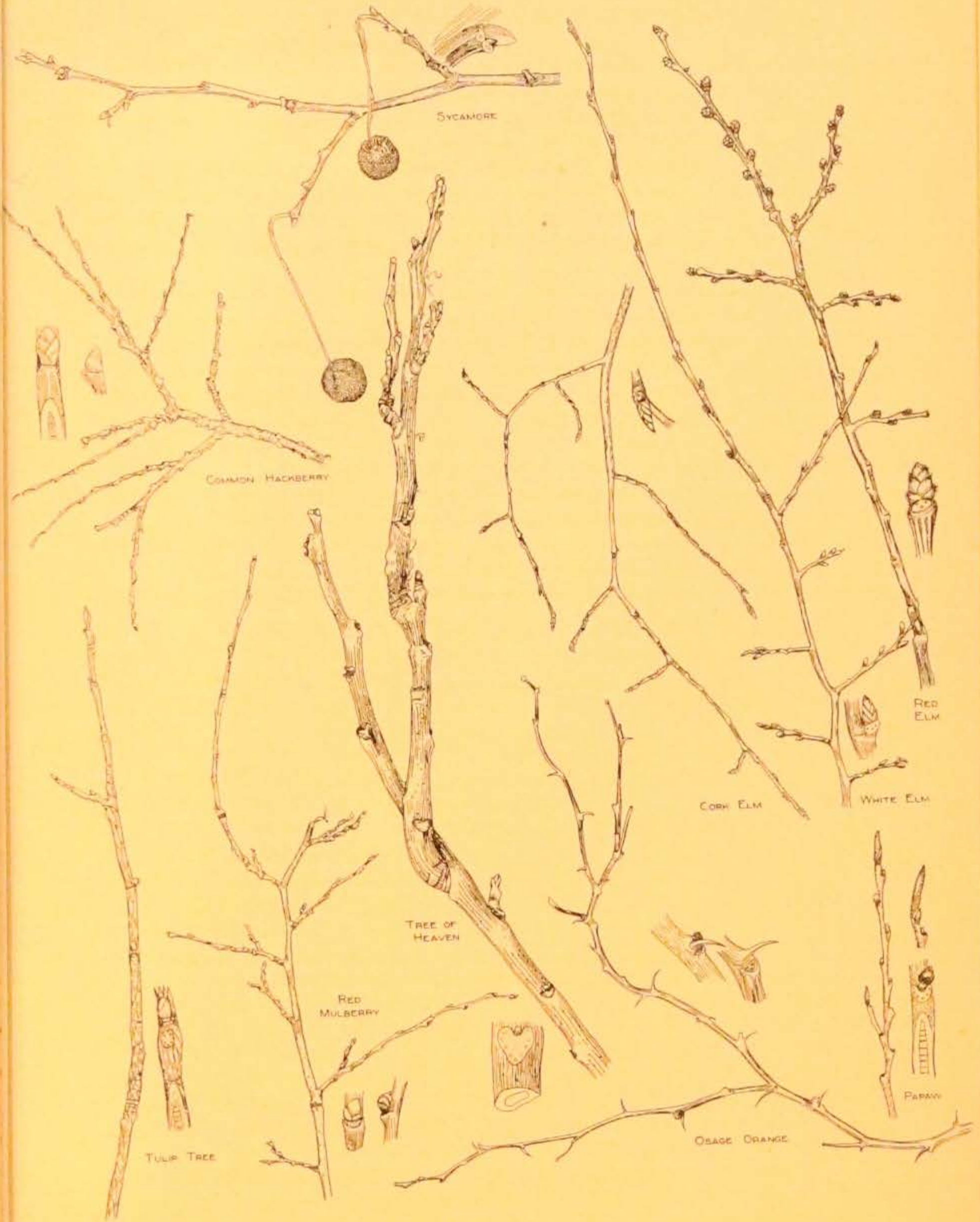


Plate VI.

d. Lenticels not showy nor whitish; buds more pointed; fruit a crab.

SIBERIAN CRAB. *P. baccata*.* (Page 64)

Amelanchier. THE JUNEBERRY. Shrubs and small trees with smooth brownish gray branches and with slender twigs. The buds are slender and long-pointed and of a yellowish color late in winter. Only one species ranks as a tree in Iowa.

COMMON JUNEBERRY. *Amelanchier canadensis*. (Page 42)

Crataegus. THE RED HAW. True woody thorns are present on the branches of the wide-spreading small trees. The leaf-scars are alternate and more than two-ranked. The fruit is small, apple-like but containing one to five bony nutlets.

a. Crown flat-topped; thorns straight, 1-3 inches long; fruit yellow or red, dotted, with 3-4 nutlets.

PUNCTATE HAW, DOTTED THORN. *Crataegus punctata*. (Page 48)

a. Crown more or less rounded.

b. Thorns on branches few, curved; fruit $\frac{1}{2}$ to 1 inch in diameter, red, usually with 5 nutlets.

COMMON RED HAW, DOWNY THORN. *C. mollis*. (Page 49)

b. Thorns on branches usually numerous and straight, slender; fruit dull red or greenish, usually $\frac{1}{2}$ inch or less and with 2 nutlets.

c. Thorns slightly curved, 2 to 7 inches long; bark dark gray.

COCK'S SPUR HAW. *C. Crus-galli*. (Page 49)

c. Thorns 1 to 2 inches long; bark dark brown.

A RED HAW. *C. Margaretta*. (Page 49)

Prunus. In this genus we have a mixture of native and cultivated trees all small with the exception of the wild black cherry. They have black, grayish brown or reddish brown bark and enlarged lenticels on the branches. The leaf-scars are alternate, more than two-ranked with three bundle-scars. The terminal bud may be present or absent but the fruit in all cases is plum-like or cherry-like.

a. Terminal bud absent or not very noticeable; some of the branches usually reduced to thorns; the leaves rolled from the edge inward in the bud.

b. Buds broadly egg-shaped.

c. Buds reddish brown, sharply pointed, scales hairy on the margins; fruit an apricot. APRICOT. *Prunus armeniaca*.* (Page 61)

c. Buds light brown not sharply pointed, scales finely hairy; fruit a red plum. GARDEN PLUM. *P. domestica*.* (Page 62)

b. Buds narrowly egg-shaped; shrubby native tree with stunted thorn-like branches and thick reddish gray to reddish black bark.

WILD PLUM. *P. americana*. (Page 62)

a. Terminal bud usually present; none of the branches reduced to thorns; the leaves folded inward along the midrib in the bud.

b. Twigs generally green above and red beneath, not covered with thin white membrane; buds woolly. PEACH. *P. persica*.* (Page 62)

b. Twigs reddish brown or gray; covered with a thin white membrane, buds smooth.

c. Buds dull brown, egg-shaped, scales rough; buds and twigs strongly ill-scented when bruised. CHOKER CHERRY. *P. virginiana*. (Page 62)

c. Buds clear brown and glossy, egg-shaped, scales not rough; bud and twigs not strongly ill-scented when bruised.

d. Buds small, usually 1/12 to 1/6 inch; native trees.

e. Twigs very slender, pith brown; buds usually less than 1/8 inch long; older bark curling crosswise; a small tree.

NORTHERN PIN CHERRY. *P. pennsylvanica*. (Page 62)

e. Twigs more than 1/6 inch thick, pith white; older bark rough, scaly; a large tree.

WILD BLACK CHERRY. *P. serotina*. (Page 63)

d. Buds larger, 1/5 to 1/3 inch; cultivated tree.

COMMON CULTIVATED CHERRY, SOUR CHERRY. *P. Cerasus*.* (Page 63)

Gymnocladus. THE KENTUCKY COFFEE TREE. A tall slender tree with bark roughened in longitudinal strips as though raised from one side by a knife-blade. The twigs are very stout with several small sunken buds above large leaf-scars. The bean type of pod is shorter, wider and heavier than the honey locust pod. *Gymnocladus dioica*. (Page 51)

Gleditsia. THE HONEY LOCUST. The tree is large, broad in contour, with trunks covered with long, branched thorns although some few are almost entirely smooth. The thorns on the smaller branches are usually numerous and not branched. The bark is hard and remains almost smooth between the fissures on many larger trunks. The lenticels remain, even on larger branches, becoming oblong in shape. The fruit is a long, flat, reddish-brown twisted pod almost 1 foot long. *Gleditsia triacanthos*. (Page 51)

Cercis. THE REDBUD. The leaf-scars are alternate and two-ranked on slender, dark, reddish brown usually mottled twigs. The lenticels are very small and numerous. The fruit often present is a flat, thin-walled, bean-like pod about 2½ to 3 inches long. *Cercis canadensis*. (Page 48)

Robinia. BLACK LOCUSTS. Slender trees with small bean-like pods and short, sharp thorns peeling off with the bark. The twigs are rather slender, brittle, usually zigzag and light reddish to greenish brown. The leaf-scars are more than two-ranked and usually large and showy with three bundle-scars. There is no terminal bud; the lateral buds are rusty, finely hairy and placed two to three above the lower bud.

a. Small twigs smooth or almost so; a tree usually 30 to 60 feet high.

BLACK LOCUST. *Robinia Pseudo-Acacia*.* (Page 68)

a. Small twigs hairy or bristly but not glandular bristly; a tree usually less than 25 feet high.

BRISTLY LOCUST, ROSE ACACIA. *R. hispida*.* (Page 68)

Ailanthus. THE TREE OF HEAVEN. A tall disagreeably smelling tree of very rapid growth with sturdy twigs and large brown pith. Often escaped from cultivation. *Ailanthus altissima*.* (Page 42)

Acer. THE MAPLES. Principally large trees with opposite U or V-shaped leaf-scars and with very noticeable bundle-scars, usually three in number. The fruit has long wings and is borne in pairs.

a. Buds white-downy; twigs green or purplish brown, smooth and covered with a whitish bloom; twigs with large pith; pollen and fruiting-flowers on different trees; fruit often on fruit-bearing trees during winter.

BOXELDER. *Acer Negundo*. (Page 40)

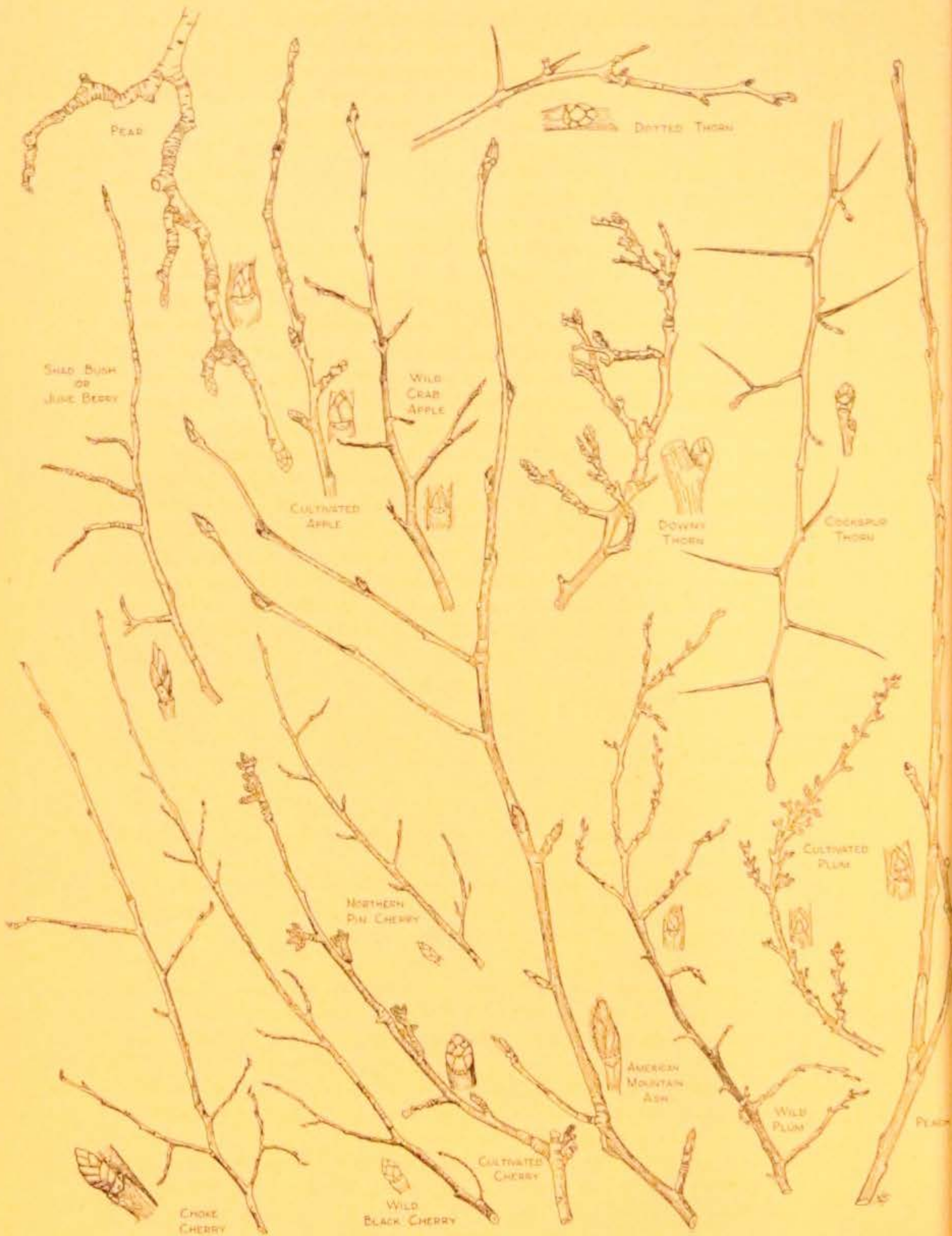


Plate VII.

- a. Buds not white-downy; twigs red, gray or brownish gray, smooth or roughened but not covered with a whitish bloom; twigs with smaller pith; pollen and fruiting-flowers on the same tree; no fruit on tree during winter.

- b. Small, shrubby tree with densely hairy twigs.

MOUNTAIN MAPLE. *A. spicatum*. (Page 40)

- b. Large trees with smooth twigs.

- c. Sap milky; leaf-scars meeting around the twig.

NORWAY MAPLE. *A. platanoides*.* (Page 40)

- c. Sap clear, not milky; leaf-scars not meeting around the twig.

- d. Twigs and buds red or reddish gray.

- e. Twigs and buds bright red, without rank odor when crushed; flower buds not clustered; bud scales rounded; bark of branches whitish.

RED MAPLE. *A. rubrum*. (Page 40)

- e. Twigs and buds reddish-gray with rank odor when crushed; flower buds clustered; bud-scales pointed; bark of branches gray rather than whitish.

SOFT MAPLE. *A. saccharinum*. (Page 41)

- d. Twigs and buds grayish brown.

- e. Buds nearly smooth, yellowish; bark medium to dark gray with lighter streaks circling the trunk.

HARD OR SUGAR MAPLE. *A. saccharum*. (Page 41)

- e. Buds hoary pubescent, darker, not yellowish; bark darker gray to almost black with less marked lighter streaks.

BLACK SUGAR MAPLE. *A. saccharum nigrum*. (Page 41)

Aesculus. THE BUCKEYES. These are small to medium-sized trees with opposite heart-shaped leaf-scars, stout gray to brown twigs and large brown buds. Occasional dead leaves remain on the tree; they are palmately compound with five to seven leaflets.

- a. Winter buds gummy; bundle-scars arranged in a curved line.

HORSE CHESTNUT. *Aesculus hippocastanum*.* (Page 41)

- a. Winter buds not gummy; bundle-scars arranged in three areas.

- b. Fruit without spines; bark on old stems dark brown, broken into thin plates; terminal bud bluntly pointed.

SWEET BUCKEYE. *A. octandra*.* (Page 41)

- b. Fruit with spines; bark on old stems ashy to dark gray, broken into thick plates; terminal bud more elongate pointed.

- c. A medium-sized tree; bark on old stems usually ashy gray; leaflets not long-pointed nor deeply serrate.

OHIO BUCKEYE. *A. glabra*. (Page 42)

- c. A small shrub-like tree; bark usually darker gray; leaflets long-pointed and deeply serrate.

WESTERN BUCKEYE. *A. glabra arguta*. (Page 42)

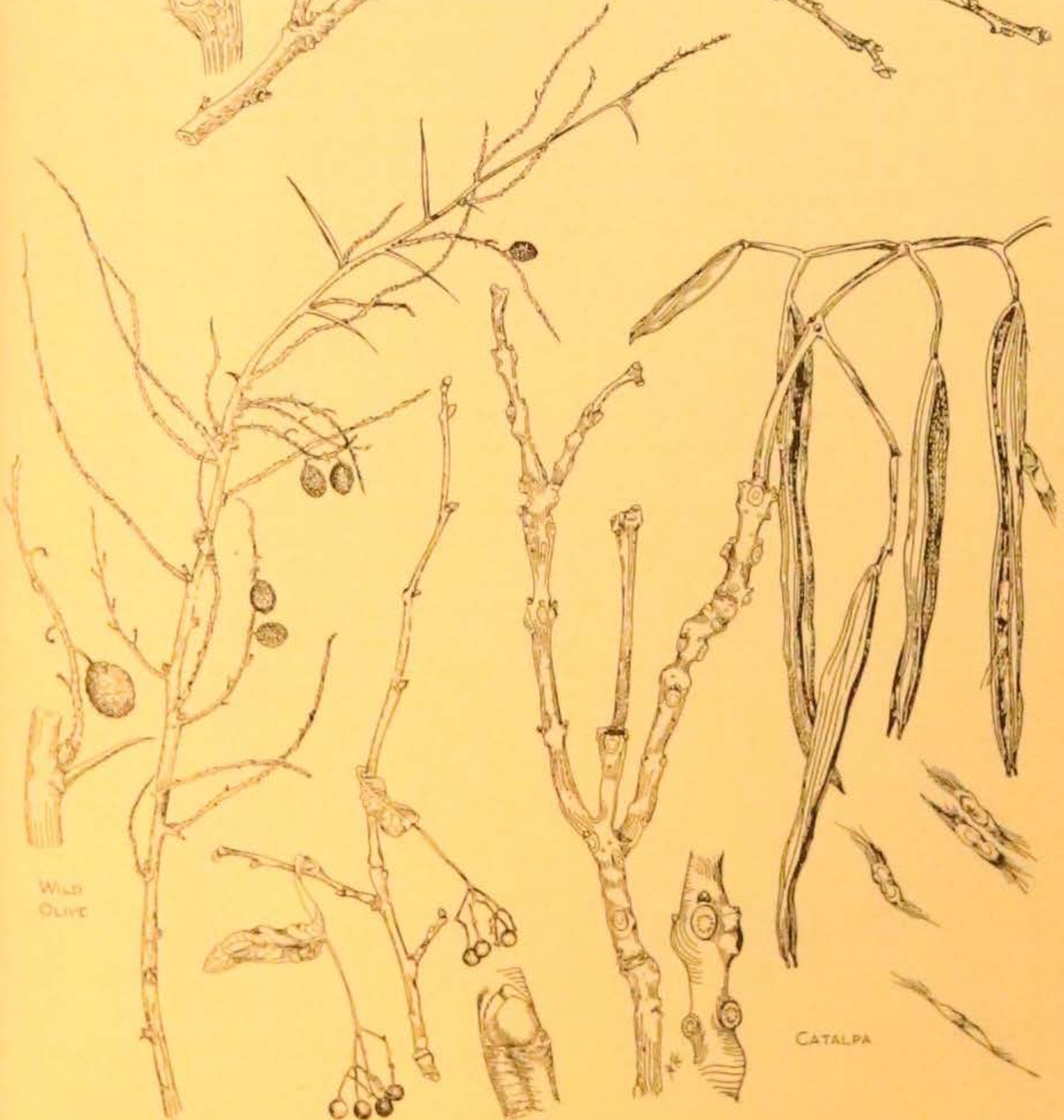
Tilia. THE LINDEN OR BASSWOOD. A large tree of soft wood; moderately heavy twigs which are gray to reddish and somewhat shiny and zigzag. The twigs are tough because of the fibers in the inner bark. The buds are showy, usually red, lop-sided and usually have no more than three bud scales showing. The fruit is about the size of a small pea and is borne in clusters fastened to a leafy bract. Some part of the bract and the fruit is



Plate VIII.



PERSIMMON



Wild Olive

LINDEN

CATALPA

often present in winter. Only one species of this group is common to Iowa.
Tilia americana. (Page 70)

Elaeagnus. THE RUSSIAN OLIVE. A slender tree with silvery white buds and twigs but with the bark becoming brownish red on the larger branches and trunk; thorns woody and usually unbranched.

*Elaeagnus angustifolia.** (Page 49)

Diospyros. THE PERSIMMON. A medium-sized tree with dark bark broken into thick square plates on the trunk. The bud-scars are two or more ranked and the pith of the twigs is solid or chambered. There is only one bundle-scar and the pith is usually somewhat large. This is a southern tree which is quite often planted in the southern half of the state.

*Diospyros virginiana.** (Page 49)

Fraxinus. THE ASHES. Large trees with opposite leaf-scars and dark brown or black, rough, dry buds. The bundle-scars are numerous and small, usually forming a curved line within the leaf-scar. Fruits, sometimes present in winter, are slender with a long terminal wing.

a. Twigs four-angled; bark broken into plates.

BLUE ASH. *Fraxinus quadrangulata.* (Page 50)

a. Twigs round or nearly so in cross-section; bark not broken into plates.

b. Leaf-scars horse-shoe shaped; usually an upland tree.

WHITE ASH. *F. americana.* (Page 50)

b. Leaf-scars semi-circular to shield-shaped; usually flood-plain trees.

c. Bark soft-scaly; buds black. BLACK ASH. *F. nigra.* (Page 50)

e. Bark not soft-scaly; ridged; buds dark brown rather than black.

d. Twigs and buds with fine brownish hairs.

RED ASH. *F. pennsylvanica.* (Page 50)

d. Twigs and buds without fine brownish hairs, sometimes very faintly greenish hairy.

GREEN ASH. *F. pennsylvanica lanceolata.* (Page 51)

Catalpa. THE CATALPA. Leaf-scars round and usually more than two at a node. The bundle-scars form a somewhat flattened circle inside the leaf-scar. Fruit a long capsule containing many winged seeds.

COMMON HARDY CATALPA. *Catalpa speciosa.** (Page 46)

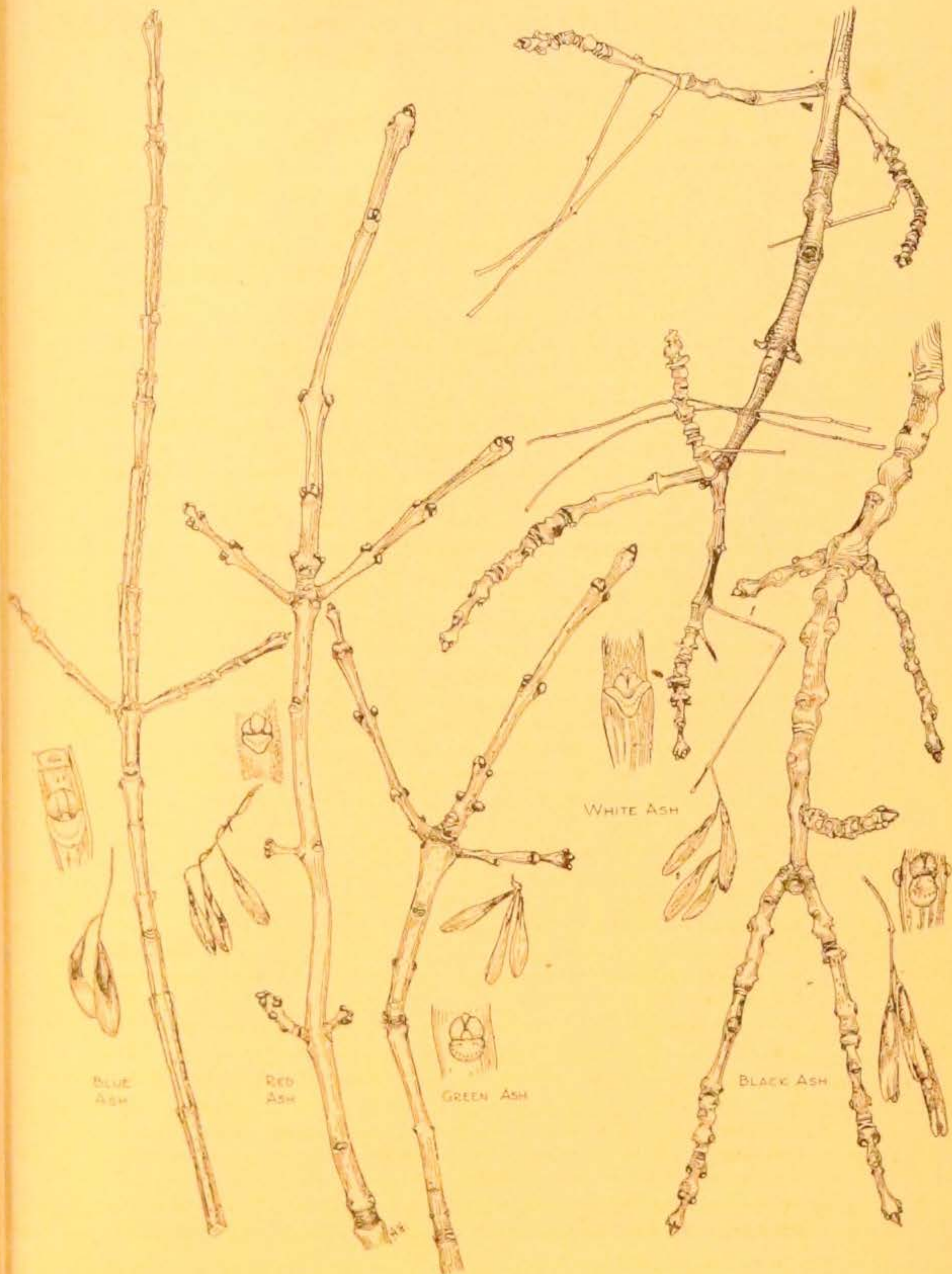


Plate X.

A BRIEF DESCRIPTION OF THE SPECIES OF IOWA TREES WITH EMPHASIS ON WINTER CHARACTERS

**Abies concolor* Lindl. and Gord. WHITE FIR. The western white fir is a large tree (150 to 220 feet) growing at high elevations throughout the mountains of western North America. The leaves are linear and flat and whitened with stomates on both surfaces with fewer on the top. The trunk is light gray and smooth, except in age, and covered with resin blisters. The cones are upright, on the upper branches, rounded at the tip, 2 to 4 inches long, velvety; they break up on the tree when mature. The tree is occasionally planted in Iowa in wind-breaks and for ornament, where it grows to a height of 40 to 90 feet.

Abies balsamea (L.) Mill. BALSAM FIR. This medium-sized tree (50 to 60 feet) grows naturally in the Great Lakes region and northward. The leaves are linear but smaller ($\frac{3}{2}$ inch to slightly more than 1 inch), than those of the white fir and whitish only on the lower surface where all of the stomates are located. The cones are upright on the upper branches as in the white fir but somewhat smaller and not so velvety. The balsam fir grows naturally in the northeastern two counties of Iowa and is quite often planted in the state.

Acer Negundo L. BOX ELDER. This tree is often called the ash-leaved maple because the tree and its varieties are the only maples with compound leaves like the ashes. It is a rapidly growing softwood tree of irregular shape. Trees of this species are of two kinds, pollen-bearing trees and fruit-bearing trees. The twigs are greenish or purplish white with white downy buds and with large pith. The fruit hangs in clusters on smooth stems and is often present at least in part during the winter. The box elder is able to endure flooding on lower flood-plains as well as a variety of other conditions and with its varieties is found throughout most of the United States and southern Canada. It is a native to all parts of Iowa.

Acer spicatum Lam. MOUNTAIN MAPLE. A slender tree about 25 feet high when growing alone; it becomes quite shrubby when growing naturally near other trees. The twigs are usually brownish gray and are densely hairy. The leaves are somewhat heart-shaped at the base and usually three-lobed. The mountain maple is a native of northeastern North America growing as far west as northeastern Iowa in the few counties bordering the Mississippi river.

**Acer platanoides* L. NORWAY MAPLE. The tree is of medium to large size with a broad, well-rounded, spreading crown made up of several long branches and many branchlets. This maple is a native of Europe and has become a popular shade tree in the state. In general appearance it resembles the hard maple but may be distinguished from it in winter by the milky juice and by the meeting of the leaf scars around the twig in the Norway maple.

Acer rubrum L. RED MAPLE. This tree is found in cold moist places of northeastern North America. It has been reported as growing naturally in eastern Iowa but if native to the state it is very rare. The twigs are dark red with the bud scales bordered with fine silky hairs. The bark of the branches is more nearly white than that of any of the other maples in the

*Species of trees not native to Iowa.

state. It is planted as an ornamental tree to a degree in the eastern part of the state but very little in the western part since it is not well adapted to dry conditions.

Acer saccharinum L. SOFT MAPLE. The tree grows to a height of 45 to 80 feet in the state, but because of its broad irregular very open crown it makes a poor shade tree. The bark is usually medium to light brownish gray on small branches and is reddish brown on the twigs. The bark on older trunks is reddish brown and is roughened by long slender flakes which loosen at the ends. Late in the winter the many clusters of flower buds on the tree are very showy. The leaves of the soft maple are deeply lobed and appear in the spring after the flowers. This is one of our most common native trees, growing naturally on lower flood-plains but able to grow in a wide variety of places. It grows rapidly but it has very soft wood and breaks easily. It was formerly planted extensively in woodlots throughout the state.

Acer saccharum Marsh. SUGAR MAPLE. The sugar maple usually grows to a height of 60 to 80 feet and a trunk diameter of 2 or more feet in good habitats in the state. The branches, each with many twigs, grow close together forming a close crown which produces a heavy shade in summer. In general appearance the sugar maple, which grows naturally only in the eastern part of the state, is very much like the black sugar maple which is found throughout the state except in a few western counties. The brownish gray bark on the small branches is lighter than that of the black sugar maple, and the bark on the trunk is lighter and has showy, lighter gray streaks circling the trunk. The leaves of the sugar maple usually have five lobes and the black maple usually only three; the sugar maple leaves are smooth and whitish underneath while those of the black maple are spongy and hairy. These two sugar maple trees are among our finest shade trees. The black sugar maple is more abundant but the sugar maple is planted to a large extent in the state.

Acer saccharum nigrum (Michx.) Britton. BLACK SUGAR MAPLE. This variety of sugar maple, which by some authorities is considered to be a true species, is able to grow about 200 miles farther west in Iowa than is the sugar maple. For this reason it is a better tree for planting throughout the state. It very closely resembles the sugar maple; the differences between the two are discussed under sugar maple.

**Aesculus hippocastanum* L. HORSE CHESTNUT. This medium-sized tree came originally from Asia. It has been planted at various places throughout the state near homes and public buildings but seldom as a street tree. It is a well formed tree with stout twigs on which are located large showy heart-shaped leaf scars. It resembles the true buckeyes which belong to this group but unlike most of them, the large showy buds are sticky, the compound leaves are almost always made up of seven leaflets, and the bark is brownish rather than gray.

**Aesculus octandra* Marsh. SWEET BUCKEYE. This is only one of the true buckeyes which has brownish bark on the old branches and trunks. Like the other buckeyes it has large showy, opposite leaf scars. It is slightly larger than the other buckeyes and the horsechestnut. It is reported as growing naturally in several places in southeastern Iowa, but

we have no specimens of it in the Iowa State College herbarium. Besides the brown bark, it is different from the other buckeyes in that it has fruit without spines and pollen-bearing organs which do not extend out beyond the petals.

Aesculus glabra Willd. OHIO BUCKEYE. The common buckeye of the state grows to be about 50 feet high on rich upper flood-plains but on rocky thin soil, where it is often crowded, it becomes only 25 to 30 feet high. The bark is gray on old branches and trunks and has shallow fissures between the ridges. The leaves, with an occasional exception, have five leaflets. The fruits of this species and of the following variety are spiny. It grows naturally in the southern half of the state and is occasionally planted as an ornamental tree.

Aesculus glabra arguta (Buckley) Robinson. THE WESTERN BUCKEYE. This smaller tree resembles the Ohio buckeye except for size, for the darker gray bark on the old stems and the leaves of six or seven long-pointed, deeply saw-toothed leaflets. It grows naturally in the southern one-fourth of the state and extends through Missouri to Kansas, Oklahoma and Texas.

**Ailanthus altissima* Swingle. TREE OF HEAVEN. The tall, rapid-growing tree of heaven was introduced from Asia. It is planted throughout the state as an ornamental, but is not a desirable shade tree because of its thin crown, its bad smelling juice and its many suckers which injure lawns. The leaves are 1 to 1½ feet long, made up of 11 to 23 leaflets which are opposite each other with an odd one at the end. There are many fruits each bearing one seed and an elongate wing extending to both ends.

Amelanchier canadensis (L.) Medic. COMMON JUNEBERRY. The common Juneberry is a small tree which grows as high as 35 feet under good conditions but under unfavorable conditions, especially in the western part of the state, it is shrub-like. It grows naturally throughout the state at the edge of oak-hickory woods, especially along stream banks. The tree is usually slender, with a few long branches and slender twigs with long-pointed yellowish buds. The bark is brownish gray and smooth except on old trunks where it is divided into low, flat-topped narrow ridges. Often the trees are marked by a series of girdles from the bottom of the trunk to the top caused by sapsuckers, members of the woodpecker family.

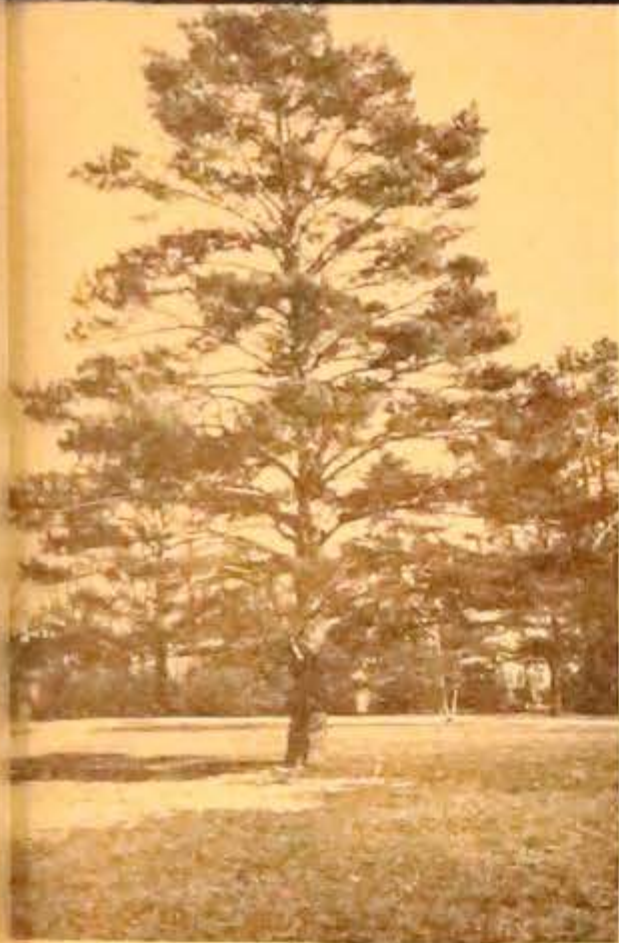
Asimina triloba Dunal. PAPAWE. This southern tree grows naturally for a short distance along the Mississippi river in the southeastern part of Iowa and along the Missouri river for about the same distance in the southwestern part but rarely in between these two locations. The tree is small and shrubby, especially in Iowa, being found on upper flood-plains and on lower slopes bordering flood-plains. They grow in openings in woods rather than in dense shade. The buds are brown, silky and somewhat stalked and

FIG. 1. (OPPOSITE PAGE)

TOP ROW, LEFT TO RIGHT, Scotch pine *Pinus sylvestris*; Austrian pine *Pinus nigra austriaca*; European larch *Larix decidua*

CENTER ROW, LEFT TO RIGHT, Western yellow pine *Pinus ponderosa*; Jack pine *Pinus banksiana*; American larch *Larix laricina*

BOTTOM ROW, LEFT TO RIGHT, Norway spruce *Picea Abies*; The hemlock *Tsuga canadensis*; Colorado spruce *Picea pungens*



elongate, resembling those of the Magnolias but without stipule scars surrounding the stem at the base of the bud. The leaves which are grouped near the ends of twigs are large (6 inches to over 1 foot long) and egg-shaped in outline, with the upper end broader and bluntly pointed.

Betula lutea Michx. YELLOW BIRCH, GRAY BIRCH. The adjective "*lutea*" applied to this tree means yellow, but the general appearance of the tree is gray or silver rather than yellow, although the newly exposed silvery gray bark usually has a yellowish tint. The twigs are slender, yellowish brown and the fruits are borne in oblong catkins covered with fine downy hairs. This birch will not grow where it is flooded but does well on rich upper flood-plains and on slopes bordering streams where the shade is not too dense. It is found mostly in northeastern Iowa and as far to the southwest as Eldora and near Marshalltown. It is sometimes planted, especially in the eastern half of the state, and makes a beautiful specimen tree although it is not as showy as the paper birch.

Betula nigra L. BLACK BIRCH, RIVER BIRCH. The river birch is found on lower flood-plains in the eastern and southern parts of the state. A line from the northeast corner to slightly west of the middle of the lower tier of counties forms the western border of its distribution in the state. The bark on both the trunk and branches is thin, forming curling paper-like layers which are of all colors from yellowish brown through orange-brown to blackish and reddish brown, giving a general yellowish brown appearance. The lenticels on the twigs are much lighter than the reddish, shining bark of the twigs. Because the bark on the large branches and trunk of this tree is much yellower than that of the yellow birch the tree is often called yellow birch.

Betula papyrifera Marsh. PAPER BIRCH, CANOE BIRCH. This showy white-barked tree is native to the northeastern 10 or 12 counties of the state and extends southwestward to Eldora. It is a large, spreading open crowned tree with shiny white or cream-colored bark on the trunk and medium to large-sized branches. The lenticels which lengthen as the branch enlarges are especially noticeable on the white bark. The fruiting catkins which are breaking up in winter are longer and slenderer than those of the yellow birch. The pollen-bearing catkins which will ripen the next spring are usually 2 to 3 inches long and 1/8 inch or more across by midwinter. The paper birch is planted throughout the state but especially in the northern part.

**Betula populifolia* Ait. GRAY BIRCH, OLD FIELD BIRCH. This tree is occasionally planted in the eastern part of the state where it grows to a height of about 25 feet. The bark is dull, chalky or ashy white and does not split freely into papery layers. The fruiting clusters are cylinder-shaped and slender-stalked, little over 1 inch long, with spreading, slightly hairy bracts between the fruits. The leaves are rounded triangular but straight across the bottom.

**Betula pendula* Roth. WEEPING BIRCH.

**Betula pendula dalecarlica* Schneid. CUT-LEAVED WEEPING BIRCH. This species and variety of birch are planted at many places in the state as specimen trees in yards surrounding homes. The first one named has drooping or "weeping" branches and leaves that are saw-toothed but not

deeply cut. The second one has "weeping" branches and leaves which are deeply cut and usually long-pointed. These two trees as a rule do not grow as well as the common paper birch.

Carpinus caroliniana Walt. BLUE BEECH. The common name of this small tree is misleading since it belongs to the birch family rather than to the beech family. It is native to the eastern half of the state but is found only in certain localities rather than being generally distributed over the area. It is distinguished from the ironwood which it somewhat resembles in size and shape by the smooth bluish gray bark, by the fluted or winged appearance of the trunk and by the usual absence of pollen-bearing catkins in the winter. The blue beech cannot grow in as dense shade as the ironwood.

Carya illinoensis (Wang.) K. Koch. PECAN. The pecan, with its roughened bark and its somewhat hairy leaves which have 9 to 15 leaflets each, is the hickory which more nearly resembles the walnuts. The buds, however, are yellow like those of the bitternut hickory with scales which unite with each other along their edges, but they are less slender and are covered with yellow hairs. The shelled nuts resemble those of the bitternut and the pignut in having no angles like other hickories but are different from these two in being about twice as long as broad, brown, sweet and of good taste. This tree grows naturally in a few places only along the Mississippi River in the extreme eastern part of the state. It is sometimes planted in southeastern Iowa for ornament and for the nuts.

Carya cordiformis (Wang.) K. Koch. BITTERNUT. This tall slender tree often becomes 60 or 70 or more feet high on upper flood-plains and at the bottoms of slopes. It grows naturally throughout the state and is usually of smaller size in dry oak-hickory woods where it commonly grows. Since the pecan, the other hickory which has a somewhat long yellow bud, is not commonly found in the state, and since the bitternut hickory usually bears shortened bitter nuts, one has little difficulty in separating the two. The bark is medium to light gray and is not shaggy. The wood is hard and heavy and very tough and is used almost as generally for tool handles and like uses and for fuel as the better known shagbark hickory wood.

Carya ovata (Mill.) K. Koch. SHAGBARK SHELLBARK HICKORY. This is the best known hickory tree in the state although it does not extend so far into the northwestern corner of the state as does the bitternut hickory. In a few southeastern counties it may be confused with the kingnut, the other native shaggy-barked hickory, but in all other parts of the state it is the only shaggy-barked hickory. It grows to a height of 50 to 75 feet except in dry habitats, where the height is often reduced to about 30 to 35 feet. It also may grow on upper flood-plains, but its usual location is in well-developed oak-hickory woods where it may often form pure stands. The nuts, though smaller than those of the white hickory nut and the kingnut, have a greater proportion of kernel to shell and are considered by many to have a better taste. The buds are large, have wide overlapping scales which are finely silky-hairy, and the leaves seldom have more than five leaflets. The wood seems to be more flexible than that of the bitternut and is better known for its use in making tool handles, implements, and for fuel.

- Carya glabra* (Mill.) Spach. PIGNUT. This tree grows naturally in only a few places in southeastern Iowa. The bark resembles that of the bitternut in its lack of shaginess, but the tree differs from the bitternut in having broader buds with overlapping bud-scales. The nut is larger than the bitternut and has thicker shell and husk, and the kernel is slightly less bitter.
- Carya alba* (L.) K. Koch. WHITE HICKORY, MOCKERNUT. A tree of common occurrence in southeastern Iowa as far north as Clinton and along the Des Moines river to Ottumwa. The tree is about as large as the shagbark hickory and usually grows farther down the slope. The bark is not shaggy but is more roughened than any other non-shaggy hickory except the pecan. The buds are large grayish brown, with overlapping scales and the twigs are covered with fine hairs. The leaves usually have seven and sometimes nine leaflets with the petiole and leaf axis finely hairy, a fact from which the former name *C. pubescens* was derived. The nut is larger than that of the shagbark hickory and has a much thicker, angled shell and a thicker husk. The wood has the same uses as that of the shag-bark but is not so commonly used because of the limited distribution of the tree.
- Carya laciniosa* (Michx.) Loud. BIGNUT HICKORY, KINGNUT. The kingnut grows naturally in the extreme eastern and southeastern part of the state but is not very common. The tree is about the size of the shagbark and white hickory. The shaggy strips are usually narrower than those of the shagbark hickory. The nut is larger than this common hickory nut, being about the size of the white hickory nut and with about the same thickness of shell and husk. The shell, however, is brownish purple tinted on the outside compared to the white color of the white hickory nut, and the bark is shaggy as compared with the roughened non-shaggy bark of the white hickory tree. The wood has the same use as other hickories but is little used in the state because of its scarcity.
- **Castanea dentata* (Marsh.) Borkh. CHESTNUT. The chestnut, a member of the beech family, grows naturally with the oaks in eastern United States but does not extend westward to Iowa. In recent years it has been almost entirely killed out by a plant disease, the chestnut blight. The tree resembles the red oak tree but has a more open crown. The buds are not clustered at the ends of the twigs as in the oaks and are reddish in winter. The leaves are long, pointed at both ends and are deeply saw-toothed. The fruit is a prickly bur, about 2 inches or more across, which contains flattened nuts with thin, tough shells. The chestnut is planted to some extent in the eastern part of the state but rarely in other parts as an ornamental tree.
- **Catalpa speciosa* Warder. COMMON HARDY CATALPA. This best-known catalpa of the state grows to a height of 70 to 80 feet in the most favorable

FIG. 2. (OPPOSITE PAGE)

TOP ROW, LEFT TO RIGHT, Golden willow *Salix alba vitellina*; Black willow *Salix nigra*; Cottonwood *Populus deltoides*

CENTER ROW, LEFT TO RIGHT, Douglas fir *Pseudotsuga taxifolia*; White fir *Abies concolor*; Eastern red cedar *Juniperus virginia*

BOTTOM ROW, LEFT TO RIGHT, White poplar *Populus alba*; Butternut *Juglans cinerea*; Black walnut, *Juglans nigra*



localities and is reduced to a height of 25 to 40 feet in the drier habitats of central and western Iowa. The bark is usually grayish brown and forms long, low ridges. The twigs are stout and usually yellowish brown with the roundish leaf-scars commonly three at a node and with no terminal buds. The leaves are large and chiefly heart-shaped, and the fruit capsule is 10 to 20 inches long. This catalpa is planted in most parts of Iowa as a specimen tree and in woodlots. It is used for fuel and is of some value for fenceposts.

Celtis occidentalis L. COMMON HACKBERRY. A tree which grows on upper flood-plains throughout the state with the elms and ashes but is usually not very abundant. Under good conditions it is about the same size as the elms, often reaching a height of 70 to 80 feet but in the north-western half of the state is usually 30 to 40 feet high. The crown is generally slightly more open, casting less shade than the elms. The twigs are slender, zigzag and have quite showy lenticels. All but young trees may be recognized by the narrow, steep-sided bark ridges which are built up of definite layers. Although belonging to the same family as the elm, the hackberry, instead of elm-like winged fruit, has a one-seeded berry fruit which was much used by the Indians, especially when dried and ground up with dried meat. The wood is used locally for fencing and farm building.

Celtis occidentalis crassifolia (Lam.) Gray. ROUGH-LEAVED HACKBERRY. This variety of the hackberry is found in some localities in the state. The twigs are covered with soft fine hairs, and the large cordate leaves more roughened than those of the common hackberry by short, somewhat stiff hairs.

Cercis canadensis L. REDBUD, JUDAS TREE. A member of the pea or legume family, the redbud grows naturally throughout the southern two-thirds of the state. It is about 30 feet high but is often reduced in size, especially near the borders of woods and toward the edge of its range. The 2 to 3 inch, thin, bean-like pod is almost always present on the tree in winter. The buds are dark purplish red, spotted and rounded. The flower buds are located back from the end of the branchlets on older wood and are numerous. The flowers in early spring are one-sided, resembling pea flowers; they are purplish when partly open and change through lavender to almost white when fully open. It is commonly planted in all parts of the state as an ornamental tree.

Crataegus punctata Jacq. PUNCTATE HAW, DOTTED THORN. This is a member of the red haw group (genus) which includes several hundred species growing naturally in eastern and central North America. It is extremely difficult to distinguish between so many different species and especially is this true in the winter condition. This tree is flat-topped, about 20 to 25 feet high, with long branches which grow almost straight out from the tree. The bark of the trunk is roughened and dark brownish gray. The 1-year twigs are covered with fine gray hairs which disappear by the second year, the twigs becoming almost smooth and silvery gray. The thorns are straight and 1 to 3 inches long. The leaves are wedge-shaped at the base above which the margin is doubly serrate. They are lighter green below, the older leaves remaining hairy along the veins. The small apple-

like fruits may be yellow or red with punctate dots and are cut squarely across the ends; nutlets three to four. It is well distributed in the northern half of the state with the exception of a few western counties and is found occasionally in a few southern counties. It grows in open oak-hickory woods, especially near their edges and often in open pastures where because of the absence of other trees it makes its best development.

Crataegus mollis (T. and G.) Scheele. COMMON RED HAW. The most common red haw of Iowa as well as of the eastern United States, this tree is found in every county of the state. Since it is the best known haw, sometimes other species are mistaken for it. The tree is very common in oak-hickory woods where it is about 25 to 35 feet high. It is also found in and near shrub thickets where it may appear as a small shrubby tree 12 to 18 feet high. The crown is broad and rounded. The branches extend slightly upward with branchlets growing out at nearly right angles. The thorns are $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, slightly curved and are found chiefly only on the young branchlets. The leaves are broad, oval-shaped, with heart-shaped bases. The margin is doubly saw-toothed and may be deeply cut or lobed. The stems of the leaves (petioles) are woolly-hairy. The fruits are borne in clusters of 6 to 12. They are red and among the largest of red haw fruits, $\frac{1}{2}$ to 1 inch in diameter.

Crataegus Crus-galli L. COCK'S-SPUR HAW. The tree is small (about 20 feet or less) and is seldom broad-topped. The bark is yellowish brown and shiny on young twigs and is dark grayish brown on older branches and trunks. This species is easily distinguished by its numerous long (2 to 7 inches) slender, slightly curved thorns. The fruit is less than $\frac{1}{2}$ inch long and red when ripe. The leaves are medium-slender, broader toward the tip, wedge-shaped at the base and finely saw-toothed. It grows naturally in the eastern half of the state but is of somewhat rare occurrence there.

Crataegus Margaretta Ashe. A RED HAW. This tree is difficult to distinguish from other haws in winter. It is 20 to 25 feet high, with a straighter trunk and taller crown than most haws. The branches are somewhat erect, the branchlets becoming shiny chestnut brown to ashy gray, and bearing almost straight $\frac{3}{4}$ to $1\frac{1}{2}$ inch thorns. The fruits, which are few in drooping clusters, are short, flattened at the ends and dull, dark red or rusty orange-red or rarely yellow in color. The leaves are oblong but slightly broader at the upper end and are entire below, bluntly saw-toothed above the middle and shallowly lobed at the upper end. It occurs rarely at the edge of woods throughout Iowa, except in the north-western corner.

**Diospyros virginiana* L. PERSIMMON. The common persimmon grows naturally from central Missouri southward. In the southern half of Iowa, where it has been occasionally planted, it may grow to a height of about 40 feet, forming a narrow or broad round-topped crown. The branchlets have a thick pith, are slender, slightly zigzag and light brown when young, changing to ashy gray with showy orange-colored lenticels. The bark on the trunk is very dark gray tinged with red and deeply divided into thick square plates. The fruit is fleshy, pale yellow and very unpleasant to the taste, becoming yellowish brown and of good taste after frost.

**Elaeagnus angustifolia* L. RUSSIAN OLIVE. This slender, small tree

has been introduced into North America from Europe and Asia. It is easily identified among our trees by its silvery gray young twigs, its reddish brown older twigs and branches, its silvery buds and its quite numerous unbranched thorns. The leaves are inverted lance-shaped, grayish green above and silvery beneath. The fruit is small whitish and olive-like. The Russian olive seems to grow well wherever planted in Iowa.

Fagus grandifolia* Ehrh. **BEECH. The beech grows with the sugar maple in the most favorable sites of the forests of eastern North America, but its range does not reach as far west as Iowa. Where it has been planted in eastern Iowa, it may grow to a height of 60 feet, with a trunk diameter of 1½ to 2 feet. It has an elongate rounded crown of slender, slightly drooping branches. Young branchlets are pale green, coated with long slender temporary hairs, changing through reddish brown to ashy gray as they grow older. The winter buds are nearly an inch long, shiny brown and long-pointed. The leaves are crowded on short side branchlets which are borne at the ends of the main branches. They are oblong, rounded, usually bluntly pointed at both ends, with spreading or incurved teeth and lighter green and very finely hairy below.

Fraxinus quadrangulata Michx. **BLUE ASH.** This ash tree with its unusual four-angled twigs grows naturally in the very extreme south-eastern corner of the state. It is planted in other parts of the state. In Iowa it seldom becomes more than 30 feet high. The bark on the trunk is broken into almost square plates. The inner bark will tint water blue.

Fraxinus americana L. **WHITE ASH.** The white ash with the much less common blue ash are not considered flood-plain trees as are the other ashes. The white ash is common, chiefly on slopes with upland trees in all parts of Iowa except the north-western one-sixth of the state. Among these trees it is slender and 30 to 70 feet high. The bark on the trunk is dark grayish brown, narrowly furrowed, and the twigs are grayish brown or greenish brown. The opposite leaf scars, common to all ashes, are horse-shoe shaped rather than semi-circular. The wing of the fruit is almost entirely terminal, not extending down along each side of the seed. The wood where abundant is very valuable for the making of implements, furniture, tool handles and for general local use and fuel.

Fraxinus nigra Marsh. **BLACK ASH.** The black ash is a tree of lower flood-plains and swamps, where it may grow to a height of 70 feet, although it is usually smaller. Under these conditions it has a tall, open, irregular crown. It grows naturally in Iowa, except in the southwestern and western one-third of the state. The bark is ashy to dark gray and soft and scaly to the touch. The twigs are stout and definitely separated into divisions by the bud-scale scars of previous years. The 7 to 11 leaflets making up the leaf are sessile (not stalked) and are somewhat hairy over the entire lower surface. The fruit is wide with the broad wing notched at the upper end and extending down each side to the base of the seed. It is often called basket or hoop-ash because of the use of its wood for these purposes. It is also used to some extent for interior finish of houses, but in Iowa it is only of general local use.

Fraxinus pennsylvanica Marsh. **RED ASH.** The red ash grows naturally on upper flood-plains throughout the state but is not so abundant as the

green ash which is considered not a true species but only a variety of the red ash. This tree resembles the green ash in every way except it has fine brownish hairs on 1 and 2-year-old twigs, whereas the twigs of the green ash are smooth or have very faint greenish hairs on 1-year-old twigs but not on the 2-year-old twigs. The leaf stems and leaf axes of the two trees also have this difference.

Fraxinus pennsylvanica lanceolata (Bork.) Sarg. GREEN ASH. The green ash shares with the elms the honor of being the most important flood-plain tree in the state. It grows in all parts of the state on upper flood-plains. In favorable localities it may become 75 feet high but towards the western and north-western part of the state, it is usually reduced in size to about 30 or 40 feet. Growing with other trees it is tall and rather slender and has an irregular crown which gives only moderately dense shade in summer. The bark of the trunk is grayish brown and definitely ridged. The buds are dark brown and slightly flaky, and the twigs are greenish gray and smooth or only slightly greenish hairy. The fruit resembles that of the white ash, except the wing extends down along each side of the seed to the base. The leaves have five to nine leaflets which are attached to the axes of the leaf by a short stalk. The wood is more brittle than that of the white ash and not so valuable but is of much general use on the farm.

**Ginkgo biloba* L. MAIDENHAIR TREE. This tree which is a native of China and Japan is the only species which remains of a large group of plants which resemble our cone-bearing trees in having naked seeds but in many other ways differ from them. It grows well in the southern one-half of the state and is occasionally found north of the center of the state. It may be easily recognized by the many blunt dwarf branches which are covered with leaf-scars with the more recent ones at the tip. The leaves fall off in autumn, are fan-shaped, divided into two parts at the broad tip and have many close straight veins ending in the margin of the leaf. Almost the only trees grown are the pollen-bearing ones because of the disagreeable odor of the large number of plum-like fruits when decaying.

Gleditsia triacanthos L. HONEY LOCUST. This tree is found throughout the state except in the extreme northwest corner. It is a tree of the upper flood-plain but is not abundant there. It is found in a variety of sites and where allowed to do so, it has extensively invaded old fields and pastures. It is easily recognized by its almost smooth trunk, its few to many branched thorns, sometimes lacking, and its singly or double compound leaves of many small leaflets. Its lower branches are somewhat drooping; its twigs are zigzag and the lenticils prominent. The fruit is a bean-like pod about 1 foot long and reddish brown. The wood is strong, coarse-grained and splits easily. Its chief use is for fence posts, for construction and fuel. For this reason it is a valuable wood-lot tree and is often planted throughout the state, where it grows well.

Gymnocladus dioica (L.) Koch. KENTUCKY COFFEE TREE. The tall and slender coffee tree grows throughout the state but not so favorably in the northern part where it is near the limit of its range. It grows naturally in oak-hickory woods, even in the shadier portions where it grows tall with its large, doubly compound food-making leaves well above the cover of other trees. It varies in height in Iowa from 40 to 75 feet. The longitud-

inal strips of bark are raised along one side as by a knife blade and are dark grayish and reddish brown. The twigs are heavy, have no terminal buds and give the tree a bald appearance when the large leaves have fallen. Most of the branches grow almost upright. The twigs have large, salmon-pink to brown pith, large alternate leaf scars and showy lenticels. The fruit is the typical bean-like legume but is short and wide (about 5 by 1½ inches), thick and jelly-like inside. The wood is used for fence posts and fuel and also to some extent for building-lumber. The tree is showy and is much planted as an ornamental and to some extent as a wind-break tree.

Juglans nigra L. BLACK WALNUT. The black walnut is a large tree, usually 40 to 75 feet high. It grows throughout the state on upper rich flood-plains with the elms and the flood-plain ashes. In addition it will grow under a great variety of conditions and is generally planted in wood-lots and around farm sites because of the desirability of its nuts and the value of its wood. The bark is dark grayish brown and roughly furrowed and shows dark brown under the outer layer. The leaves are made up of 15 to 23 leaflets placed opposite each other on the central leaf axis (rachis) with an odd one at the end. The pith of the twigs has thin diaphragms and is broader and lighter in color than that of the butternut, and the soft hairy buds are shorter and slightly darker. The wood is rich dark brown with typical walnut odor, light, strong and easily split. It is valuable for interior finish, furniture, gun stocks, airplane propellers and even fence posts and fuel. The nuts are edible and in considerable demand. It is one of the most valuable of Iowa trees.

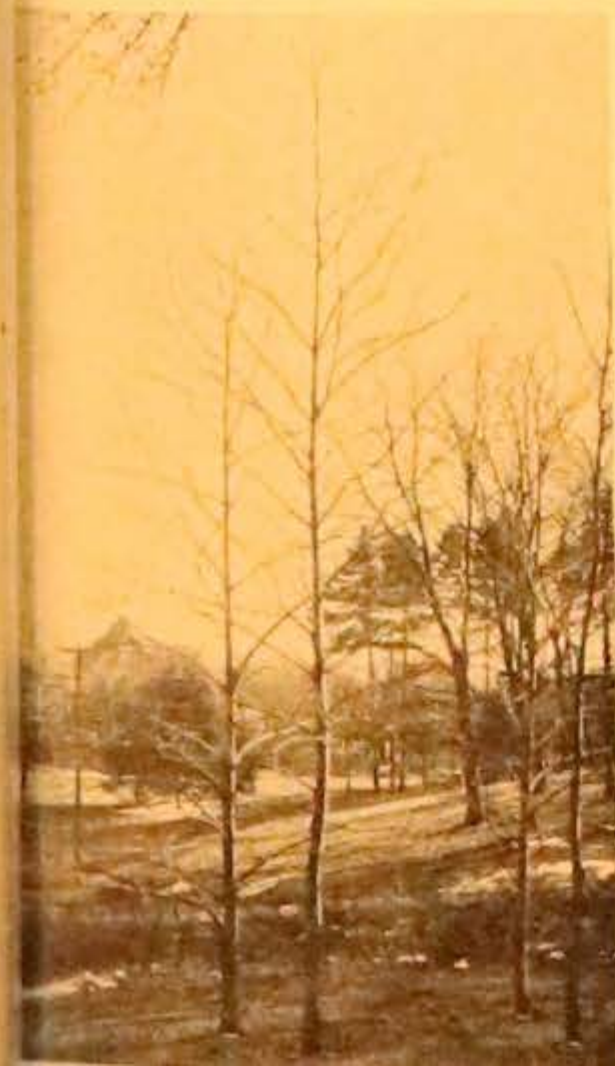
Juglans cinerea L. BUTTERNUT. The white walnut or butternut is not as valuable a tree as the black walnut, and although they grow together on rich upper flood-plains the butternut is not able to grow on upper slopes where it has to compete with more shade-loving trees. It is found throughout the state but is smaller toward the west and drops out almost entirely in the extreme northwest corner. The leaf has fewer leaflets (usually 11 to 15) than that of the black walnut and the partitions of the pith are thicker, shorter and of darker color. The buds are longer and of lighter color than those of the black walnut. The bark of the trunk is divided into long wide flat-topped almost white ridges which help to distinguish it from black walnut bark. It is not dark brown underneath. The nut is more elongate than the black walnut and the nut itself is deeply carved with sharper ridges. The tree is smaller, usually 20 to 40 feet high, except under very favorable conditions. The wood is softer and less strong than black walnut. It is of much less value but is used for about the same purpose. The nuts are considered to be of more value by some but not generally because of the smaller proportion of kernel to shell.

FIG. 3. (OPPOSITE PAGE)

TOP ROW, LEFT TO RIGHT, Bur oak *Quercus macrocarpa*; White oak *Quercus alba*; Red elm (slippery elm) *Ulmus fulva*

CENTER ROW, LEFT TO RIGHT, paper birch *Betula papyrifera*; River birch *Betula nigra*; Bitternut hickory *Carya cordiformis*

BOTTOM ROW, LEFT TO RIGHT, Chestnut *Castanea dentata*; English oak *Quercus robur*; Pin oak *Quercus palustris*



Juniperus communis L. COMMON JUNIPER. In Iowa the common juniper is a large bushy shrub or a small tree, growing to a height of 15 or 20 feet. The trunk is short, irregular and rarely more than 6 or 8 inches in diameter. The slender branchlets are smooth, shiny, three-angled and light yellow toward the ends. The older branchlets are dark red-brown with small thin bark scales. The leaves are scale-like, spreading and $1/3$ to $1/2$ inch long. They are yellowish green, turning a rich bronze color during the winter. The fruit, which matures in the third season, is irregular ball-shape and about $1/4$ inch in diameter with one to three seeds. The tree is native to northern Iowa but will grow when planted throughout the state. It has never been planted to any extent in Iowa and is even less popular now since it is known to be an alternate host of the cedar-apple rust. In many parts of the state cedar-apple rust is not a menace; in fact the junipers may be found more valuable than the susceptible apple trees.

Juniperus virginiana L. EASTERN RED CEDAR. This is the common cedar tree of Iowa, growing naturally throughout the entire state. It very rarely grows in close stands but is rather widely scattered wherever the seeds, which are carried by birds, germinate and are able to establish themselves. It is a sun-loving tree (20 to 40 feet high) and must have plenty of room to become established and grow. Close to other trees it is spire-like but with sufficient room becomes broader. The leaves are of two sorts on the same tree, scale-like and awl-shaped, and are very small, as many as 20 to 30 of them covering a twig $1/2$ inch long. The fruit is a dark blue berry which matures in one season and has one to two bony seeds. The wood is light, close-grained, and brittle with dull red heart-wood. Where abundant it is used for lead pencils, cedar chests and other cabinet work but in Iowa finds general use and is used for fence posts. In an early day it was widely planted in the state but its planting is now restricted in parts of the state where apples are an important crop because the cedar apple rust can complete its life cycle, growing on the red cedar and the apple tree, if they occur within 2 miles of each other.

**Larix laricina* (Du Roi) Koch. AMERICAN LARCH, TAMARACK. The tamarack or American larch grows naturally around the edges of bogs in northeastern United States and on well-drained uplands in central and northern Canada. It is not native to Iowa but is planted to a considerable extent in the northeastern part and occasionally elsewhere in the state. It is a tall, slender cone-shaped tree which may grow to a height of 60 feet but cannot endure shading from other trees. The bark of the trunk is thin, close and reddish brown, breaking into small rounded scales on the surface. The twigs are very slender, smooth, light greenish orange to yellow-brown in color and are covered with many short, dwarf-branches each of which during the summer bears 12 to 30 leaves at the tip. The fruit is a light brown cone of 12 or less scales, becoming dull grayish brown after opening, the entire cone usually about $1/2$ inch long.

**Larix decidua* Mill. EUROPEAN LARCH. In Iowa this tree grows to about the same height as the American larch, but it has a broader cone-shaped head. The branches are straighter and longer, the lower ones bearing drooping branchlets. The leaves are more numerous, 20 to 40 in a group,

and longer, 1 to 2 inches. The cones are 1 to 1½ inches long and grayish brown becoming dull-gray in color. The tree is planted at various places in the state where it grows well except where planted in close stands with other more shade-loving trees.

**Liriodendron tulipifera* L. TULIP TREE. This slender, cone-shaped tree is occasionally planted in protected sites in southeastern Iowa where it attains a height of 50 to 70 feet. The bark is scaly and medium gray on young trees becoming 1 to 2 inches thick, deeply furrowed and brownish gray on old trunks which somewhat resemble those of hard maple in texture of bark. Young twigs are reddish brown; older twigs are medium gray in color. The fruiting body, made up of a close cluster of enclosed seeds, is usually less than 3 inches long and about ¾ inch in diameter. The wood is light, soft and brittle and is known as tulip "poplar." It is well suited for planting in home grounds in southeastern Iowa. It winter-kills quite badly in other parts of the state.

**Maclura pomifera* (Raf.) Schneider. OSAGE ORANGE. The native home of this small tree is a small area from Missouri southwestward into Oklahoma and northern Texas. It is planted for hedges in Iowa, especially in the southern part where it has escaped into woods and fence rows. In Iowa the tree is 20 to 35 feet high, and the crown is oval-shaped where it is growing alone. The leaves are shiny green and not indented in any way on the margin. Osage orange wood is orange colored, heavy, very hard and tough. It is useful, especially for very durable fence posts and is much desired by archers as bow-wood.

**Magnolia acuminata* L. THE CUCUMBER TREE, MAGNOLIA. A broadly cone-shaped tree which grows to a height of 40 to 60 feet when planted in favorable sites in southeastern Iowa. The bark of the trunk is dark grayish brown, covered by numerous thin scales. The twigs are gray and are surrounded by a ring at the base of each leaf-scar. The leaf-scars are narrow and have two rows of large fibro-vascular bundles. The fruit is a cone about 2 inches long and less than 1 inch wide on Iowa-grown trees. The seeds are less than ½ inch long and bright red. This is a good specimen tree for protected home grounds in southeastern Iowa.

Morus rubra L. RED MULBERRY. The red mulberry, growing to a height of 15 to 25 feet, is distributed in small numbers over Iowa, except in the northwestern one-fourth of the state. The tree divides within a few feet of the ground into several branches which are spreading, forming an irregular open crown. It grows in small openings in woods, usually on the upland but also on upper flood-plains. The bark is dark orange-brown, forming low, irregular ridges; the twigs are slightly less slender than those of the white mulberry, zigzag and slightly greenish orange-brown. The leaf lobes when present have an extended point and the leaves are stiff-hairy above. The wood is less hard and tough but somewhat resembles osage orange wood and makes good fence posts. The "fruit," which is actually a cluster of fruits, is combined with other fruits in the making of jams and jellies.

**Morus alba* L. WHITE MULBERRY. This is the mulberry which is grown in Asia to supply the leaves for the feeding of silk worms. It has been planted to some extent in most parts of the state but kills back quite badly in the

northern and western parts. It has escaped to some extent to native woodlands. The bark is not so deeply furrowed as that of the red mulberry, forming light yellowish brown ridges. The twigs are slightly slenderer, smoother and shinier than those of the red mulberry and are yellowish green to brownish gray. The leaf lobes when present do not have an extended point and are smooth above. The "fruit" which is actually a cluster of fruits, is whitish instead of reddish black as in the red mulberry. It is also used to some extent for food.

Ostrya virginiana (Mill.) K. Koch. ironwood. The hop-hornbeam or lever-wood, as it is sometimes called, grows in all parts of Iowa. It is our most shade-loving tree, growing under somewhat dense stands of maple and linden. Its thin, lop-sided, saw-toothed, pointed leaves and pollen-bearing catkins help to identify it as a member of the birch family. It has hop-like fruits. When growing alone it forms an elongate, well-rounded crown and the leaves become thicker. The wood which is hard, tough and very heavy is used for tool handles, mallets and for general farm needs.

**Picea abies* Karst. or *P. excelsa* Link. NORWAY SPRUCE. This European spruce tree is frequently found in the state. It is a large tree, attaining a height of 40 to 60 feet in Iowa. Where uncrowded, it is a graceful cone-shaped tree with many small drooping branchlets. The bright, brownish orange twigs may be either smooth or finely hairy; the leaves are yellow-green, slightly curved, about $\frac{3}{4}$ inch long. More of them are borne on the upper side of the twig, where they usually point forward, than on the lower side. The bark on old trunks is reddish to grayish brown and scaly. The cones are cylinder-shape, 4 to 7 inches long, rounded at the end, heavier and stiffer than most spruce cones and with scales which are cut off almost straight across the upper end. The wood is valuable, but practically none of it is available in Iowa where it is planted chiefly as an ornamental and wind-break tree.

**Picea canadensis* (Mill.) B.S.P. or *P. glabra* Voss. WHITE SPRUCE. Iowa is only a very short distance southwest of the border of the range of white spruce which is generally planted in the state. The tree has about the same broad conical crown as the Norway spruce but lacks the hanging branchlets. The twigs are slenderer and less bright in color than those of the Norway spruce and are not finely hairy. The leaves are pale bluish green to whitish, almost straight and seem to vary in length on different trees. They are almost evenly divided between the upper and lower sides of the twigs where they usually point straight outward. The cones are smaller (1 to 2 inches) and less stiff than those of the Norway spruce and have rounded scales. The Black Hill spruce which is considered a variety of the white spruce and seems to be adapted to drier habitats is becoming popular in the state. The trees are slenderer and irregular in shape and the cones are darker, heavier and thicker.

**Picea pungens* Engelm. COLORADO SPRUCE. The Colorado spruce varies from an extremely bluish to a green color. It grows naturally along streams in the mountains of Colorado and bordering states. In Iowa it is planted chiefly as an ornamental. The trees of bluish cast, many of which are obtained by budding, are the most popular. The trees are broad, cone-shaped becoming more elongate cone-shaped and slightly irregular in old age.

The twigs are stouter than those of white spruce and are dull yellow-brown in color. The leaves are an inch or more long and very sharp-pointed or pungent which gives the tree its descriptive name. On trees of a blue cast the young leaves give the appearance of having been washed with a bluish white substance. They are situated almost evenly on all sides of the young twigs and point straight outward. In late winter the buds are large and flower-like because of the curling of the thin edges of the scales. In Iowa the cones are 2 to 3 inches long, the most papery of all spruce cones, ragged in appearance from the roughened edges of the scales and of varying shades of brown when viewed from different angles.

**Picea mariana* (Mill.) B.S.P. BLACK SPRUCE. The black and white spruces have almost the same distribution in North America, from the Great Lakes region in a broad belt across Canada to northwestern Alaska. However, the black spruce is a tree of cold bogs and acid conditions which makes it a less desirable tree for planting in Iowa than the white spruce. The tree is medium size, 20 to 30 feet, slender cone-shaped and has some drooping branches. The twigs are finely hairy, cinnamon-brown becoming darker brown with age. The leaves are the shortest of all the spruces ($\frac{1}{2}$ inch) and are blue-green but do not have a washed appearance. The cones, which remain on the tree for several years after shedding their seeds the first year, are almost as broad as long, usually not over an inch in length, dark brown and with scales indented on the margins. It is seldom planted in the state, but many of our small "commercial" Christmas trees may be identified as this species from the leaves and usually present cones.

**Picea rubra* (Du Roi) Dietr. RED SPRUCE. This tree grows naturally in a belt along the coast of northeastern North America. Very few red spruce trees have been planted in the state. The twigs are finely hairy and light green; the leaves are little longer than those of black spruce and quite broad; the cones are slightly longer than those of black spruce, reddish in color and with entire scales. The red spruce should become popular for planting in favorable sites in the state.

Pinus Strobus L. WHITE PINE. This largest and most shade-loving pine of the Great Lakes region grows naturally in certain habitats in northeastern Iowa and to Eldora in Hardin county. It is planted throughout the state where it varies in height from 30 to 75 feet. In close stands it is tall and slender but becomes broader and somewhat open-topped when growing alone. The leaves are five in a place, silky, about $3\frac{1}{2}$ inches long and finely toothed. The cones of Iowa-grown trees are 3 to 6 inches long, slender and curved. The bark on young stems is smooth, dark green and on old branches dark greenish gray with flat-topped ridges. The wood is very valuable, but the tree is now of little importance in its original habitat because of the white pine blister rust.

**Pinus flexilis* James. LIMBER PINE. The limber pine, a Rocky Mountain timber-line soft pine has been planted in only a few places in the state. It is sometimes confused with the white pine. The leaves although five in a place are shorter, stiffer, than those of the white pine and pointed toward the ends of the heavy flexible branches. The cones are broader and heavier and lighter in color than white pine cones. The tree is more open and casts less shade.

- **Pinus nigra austriaca* A. & G. or *Pinus laricio austriaca* Endl. AUSTRIAN PINE. A native of Europe, this tree is planted throughout Iowa. The shape of the crown varies from slender cone-shaped to broad rounded and only slightly cone-shaped, depending on the age of the tree and the closeness of planting. The tree grows to a height of 75 feet in the state and has a broad trunk which is covered with medium to dark gray, broad-ridged bark. The twigs are few in number and thick. The leaves are two in a place, dark green, 3 to 5 inches long, heavy, and each pair has a sheath about $\frac{1}{2}$ inch long at the base. The cones are light brown, 2 to 3 inches long, solitary or grouped and do not remain long on the tree.
- **Pinus resinosa* Ail. RED PINE, NORWAY PINE. The red pine is a native of the Great Lakes region, growing with the white pine. It is almost as large a tree and casts almost as dense a shade. Growing in the open, it has somewhat the same general shape as the white pine. The trunk is reddish brown, very slightly ridged but covered with large flakes. The twigs are reddish. The leaves are two in a place, slender, $3\frac{1}{2}$ to 6 inches long and brittle. The cones point straight outward from the stem and usually remain unopened on the stem till the next fall after ripening and for several years after shedding the seeds. This tree is not planted in the state as much as it might be.
- **Pinus Banksiana* Lamb. JACK PINE. This is a sun-loving pine tree which grows well in sandy and other poor soil. It is not planted to any extent in Iowa but has possibilities on some of our sand lands which are acid enough to grow it. The tree is of poor shape, having an open crown, the lower branches of which die under slight shade. The bark on the trunk is grayish brown and covered with scales. The leaves are in two's, short and broad and spread from each other at a wide angle. The twigs are yellowish gray turning dark purplish gray. The cones point toward the end of the branches often remaining unopened for several years.
- **Pinus sylvestris* L. SCOTCH PINE, SCOTS PINE. This well known European tree is planted throughout the state. It usually varies from 25 to 65 feet in height, depending upon the conditions under which it is growing. It is almost always irregular in shape, and all but young trees have bright orange colored upper trunk and branches. The leaves are two in a place, twisted and, except on young trees where they are longer, they are 2 to $3\frac{1}{2}$ inches long. The cones are slender, lopsided, pointing, at an angle, away from the tip of the branch and remain on the tree for a few years.
- **Pinus rigida* Mill. PITCH PINE. The pitch pine grows naturally along the coast and in the foothills from Georgia to Maine. It is planted in a few places in Iowa, chiefly in the eastern part where it grows to a height of 25 to 45 feet. It seems to have possibilities as a sand land tree if not planted in too close stands. The leaves are about 3 inches long, are three

FIG. 4. (OPPOSITE PAGE)

TOP ROW, LEFT TO RIGHT, Cork elm *Ulmus racemosa*; American elm *Ulmus americana*; Common red haw *Crataegus mollis*

CENTER ROW, LEFT TO RIGHT, Sycamore *Platanus occidentalis*; Western crab (Iowa crab) *Pyrus ioensis*; Common hackberry *Celtis occidentalis*

BOTTOM ROW, LEFT TO RIGHT, Honey locust *Gleditsia triacanthos*; Cock's spur haw *Crataegus Crus-galli*; Black locust *Robinia Pseudo-Acacia*



in a place and are quite stiff or rigid and twisted. The presence of clusters of leaves growing at irregular intervals on the trunk is a good means of identification. The cones are broadly egg-shaped and have short, stiff, sharp spines. The bark is yellowish brown and has low, irregular ridges.

**Pinus ponderosa* LAWS. WESTERN YELLOW PINE, PONDEROSA PINE. This is the most common pine tree throughout the mountainous regions of western United States, growing naturally as far eastward as central Nebraska. It grows well where planted in every part of Iowa but it is not as common as might be expected. The yellow pine of the western mountains has yellow-orange bark divided into large irregular plates by dark brown fissures. However, most of the yellow pine growing in Iowa seems to be of the variety growing chiefly in the eastern Rocky Mountain foothills (*Pinus ponderosa scopulorum*). This variety has dark brownish black bark which peels off in small flakes. The leaves also are shorter and the cones smaller. The leaves of yellow pine, including the variety, are stout, form clusters of two or three and are 3 to 6 inches long. The cones of Iowa-grown trees are usually $2\frac{1}{2}$ to $3\frac{1}{2}$ inches long, with spines which curve back from the tip of the cone. They usually break off of the tree late in the winter after ripening and leave a few scales on the tree.

Platanus occidentalis L. SYCAMORE. The sycamore grows naturally in all parts of Iowa. It is never abundant but grows in somewhat low, otherwise unoccupied places on flood-plains. It is a showy tree with splotched white to green-tan bark which peels off in large flakes. It is an open-crowned tree of few large branches, giving little shade. The bud is protected under the base of the leaf petiole, which upon falling leaves a scar surrounding the bud. The leaves are large with many pointed lobes. The fruits, which are often present in the winter, are clustered in balls which are about an inch across.

**Populus alba* L. WHITE POPLAR. This showy white-barked tree, although a close relative of the cottonwood, is often called the silver maple because of its leaves which are often lobed like the maple and are silvery hairy below. Like all poplars its pollen-bearing and fruit-bearing flowers are borne in catkins on different trees. They may be found by opening the large buds late in winter. The white poplar originally came from Europe but has been planted or has escaped cultivation in all parts of the state. It is not a very desirable lawn tree because of its habit of reproducing from the roots, nor is it a desirable farm woodlot tree.

**Populus alba pyramidalis* Bge. or *Populus Bolleana* Lauche. BOLLE'S POPLAR. This variety of the white poplar has a cylinder-shaped crown because of the branches growing upright. It does not winter-kill as readily as the Lombardy poplar, another tree of the same shape, but like the white poplar has the undesirable habit of producing new trees from root sprouts.

Populus deltoides Marsh. COTTONWOOD. The common cottonwood grows naturally throughout the state on lower flood-plains, usually following and shading out black and peach-leaf willows. The trees have open crowns which cast little shade and grow in the state to a height of 60 to 90 feet. The bark on the trunks becomes dark brownish gray and roughened, but the bark on the branches is light tan-gray. The buds are long and sticky with resinous material. The pollen-bearing and fruit-bearing catkins are

on different trees, the pollen-bearing trees being most popular for planting. Small twigs fall off by a process of self-pruning. The trees may be reproduced readily by means of cuttings. The wood is used to some extent for rough building and for boxes but chiefly for fuel.

**Populus nigra italica* Dur. LOMBARDY POPLAR. This European poplar is the best known of the poplar trees of the tall pyramid type and has been planted throughout the state. It resembles the cottonwood in color and in the general appearance of the twigs, buds and leaves. The twigs are slenderer than those of the cottonwood, and the buds are smaller and have less resin. The leaves are smaller, have shorter petioles and are not even slightly heart-shaped at base as is sometimes true of the cottonwood. Very few of the older Lombardy poplar trees in the state are free from winter-killed branches and parts of the trunk. For this reason it is not popular for planting around home grounds as it was years ago.

Populus grandidentata Michx. LARGE-TOOTHED ASPEN. This tree grows naturally in the northeastern part of the state in openings in upland woods, rather than on flood-plains as does the cottonwood. The tree is usually 35 to 55 feet high and quite irregular in shape because of crowding by other trees as it increases in size. The bark which is greenish white on young branches and dark gray on the trunk is more tinged with yellow-brown than in the cottonwood. The twigs are finely hairy when young; the buds are brownish, almost as broad as long and are finely hairy. The leaves are not triangular as in the cottonwood but are almost round, about twice the size of quaking aspen leaves, blunt-pointed and with large indentations; hence the name. The wood is soft and easily broken and is used in the state chiefly for fuel.

Populus tremuloides Michx. QUAKING ASPEN. A tall slender northern tree which is found throughout the northern half of the state but is not abundant. It varies in height from 18 to 40 feet and in trunk diameter from 3 to 12 inches. It grows singly or in small clumps in openings made by the removal of one or more trees, especially where trees have been removed by fire. The bark on young twigs is reddish brown becoming light gray on branches of medium size but is very dark gray and roughened on old trunks. The buds are brown, not long and are smooth and shiny. The leaves are almost round with an abrupt point, with very fine indentations and are usually about an inch across. The name comes from the trembling of the leaves because of the very flattened condition of the petioles.

**Populus candicans* Ait. BALM OF GILEAD. A few of these trees have been introduced into the state. They resemble the cottonwood to some extent but the sticky buds are broader and more aromatic, the twigs are of a deeper brown color and finely hairy, and the leaves are heart-shaped rather than triangular and do not have flattened leaf petioles.

**Prunus Armeniaca* L. APRICOT. The apricot which originally came from Asia is cultivated to some extent in the southern half of the state as an orchard tree. The bark of the trunk and branches is of a marked reddish brown color, the buds are egg-shaped but sharply pointed and with fine hairs around the edges of the scales. A very few of the branches on the trees are thornlike. The flowers are pale pink, opening very early in the spring.

- **Prunus domestica* L. GARDEN PLUM. The common garden plum is a smaller tree than the apricot or the peach and is cultivated throughout the state. The bark is reddish brown on young branches, to reddish black on old branches and trunks where the bark peels off in strips. Thorns and thorn-like branches are numerous. The buds are light brown and finely hairy. Full grown leaves are slightly hairy below, roughened and leathery.
- Prunus americana* Marsh. WILD PLUM. This is the common wild plum of eastern and central United States that grows throughout the state along fence rows, borders of woods and in many waste places. When growing in the open, the plant is usually of definite tree form and 12 to 25 feet high, but when crowded it is shrubby. The bark is thick, reddish gray on branchlets to reddish black on trunks where it peels off in irregular plates. There are many thorn-like branches. The yellowish red fruit is about $\frac{1}{2}$ to 1 inch across with an almost round seed and is used for jams and jellies, especially when other fruit is scarce. Its other chief values are for erosion control and as game cover.
- **Prunus Persica* Batsch. PEACH. Almost everybody can recognize a peach tree even without its leaves, flowers or fruit. It is a native of China but has been cultivated in the United States for many years. Southeastern Iowa along the Mississippi river, southwestern Iowa along the Missouri river, and several other protected places in the southern half of the state are well adapted to the growth of the peach. The bark of the trunk and branches is grayish cinnamon and is marked by noticeable lenticels. The twigs are usually green above and red below, of medium size and brittle. The buds are somewhat woolly. The seed of the fruit is about $\frac{3}{4}$ of an inch to 1 inch long and with rounded ridges between somewhat deep indentations.
- Prunus virginiana* L. CHOKO CHERRY. The choke cherry is found in all parts of the state, as a small tree in favorable habitats and a tall shrub in unfavorable habitats or where crowded. It grows at the edge of oak-hickory woods, in fence rows and in cut-over areas seldom becoming more than 25 to 30 feet high. The bark is grayish brown and is very little roughened on the trunk where it is marked by long, showy lenticels. On the twigs the bright green bark is exposed by the peeling off of the upper bark in thin dark papery layers. The buds are dull brown, egg-shaped with roughened scales and have a strong unpleasant odor when bruised. The leaves resemble those of the black cherry but are broader, thinner and have saw-like teeth which are sharp and point outward. The fruit is important as food for birds. The wood resembles that of the well known black cherry but is too small to be of any use except as fuel.
- Prunus pennsylvanica* L. NORTHERN PIN CHERRY, BIRD CHERRY. This northern tree grows naturally in the northeastern half of Iowa, becoming scarce and growing only in well-protected habitats along the southwestward edge of this range. The tree is shrub-like, usually not over 25 to 30 feet high and is slender with the branches growing in a somewhat upright position. The bark is reddish brown, with showy lenticels and with thin strips peeling off crosswise in somewhat the same manner as in the common cultivated cherry. The twigs are slenderer than those of the black cherry and choke cherry and with a partial covering of gray skin. The buds are

clear brown and glossy and usually less than 1/8 inch long. The pin cherry is neither large enough nor abundant enough to add to the supply of cherry lumber.

Prunus serotina Ehrh. WILD BLACK CHERRY. This best known and most important of the wild cherry trees grows naturally throughout the state but is seldom found in the northwestern part. In favorable habitats of the state, it grows to a height of 60 feet, with a diameter of 2 feet. The bark on the branches is reddish brown, with long showy lenticels. The bark on the trunk is reddish black with many scaly plates having upturned edges. The twigs are not so slender as those of the pin cherry; leaves are thicker and have saw-like teeth which turn in. The strong, reddish, close-grained wood takes a very fine finish and where abundant is used chiefly for furniture.

**Prunus Cerasus* L. COMMON CULTIVATED CHERRY, SOUR CHERRY. The most commonly cultivated cherry is a tree with a round to elongate rounded crown, growing to a height seldom greater than 30 feet. It is cultivated chiefly in home orchards in the southern half of the state and to some extent in the northern half. The bark is reddish brown with showy lenticels and the bark of the trunk peels off in strips around the tree. The buds are about 1/4 inch long, shiny brown and egg-shaped.

**Pseudotsuga taxifolia* Britt. DOUGLAS FIR. The Douglas fir is probably the most important lumber tree of the United States. It grows with and near the yellow pine throughout the mountain regions of the western United States. It is planted in several places in Iowa as an ornamental and in wind-breaks, where it may grow to a height of 50 to 75 feet and to a diameter of about 2 feet. It grows well in favorable habitats in the state and should become more generally used as a supply of local timber.

**Pyrus communis* L. PEAR. The pear is grown for fruit only in the southern part of Iowa in habitats near stream courses. The tree is slender and may grow to a height of 25 to 40 feet in Iowa. The bark is yellowish brown on the up-curving branches to brownish gray on the trunks. Thorn-like branches are sometimes present. The twigs are slender and the cone-shaped buds at the ends of the twigs are sharp-pointed and nearly smooth. The buds of several of the varieties of pears are hairy at the tip.

Pyrus ioensis (Wood) Bailey. IOWA CRAB. This small shrubby tree grows naturally throughout the state, at the edge of oak-hickory woods in and near thickets and in fence rows. The tree is seldom over 25 feet high and has a broad open crown. The bark is reddish brown and scaly on the trunk, gray on the branches and bright red-brown on the twigs, which are covered to some extent with whitish woolly hairs. Most of the side branchlets on the smaller branches are thorn-like. The leaves are almost twice as long as broad, deeply saw-toothed to lobed near the upper end and to some extent woolly-hairy below. The fruit is a greenish yellow crab, 3/4 to 1 inch long. The flowers add to the beauty of the landscape in the spring, and the tree offers excellent protection for game and other wildlife.

Pyrus americana (Marsh.) D.C. or *Sorbus americana* Marsh. AMERICAN MOUNTAIN ASH. The common mountain ash of northeastern North America is considered by most botanists to belong to a different group from that of the pears, but both the mountain ash and the apples are included with

the pears in Gray's Manual. The tree is tall and slender, growing naturally to a height of 20 to 25 feet in the extreme northeastern part of Iowa. It is often planted as an ornamental in northern Iowa and occasionally elsewhere in the state. The bark on the trunk is light gray broken into plates but on the long slender upright-growing branches it is yellowish green. The fruit is borne in large broad clusters and is reddish orange in color. The leaves differ from those of other members of the group in that they are made up of many leaflets, in opposite pairs on the axis, with an odd one at the end.

**Pyrus malus* L. or *Malus pumila* Mill. APPLE. This, the most common fruit tree in cultivation in North America, is planted throughout Iowa in commercial and home orchards and has escaped cultivation in all parts of the state. It often grows in fence rows and in open woods. Under favorable conditions the trunk, covered with grayish brown flaky bark, is short and the crown is broad and rounded. The leaf-scars on the stout pale-woolly twigs are shaped like the new moon and raised. The buds are not sticky as in the mountain ash but are finely hairy and blunt. The wood of discarded branches and trees makes good fuel.

**Pyrus baccata* L. or *Malus baccata* Borkh. SIBERIAN CRAB. This crab tree with its showy whitish pink flowers was imported to North America before 1800 from the Siberian region. It has been planted as an ornamental in most parts of the state and has escaped cultivation in a few places. It resembles the common apple in shape and size of the tree but the twigs are slenderer and purplish brown, and the fruit is a red or yellow crab about $\frac{1}{2}$ inch or less across. The leaves are very finely saw-toothed and thin. It grows well in the state and has become popular as an ornamental tree.

Quercus velutina Lam. BLACK OAK. The common black oak, sometimes called the quercitron oak or the yellow-barked oak because of its bright yellow inner bark, is native to all parts of Iowa except the northwestern corner. It is a large broad-crowned tree of the black oak group. The twigs are stout and reddish brown, sometimes spotted with gray and bear egg-shaped but pointed and finely hairy buds. The fruit matures in 2 years as in all members of the black oak group, the cup covering the acorn for about $\frac{1}{2}$ of its length. The scales are loosely overlapping toward the rim of the cup. The leathery leaves have sharp-pointed tips and are shiny above. The wood which is hard and coarse-grained, is used chiefly as fuel. It is found in most oak-hickory woods but is not so abundant nor so well distributed in the state as the red oak, the bur oak or the white oak.

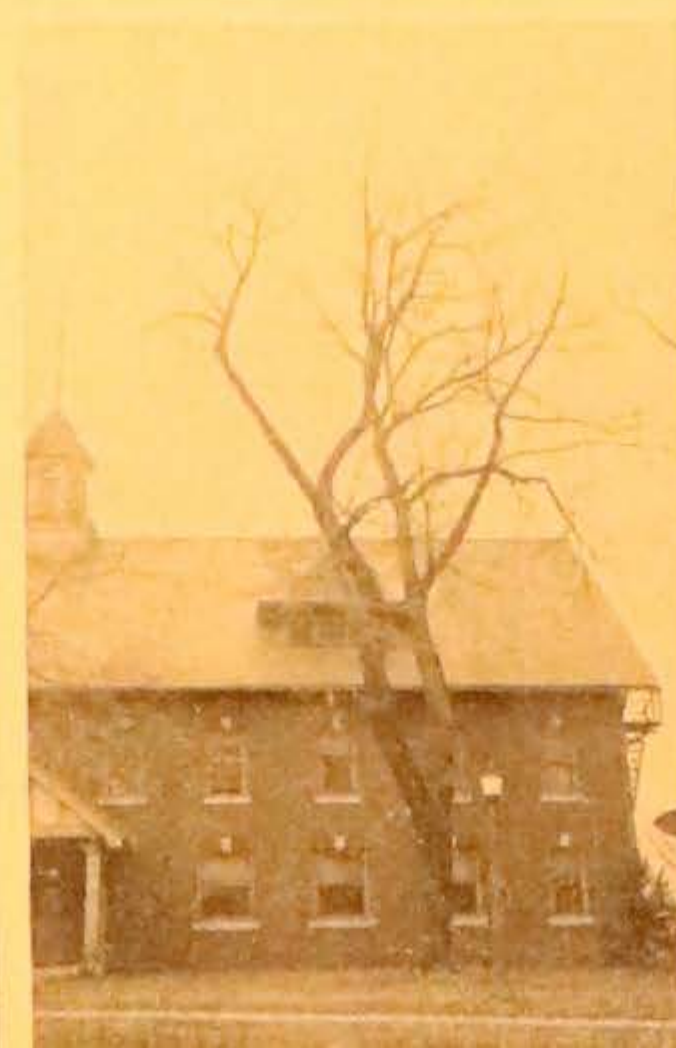
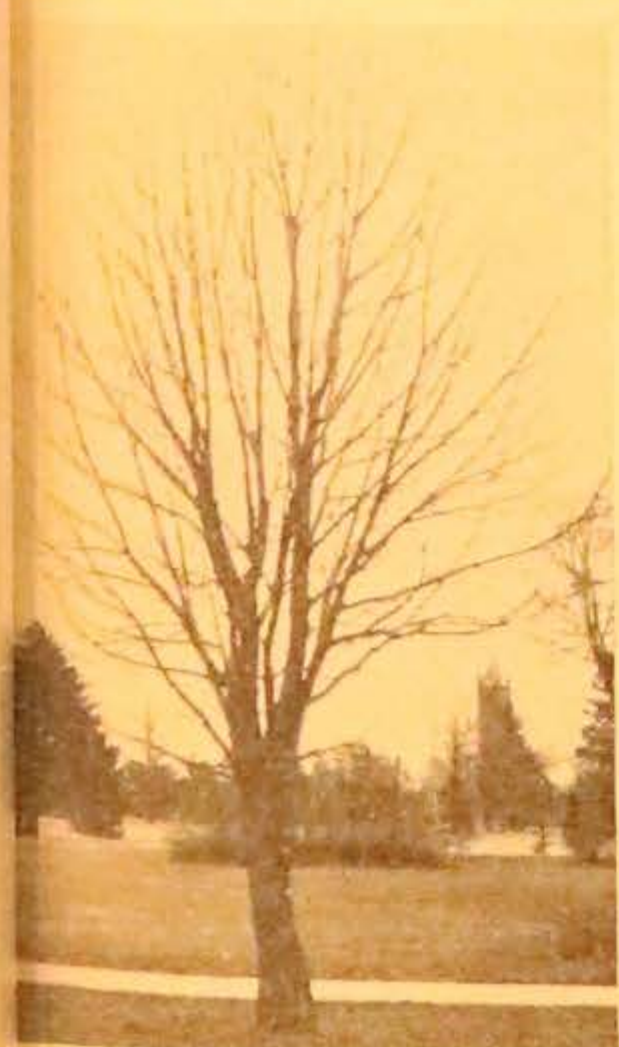
Quercus marilandica Muench. BLACK JACK OAK. Another member of the black oak group, the black jack oak grows naturally in the eastern half of the three southern tiers of counties in Iowa. In the winter condition

FIG. 5. (OPPOSITE PAGE)

TOP ROW, LEFT TO RIGHT, Common hardy catalpa *Catalpa speciosa*; Soft maple *Acer saccharinum*; Red maple *Acer rubrum*

CENTER ROW, LEFT TO RIGHT, Horse chestnut *Aesculus hippocastanum*; Ohio buckeye *Aesculus glabra*; Linden (basswood) *Tilia americana*

BOTTOM ROW, LEFT TO RIGHT, Green ash *Fraxinus pennsylvanica lanceolata*; Red ash *Fraxinus pennsylvanica*; Black sugar maple *Acer saccharum nigrum*



it resembles the black oak but in general is confined to poorer soil and is a smaller more poorly formed tree. It differs from the black oak in having finely hairy twigs and acorns with a more rounded cup. The leaves are large and broadly wedge-shaped with three, square-topped, poorly defined lobes compared to the slenderer, deeply five-lobed leaves of the black oak. The almost black bark of the trunk is broken into square plates, compared to the dark, deeply-ridged bark of the black oak. It grows chiefly in poor soil and in dry sites in oak-hickory woods. The wood is used for fuel.

Quercus ellipsoidalis E. J. Hill. YELLOW OAK, HILL'S OAK. This tree is of quite rare occurrence in the northern half of Iowa, dropping out in the extreme western part. It resembles the black oak so closely, even to the yellow under-bark, that the only way they can be separated with any certainty is by the acorns. The acorn of Hill's oak is of about the same length as that of the black oak but about one-half as wide and the scales near the lip of the cup are closely appressed instead of loose at the ends. Another difference is the opposite position of the lobes of the leaves of Hill's oak, a contrast to the alternate position of the lobes in black oak.

Quercus borealis maxima (Marsh.) Ashe. RED OAK. This common red oak of the state was known for a long time as *Quercus rubra* L., a name which should not be used since it is the correct (valid) name for the southern red oak, an entirely different species. The species described here grows in the more favorable parts of the oak-hickory woods throughout the state except in the extreme northwestern corner. It is a large tree of the black oak group, its size in the state ranging from 45 to 85 feet with a trunk diameter of 1 to 3 feet, depending on the habitat. The bark of the trunk under the same conditions of growth is much less roughened and the ridges are more regular than in the black oak. The inner bark is reddish brown and tasteless rather than bright yellow and bitter as in the case of the black oak. The buds are smooth, or very slightly hairy toward the edges of the scales. The leaves are not so deeply lobed as those of the black oak, Hill's oak or the pin oak and are dull on the upper side. The acorn differs from that of the other oaks in being large, 1 inch or slightly more long, by $\frac{3}{4}$ of an inch wide and with an extremely shallow cup having the edge rolled in. The acorn is bulged near the middle.

Quercus borealis Michx. NORTHERN RED OAK. This oak which has a somewhat smaller acorn with a deeper cup, and with a parallel-sided rather than a bulging acorn, is reported for northern Iowa. However, we have not separated its distribution from that of the common red oak.

Quercus palustris Muench. PIN OAK. The pin oak grows naturally on poorly drained soil in the southeastern corner of the state. It has a straight-growing trunk which forms an axis for the broad pyramid-shaped tree. The branches grow straight out from the trunk, usually slightly drooping near the ends and having many irregular dwarf branches. It resembles other members of the black oak group in bark coloring, but its leaves are deeply lobed like those of Hill's oak. The acorn is small, almost round and has a very shallow dark red-brown cup with very small scales. Because of its regular shape, the pin oak has been planted in parkings and as an ornamental tree in many dry habitats of the state where it does not grow well.

Quercus imbricaria Michx. SHINGLE OAK. This unusual member of the black oak group grows naturally in the southeastern one-fifth of the state, where it is found with other oaks, but it is not abundant. It is the only oak in the state with entire, unlobed leaves; some few leaves remain on the tree during winter. It is quite popular as an ornamental tree in eastern Iowa.

**Quercus robur* L. ENGLISH OAK. The English oak is planted in a few places in the state. Although belonging to the white oak group, the bark of the trunk is not so light nor so much roughened as that of the other white oaks. Most of the leaves have three pairs of rounded lobes. The acorn is about 1 inch long, slender, bulged and is borne on a long stalk. The cup is rounded and one-third as long as the acorn.

Quercus bicolor Willd. SWAMP WHITE OAK. This is the only native oak which has the acorn attached by a long stalk (peduncle). It is rare in low places in the eastern one-third of the state. In general appearance the tree resembles the bur oak although it is not so large. Young twigs are shiny green, finely hairy for a time, reddish brown to darker brown and covered with a whitish bloom. The acorn resembles the white oak but is broader and has a 1-inch to 3-inch stalk.

Quercus macrocarpa Michx. BUR OAK. This most common oak in the state is native to every county. It varies in size from 25 to 85 feet, being of smaller size in less favorable sites, especially in the northern and western parts of the state. It grows naturally toward the outer edge of the oak-hickory woods which border the streams of the state. Since it is the most sun-loving of the oaks and hickories and can grow in drier parts of the state, it is often found on flood plains in the absence of a full stand of flood plain trees. The bur oak has the thickest and roughest bark of all the oaks. The crown is broad and open and made up of a few, large, crooked branches and stout very irregular twigs which become ashy gray the second year and later grayish brown and corky. The acorns vary in size from $\frac{2}{3}$ inch in length to 2 inches. The acorn with its cup is almost round in outline, the cup enclosing the acorn from $\frac{1}{2}$ its length to a complete closing. The acorn without the always more or less bur-like cup is egg-shaped, brown and finely hairy. The wood is hard, tough and strong, being used for fence posts, railroad ties and much general farm use as well as for fuel.

Quercus stellata Wang. POST OAK. The post oak is native to the eastern half of the two southern tiers of counties. It grows in poor habitats with the black jack oak, seldom growing to a greater height in the state than 45 feet. It resembles the bur oak in habit of growth but its rounded crown is denser. The twigs of the post oak are not so corky as those of the bur oak. The leaves are usually about 4 inches long and have five short, wide lobes almost straight across the ends. The acorns are about $\frac{3}{4}$ by $\frac{1}{3}$ inch, with a reddish brown, small-scaled cup and brown acorn enclosed for almost half its length in the rounded cup. The heavy close-grained wood which is very durable in contact with soil is used in the state chiefly for fence posts and fuel.

Quercus alba L. WHITE OAK. This is about the best known and most popular oak tree in Iowa. It is the most important oak of oak-hickory woods in the state, except along the western border where it almost entirely drops

out. It is a well formed tree of irregular branching where growing in close stands but with an elongate well-rounded crown when growing in the open. The bark on the trunk is light gray and flaky instead of deeply fissured as in the bur and post oaks. The twigs are slender for oaks, reddish green with reddish brown hairs, becoming gray and smooth for white oaks. The leaves have seven to nine long, slender lobes which are about the same size and shape at both ends of the leaf. Most of the leaves remain on the tree during winter. The acorn is oblong, about $\frac{3}{4}$ inch long with a light dull brown cup of thickened rounded scales covering about $\frac{1}{4}$ of the shiny chestnut-brown nut. The white oak is a valuable wood which is used in the state for general use and for posts and fuel.

Quercus Muhlenbergii Engelm. CHESTNUT OAK. This member of the white oak group is sparsely distributed over Iowa except in the northwestern one-third of the state. It is believed by some authorities to grow only in limestone soils. In our area, it is a smaller tree than the bur oak and white oak. The bark on the trunks is lighter gray and is less deeply ridged than that of the bur oak. It is marked with fewer thin scales than that of the white oak and the dead leaves do not stay on the tree in winter as with the white oak. The leaves resemble chestnut leaves in having only serrations instead of lobes. The acorn is smaller than that of either the bur oak or white oak, is chestnut brown and has a light tannish gray, small-scaled cup which covers about half of the acorn.

**Robinia Pseudo-Acacia* L. BLACK LOCUST. The black locust, a member of the pea family, is native to east-central United States but has become naturalized in most parts of Iowa especially in the southeastern part. Since it reproduces readily from root sprouts and spreads well in open places, it is one of the best erosion-control plants among the trees. The tree grows to a height of about 60 feet in the state, has a narrow oblong crown and cannot endure much shade. The slender light pod is about 3 inches long and has four to eight seeds. The branchlets have no terminal buds and are armed with small unbranched thorns which peel off with the bark. The leaves are 6 to 12 inches long and have 7 to 19 leaflets arranged opposite each other with an odd one at the end. The wood is dark colored, hard and strong and durable in contact with the soil, making good fence posts.

**Robinia hispida* L. BRISTLY LOCUST, ROSE ACACIA. This species resembles the black locust but has bristly hairs on the twigs and is a small tree.

**Salix babylonica* L. WEEPING WILLOW. The weeping willow is an European tree which has been planted as an ornamental tree in Iowa. The twigs are yellow, long, slender and hang down (are pendulous) around the edge of the tree sometimes for a distance of 3 to 9 feet. The buds are yellowish and slender.

Salix missouriensis Bebb. MISSOURI WILLOW. This tree grows naturally on flood plains in practically all parts of the state but especially along the Missouri river in the western part of the state and along streams in central Iowa. It is 20 to 40 feet in height, with a straight trunk and a tall slender crown. The 1-year twigs are light green and finely hairy becoming reddish brown and almost smooth. The buds at the ends of the twigs are egg-shaped, flattened, reddish brown, woolly-hairy and about 1 inch long.

- The leaves are slightly broader than lance-shaped, long-pointed, finely serrate, with glands and are covered with pale hairs on the lower surface.
- Salix discolor* Muhl. PUSSY WILLOW. The pussy willow has been collected from all parts of Iowa except the southwest corner, but it is not abundant in any part of the state. The tree is small and shrub-like, usually not over 25 feet in height and with a round open crown. The twigs are stouter than those of most willows, dark reddish purple and slightly finely hairy when young. The buds are flattened next to the twig, about $\frac{3}{8}$ inch long, reddish purple and somewhat shining. The buds become large and fuzzy in late winter. The leaves are about $3\frac{1}{2}$ inches by 1 inch, are not definitely saw-toothed, finely hairy above and white woolly-hairy on the lower side.
- Salix cordata* Muhl. HEART-SHAPE LEAVED WILLOW. This willow grows naturally in all parts of Iowa but is not at all abundant. It is a larger tree than the pussy willow, grows in small groups; buds are less flattened, smaller and less fuzzy. The leaves are about the same shape as those of the pussy willow but are heart-shaped at the base.
- Salix longifolia* Muhl. SANDBAR WILLOW. This slender shrub-like tree grows naturally on sandbars and on lower flood plains in all parts of the state. The tree grows to a height of 25 feet in the state and has only a few short, erect branches. The twigs are slender, silky and orange, brown or purplish, becoming reddish gray. The buds are about $\frac{1}{8}$ inch long, narrow, egg-shaped and dark brown, slightly tinged with red. The tree flowers almost all summer and has very slender leaves with widely spaced definite saw-teeth. It is easily shaded out and replaced by other willows and cottonwoods.
- **Salix alba* L. WHITE WILLOW. This European willow has escaped cultivation in all parts of Iowa where it is one of the most popular of the planted willows. It is a large, rapidly growing tree with a few large branches and a broad open crown. The branches are almost smooth and of greenish gray color. The leaves are 3 to 5 inches long, coarsely saw-toothed, thick, whitened and slightly hairy underneath. The wood is of some use in the state as fuel.
- **Salix alba vitellina* Stokes. GOLDEN WILLOW. This tree resembles the white willow in general characteristics but has golden-yellow twigs.
- Salix lucida* Muhl. SHINING WILLOW. This northern willow grows naturally in the northeastern one half of the state but is not abundant. The tree has a short trunk and long stout branches forming a round-topped regular crown and grows to a height of 20 to 25 feet. Twigs of 1 year are orange-colored and shiny, becoming darker brown and tinged with red. The buds are light orange-brown, shiny and about $\frac{1}{4}$ inch long. The leaves are very broadly egg-shaped, long slender-pointed, shiny above and whitened below.
- Salix nigra* Marsh. BLACK WILLOW. This is the commonest willow of the state, growing naturally on lower flood-plains and along dry and partly dry streams and gullies throughout Iowa but is less abundant in the northern part of the state. The tree under favorable conditions grows to a height of 25 to 50 feet, with a medium-broad irregular crown. On lower flood plains it grows with the peach-leaved willow which resembles it, but both are later shaded out and replaced by the cottonwood, soft maple, elms and ashes. The bark is dark brownish gray with broad, flat,

connected ridges. The twigs are slender, somewhat easily broken at the base, gray-brown and finely hairy when they first appear, becoming smooth. The leaves are slender lance-shaped, definitely saw-toothed and green on both surfaces, whereas the leaves of the peach-leaf willow are whitened on the lower surface and slightly wider. The leaf-scars are straight or only slightly curved compared to those of the peach-leaved willow which are definitely U-shaped. This tree, although very short-lived, has been commonly but unwisely planted on home sites and in windbreaks in the drier parts of the state, probably because of the ease of establishing it from cuttings.

Salix amygdaloides Anders. PEACH-LEAVED WILLOW. The peach-leaved willow which grows throughout the state with the black willow is a larger tree of smoother general appearance than the black willow. The trunk is less branched with less narrowly fissured bark. Lenticels on the branches are more noticeable, the buds are slightly hairy compared to the smooth buds of the black willow and the leaf-scars are U-shaped compared to the almost straight leaf-scars of the black willow. It is planted in the state about as generally as the black willow; to a greater extent where a difference in species is noted because it is a more valuable tree. The wood of both of these willows is used chiefly for fuel in Iowa.

**Thuja occidentalis* L. ARBOR VITAE. An evergreen tree which is native to the Great Lakes region and almost reaches Iowa on the southwestern border of its range; it is planted to some extent, especially in the eastern part of the state, as an ornamental tree. The tree is cone-shaped with short branches growing straight out from the main stem which is often branched. The bark is light reddish brown, fibrous and very thin, about $\frac{1}{4}$ inch, and easily injured. The cones, which are usually present in winter, are less than $\frac{1}{2}$ inch long, and have only four seed-bearing scales. The flat twigs, bearing scale-like leaves, are slender. It is easily separated from the red cedar by means of the flat twigs and the cone fruits instead of the rounded twigs and the berry fruits of the cedar.

Tilia americana L. LINDEN OR BASSWOOD. The common American linden or basswood grows on well protected slopes throughout Iowa. It grows with the sugar maple in the eastern part of the state, with the black sugar maple chiefly through the central part and with red oak and even with bur oak in the western and northwestern parts of the state. It is a large tree growing to a height of 60 or 75 feet in favorable places. It is easily distinguished by its habit of reproducing by sprouts at the base of old and dying trees. The bark on the trunk is medium to dark brownish gray, dull, porous, forming narrow flat-topped ridges which scale off at the top. The wood is soft and the twigs are tough because of the fibrous tissue in the bark. The twigs are light gray and the buds are red, broad, lopsided and broad-pointed. The fruit is borne in clusters attached to a fruiting bract. Farther east, the wood which is very soft is used chiefly for packing cases and as a foundation for veneering, but in Iowa it is used chiefly as fuel for which it is of little value. It is sometimes planted in the state as a street tree and as an ornamental tree.

**Tsuga canadensis* (L.) Carv. HEMLOCK. The eastern hemlock is a large shade-loving evergreen tree of the Great Lakes region and northwestward,

reaching almost to Iowa on the southwestward extent of its distribution. It is planted to some extent in Iowa, especially in the northeastern part where it grows well with average protection. It is easily distinguished by its short-stalked leaves which are shiny, dark green above and whitish beneath, and its $\frac{3}{4}$ inch cones which resemble, to some extent, those of the eastern arbor vitae.

**Ulmus pumila* L. CHINESE ELM. A native of northern China, this tree has become popular as an ornamental throughout Iowa, especially in the northern and western parts of the state. It has a broad, somewhat regularly rounded open crown formed by long slender branches and long very slender, somewhat hanging twigs. The twigs are light yellowish brown and bear small, blunt, brown buds the scales of which have fine tan hairs on their borders. The leaves vary greatly in size, $\frac{3}{4}$ inch to 2 inches, and are mostly singly saw-toothed, but sometimes the teeth themselves are toothed. It is easily distinguished from native elms by the small, $\frac{1}{16}$ inch, rounded hairy scaled buds and the very slender partially "weeping" twigs and branches which are easily broken.

Ulmus fulva Michx. RED ELM, SLIPPERY ELM. The slippery elm which grows naturally on flood plains throughout the state may grow to a height of 60 feet in favorable habitats. It is not as broad a tree as the American elm, having fewer branches. Dead branches on the tree are usually bare, whereas dead branches of the American elm retain their bark. The bark of the trunk is dark brown tinged with red and having broad almost flat ridges. The bark in cross-section is reddish brown throughout instead of having whitened streaks as in the American elm. The inner bark is mucilage-like when chewed. The winter buds are blunt, reddish brown and hairy. The fruit is slightly larger than that of the American elm and is not silky hairy around the edge of the wing. The tree is planted as a street tree but not to the extent of the American elm. The tough reddish brown wood is valuable for many woodworking and building purposes and for fuel.

Ulmus racemosa Thomas. CORK ELM, ROCK ELM. The branches of the cork elm are short, stout and spreading, giving the large tree a narrow but rounded topped crown. The branchlets are light brown and covered with soft, fine pale hairs during the first year, later becoming grayish brown and marked with a few corky ridges. The buds more nearly resemble those of the American elm than those of the red elm, are pointed and chestnut brown, with scales almost smooth except on the margins where they have long fine hairs. The leaves are usually smooth above and very finely hairy below, resembling those of the American elm in contrast to those of the red elm which are rough-hairy above. The entire fruit is covered with hairs. Cork elm trees are not numerous in Iowa but are found in all parts of the state except the northwest corner. They are popular ornamental trees.

Ulmus americana L. AMERICAN ELM, WHITE ELM. This is the most common elm tree in Iowa, growing in abundance on upper flood plains throughout the state as well as in favorable sites on the upland. It is a larger and more widely spreading tree than the red elm, having more branches. The general shape of the tree is that of a broad, inverted triangle.

The winter buds are chestnut brown, smooth, slightly flattened and pointed. In the spring the flowers are in clusters but long-stalked like those of the cork elm rather than short-stalked like those of the red elm. The leaves are usually smooth above. The wood is tough, light yellowish brown, with lighter sapwood and is more difficult to split than the red elm. It is used for about the same purposes as that of red elm. This elm is the most popular and most commonly planted tree in the state.

APR 27 '42 DEC 17 '59
 JUL 25 '44 OCT 15 '59
 APR 20 '45 OCT 15 '59
 JUN 17 '46
 JAN 20 '47 APR -8 '60
 AUG 21 '47
 OCT 15 '47
 OCT 15 '47
 NOV -8 '47 MAY 25 '60
 FEB 27 '48 JUN -9 '61
 APR 23 '49 JUL -1 1967
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 DEC 26 '50
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 FEB 26 '51
 JUL 19 '56
 NOV 23 '57

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