



TREES & FORESTS of
GLACIER NATIONAL PARK

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By Donald H. Robinson
Park Naturalist



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PREFACE

To some people trees merely furnish a convenient patch of shade, a spot to hold a picnic, or a means of beautifying the landscape. Others are beginning to realize more and more the value of trees and forests to our immediate welfare and our American way of life. Our entire course of history is very closely tied in with the forests and their uses. Our present day economy relies to a very great extent on the presence of our remaining forests. Not the least of these values is the recreation and inspiration derived from the few remaining virgin stands set aside by the people, in our National Parks and other National Park Service areas.

It is often difficult to present the identifiable features of a tree in common every-day language and still provide a means of positive recognition. For the most part, the trees of Glacier National Park are relatively easy to identify, each having one or more characteristics that readily distinguish it from the others with which it is associated. For the purpose of simplicity, these features have been listed immediately following the detailed description of each tree. In the back of the book will be found an easily mastered key to aid in identifying any tree with which the reader is unfamiliar.

The common names of the trees used in this publication are in accordance with the "Check List of the Native and Naturalized Trees of the United States including Alaska," by the U. S. Forest Service, and may vary in some instances from those given by Paul C. Standley in his book, "Plants of Glacier National Park." Where the common names differ in the text, Standley's name is also given in parentheses immediately following the approved common name. The names used are those approved by the National Park Service and are the result of constant effort by botanists and foresters to standardize the common names of plants throughout the world. As it is at present, different localities may have different names for the same plant, thereby creating considerable confusion unless one is familiar with the standardized scientific nomenclature of the plant.

All illustrations of foliage used in this publication are placed on a background of one-inch squares, so the reader will readily see the relative size of the leaf or needle.

This book has been reviewed and approved by the Regional and Washington offices of the National Park Service. The assistance of Chief Park Naturalist M. E. Beatty in preparing the manuscript for publication is gratefully acknowledged. Associate Professor C. Frank Brockman of the University of Washington College of Forestry also kindly assisted by reviewing the manuscript and furnishing photographs. All photographs used were furnished by Glacier National Park except where otherwise indicated.

TREES AND FORESTS OF GLACIER NATIONAL PARK

By

Donald H. Robinson, Park Naturalist

This book has been written to furnish an easy means whereby the visitor to Glacier National Park may identify and more fully understand the forest trees with which he is constantly associated throughout his stay in the park. Glacier is essentially a forested park, situated in one of the most heavily timbered areas of the United States. Only the barren mountain peaks and the numerous lakes and glaciers are free of some sort of forest cover. Lying as it does, on the extreme northern edge of the United States, these forests closely resemble those of the adjoining provinces of British Columbia and western Alberta, but include many species of trees that extend as far south as Mexico or as far north as Alaska.

In general, the forests of Glacier National Park are typical of those of the northern Rocky Mountain region. The barrier formed by the Continental Divide cuts the park in two lengthwise and forms a local differentiation between tree types on the western and eastern slopes. The trees found on the eastern slopes more generally resemble those of the southern Rocky Mountains while those on the western slopes are mainly intermountain and Pacific Coast varieties. The McDonald Valley is a typical example of the Pacific Coast type of forest, although the trees are generally much smaller than they are farther west. Many Pacific Coast species reach the eastern limit of their range in the park and as a result are smaller and less prolific than they are in the more favorable parts of their range.

Anyone who has made a study of the vegetative cover of any region soon learns there are species of plants that are restricted to certain localities and elevations. Often times the demarkation between altitudinal limits of different species is very marked, at other times the species may overlap to a greater or lesser degree. But in all instances there are certain definable altitudinal limits to particular types of vegetation. Very few plants that grow on the valley floors also occur on the mountain tops, and vice versa. These definable belts are known as "Life Zones," and are inhabited by more or less well defined types of plant and animal life. Some species inhabit two or more zones, but the general grouping of vegetative types indicates the zone. Zones may vary in elevation somewhat, depending upon the slope of the mountain, moisture or climatic conditions, but in general they follow fairly definite altitudinal limits. On a wide, flat prairie one life zone may extend for hundreds of miles, while in the mountainous areas such as Glacier one may pass through three zones in less than an hour along the Going-to-the-Sun Highway.

The lowest zone in Glacier National Park is the Transition Zone, represented by the lower foothills on the eastern slopes and a few isolated areas along the North Fork of the Flathead River. This represents the most extensive zone in the United States, embracing much of the Great Plains region and extending up into the mountains farther south in the Rockies. This is the zone in which the ponderosa pine is found on the western side of the park. It is an open timber or prairie type area. The line of demarkation is quite distinct on the western side, being indicated by open stands of ponderosa pine or open prairies. On the eastern slopes it is more difficult to determine because the plants overlap considerably with those of the next, or Canadian zone. The extensive aspen groves along the eastern boundary of the park are typical of this zone.

The next higher, and largest, is the Canadian Zone which includes most of the forested area of the park except the narrow belt just below the barren rocky peaks. This zone includes most of the species of trees in the park except the ponderosa pine and a few of the typically alpine species. Because of the heavy forest cover it is also the habitat of most of the animal life. Here again, there is a sharp demarkation between zones on the western slopes but considerable overlapping on the eastern side. The Canadian Zone may be easily recognized by the preponderance of spruce, lodgepole pine, cottonwood, hemlock, Western white pine, and larch.

Just below timberline there is a very narrow belt known as the Hudsonian Zone, usually recognized by the strictly alpine types of vegetation. This is the region of the alpine larch, alpine fir, and whitebark pine. This is also the region of gnarled trees, interspersed with open alpine meadows. It serves as a sort of transition between the Canadian and Arctic-Alpine Zones. Many of the higher-ranging species of wildlife inhabit this area, such as the grizzly bear, porcupine, and the mountain goat. The occasional high lakes set in pockets in the mountainside, the dwarfed, twisted trees, and the alpine flowers make this one of the most beautiful areas in the mountains.

The Arctic-Alpine Zone includes the remainder of the area on the mountains, extending from timberline to the tops of the highest peaks. The vegetation that grows here is dwarfed and stunted. Only the most hardy plants can exist in the cold and high winds of this region. There are no trees in this zone, but there are several dwarfed shrubs such as the dwarfed species of willow and birch. This is an area of very short summers, and consequently the plants must grow, bloom and go to seed in the space of a few months, hence the profuse display of flowers in the alpine meadows during July and August. Many of the plants found here can also be found below timberline, but here they must grow more rapidly and withstand more severe climatic conditions.

It will be noted by anyone crossing the park from the east to the west entrances that there is a marked difference between the character of the forests on the eastern and western slopes. This is mainly due to the difference in climatic conditions. The eastern slopes are exposed to high winds and quite severe cold during the winter and much of the spring and fall. The precipitation is less and the snow that falls is often blown off, exposing the plants to the elements. In direct contrast to this, the moisture-laden winds from the Pacific Ocean strike the western side of the Continental Divide, rise, and drop most of their moisture on these slopes or immediately adjacent to them. This relative abundance of moisture, coupled with somewhat warmer winter weather and lack of severe winds, make conditions much more favorable for the growth of trees on the western side of the range. On the western slopes are found vegetative types that could not survive on the eastern side, while the eastern foothills, being more open and having more sunshine, have an abundance of herbaceous plants and flowers that could never survive under the heavy forest canopy of the western slopes. But, nevertheless, one is still able to distinguish the various life zones, within similar altitudinal limits, on both sides of the Continental Divide.

For the sake of clarity, it would not be amiss at this point to add a few generalizations about trees. First of all, one may ask just what is the definition of a tree. The author prefers the definition of the noted dendrologist, George B. Sudworth, who states that a tree is "a woody plant having one well-defined stem and a more or less definitely formed crown, and attaining a height of at least 10 feet and a diameter of not less than 2 inches." All species of shrubs or trees that are known to measure up to these specifications, even though only occasionally, are included in this publication.

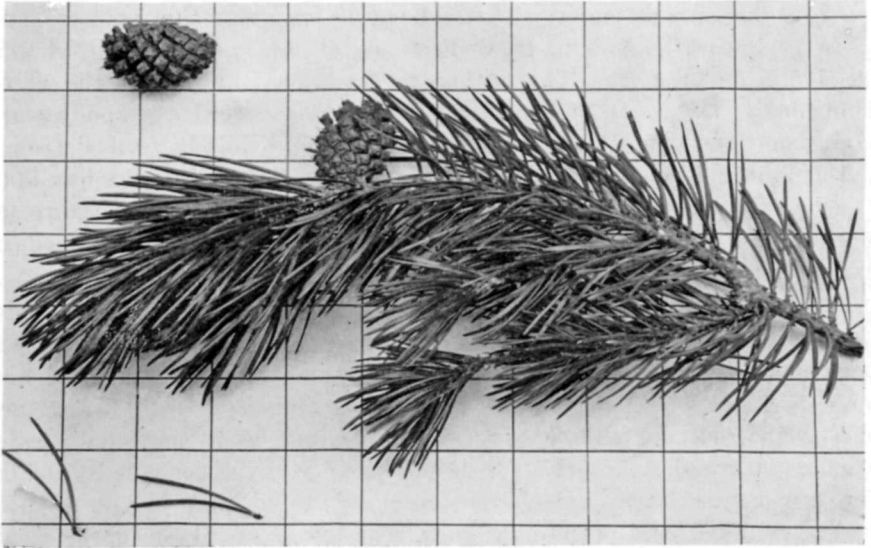
Trees are divided into two broad classifications, coniferous or cone-bearing trees, and broadleaved. The former are generally evergreen (except larch), bear their fruit in a woody cone (except the yew and junipers), and have long, slender leaves, commonly called needles. A few such as the redcedar and some species of juniper, bear very small, scale-like leaves, which may still, for the sake of clarity, be called needles. The broadleaved trees are characterized by broad thin leaves, usually oval or rounded, and borne on a stem. The leaves of all the park broadleaved trees are shed in the fall and new ones emerge from the buds in the spring. The fruit of these trees may vary considerably, from a nut to a berry, and in some instances a small woody cone quite similar to those on the cone-bearers.

LOGEPOLE PINE

Pinus contorta Dougl.

Immediately after the visitor enters the park through the West Entrance he traverses an area grown up with thousands of small trees, extending almost to the foot of Lake McDonald. This is the well-known lodgepole pine, the tree with the historically significant common name derived from the fact the Indians used the tall, slender trunks of the smaller trees for the framework of their tepees, or lodges. The Plains Indians traveled many miles to obtain their lodge poles and carried them along with them from place to place as they roamed.

Lodgepole pine is strictly a western species, occurring in most of the western states and western Canada, from Alaska to lower California. It is common in the park on both slopes, growing in pure stands and mixed with spruce, fir, and Douglas-fir. It is a small tree that occasionally reaches a height of 100 feet but here is seldom over 16 to 18 inches in diameter, more generally around 6 to 12 inches in diameter. When growing in thick stands it is characteristically tall and slender with few, if any, limbs on the lower one-half of the trunk. This is particularly true of



LOGEPOLE PINE, SHOWING SMALL, TIGHT CONES AND TWO-NEEDED BUNDLES

it in the Rocky Mountain states. Along Lee Ridge, just south of the Chief Mountain Customs Station in the northeast corner of the park, lodgepole pine has grown so thickly that the stand is stagnated and stunted, in many places not over 8 or 10 feet tall and so thick that it is almost impossible for one to travel through it.

This is the only two-needled pine in the park, the needles growing in

bundles of two each from the limbs and twigs and seldom over 2½ inches in length. They are characteristically bright yellow-green, quite stiff and sharp on the tips. These needles alone are sufficient to distinguish this tree from any other in the park.

The bark is a dark grayish-brown, well broken up and furrowed on older trees, but thin, smooth, fine-scaled, grayish on the younger trees. The thin bark makes it very susceptible to damage by forest fires, and, were it not for its remarkable reproductive powers, would be seriously depleted throughout regions of high forest fire occurrence.

Another distinguishing characteristic of this tree is the small, solid cones, seldom over 2 inches in length, which remain on the tree for several years unless cut down by the squirrels the first fall. These cones may open and scatter their seeds in the fall, or again, may remain closed for several years. The latter case accounts for the value of this species as a "fire tree," for, in spite of the fact that it is easily killed by the fire, many of the cones are not heated enough to damage the seed and later they open, seeding the area heavily. Such was the case on the previously mentioned area below the foot of Lake McDonald which was burned over by a forest fire in 1929. Another remarkable adaptation of this tree to prevent its destruction by fire is its habit of producing fertile cones on young trees not over 10 years of age.

Distinguishing Features:

2 needles to a bundle.

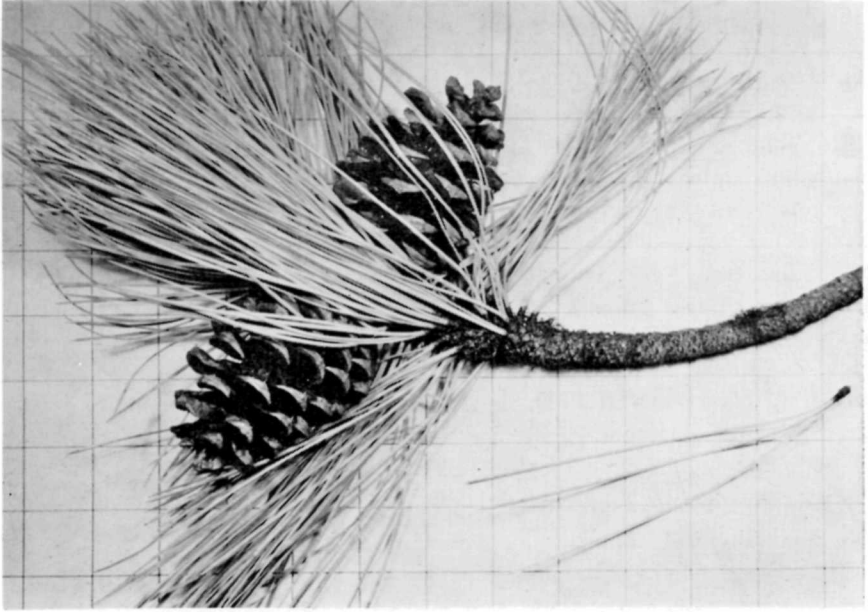
Small, slender, pole-sized tree.

PONDEROSA PINE (Western Yellow Pine)

Pinus ponderosa Laws.

The visitor who takes the time to travel off the beaten paths in Glacier National Park is often rewarded by sights not usually seen by those who follow the main arteries of travel. In the valley of the North Fork of the Flathead River are found the beautiful park-like stands of mature ponderosa pine, a sight that, unfortunately, is not seen from the main highways in the other parts of the park. Along the North Fork truck trail and trails leading from it these large, clean-boled pines present a picture that is not soon forgotten. The yellowish bark of the mature tree gives it the common western name of "yellow pine." This pine occurs in every state west of the Great Plains and the 100th meridian, and is one of the important commercial species of the west. Here are preserved some of the few pure stands of ponderosa pine that occur in this particular area. Whitetail deer and elk frequent the open parks beneath these trees to feed on the abundant grass found there, and the pine squirrels store its seed for their winter food.

This tree may be easily recognized, for it is the only three-needled pine in the park. The long, slender needles grow from 4 to 10 inches in length, in bundles of three each, clustered near the tips of the bare branches and twigs in heavy brush-like clusters, generally a deep yellow-green in color.



PONDEROSA PINE. NOTE THREE-NEEDED BUNDLE AND NEEDLES CLUSTERED AT THE TIP OF THE BRANCH
(BROCKMAN PHOTO)

Mature individuals usually have a characteristic reddish-yellow bark, broken up into smooth plates up to two or three feet long and as wide as five or six inches. Small, oddly-shaped thin plates may be peeled from the larger plates with the fingers. The young or growing trees have a dark gray bark, roughly broken up into smaller segments, seldom resembling the mature trees. Loggers frequently call the younger trees "bull pine," or "black jack," mainly because of their darker bark and the fact that the growing tree has a larger percentage of sapwood and is very heavy and pitchy.

The ponderosa pine cone is shaped somewhat like a small hornet's nest, about 2 to 5 inches in length and up to $2\frac{1}{2}$ or 3 inches in diameter, with a sharp hook or barb on the end of each scale. They are greenish when immature but after they open and release their seeds in the fall they take on a shiny red-brown color and fall to the ground shortly after. The seed is borne between the scales of the cone and when the ripened cone opens, this seed is carried away by the wind on a single, thin wing that whirls

it softly to the earth. These brownish, spotted seeds are the favorite food for squirrels and chipmunks, a fact that accounts for the slow reproduction of this species.

Distinguishing Features:

3 needles to a bundle.

Large tree, with clear, reddish-yellow trunk.



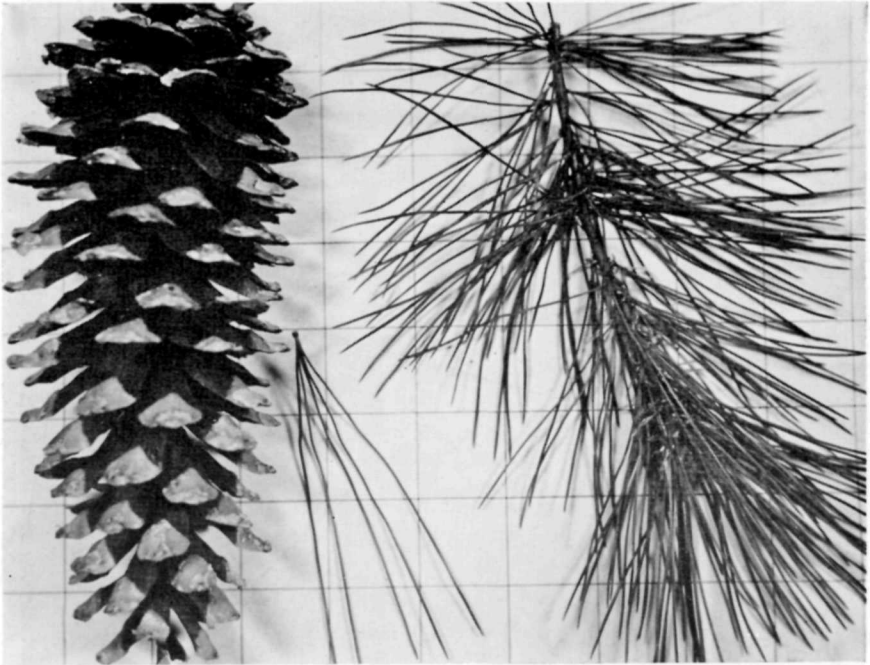
TYPICAL OPEN STAND OF MATURE PONDEROSA PINE ALONG NORTH FORK TRUCK TRAIL

WESTERN WHITE PINE

Pinus monticola Dougl.

Western white pine, the largest of the three species of 5-needle pines in the park, might well be called the aristocrat of the pines. Its soft white wood is prized as lumber in the northwest states. In dense forests, where it is generally found, this pine has a characteristic tall, slender trunk reaching a height of 100 to 150 feet and a diameter up to 4 feet or more, with a symmetrical crown and slender drooping branches. In the park it is found mainly on the western slopes in the heavily forested valley floors, commonly associated with the spruce, fir, and hemlock.

The characteristic blue-green foliage is very noticeable. The needles grow 5 in a bundle on the branches and twigs, ranging from 2 to 4 inches in length, and are slender and flexible. No other tree associated with it



WESTERN WHITE PINE WITH FIVE NEEDLES IN A BUNDLE

has the characteristic grayish-purple bark, broken up into small square blocks. The cones are long and slender, from 6 to 10 inches in length, yellowish-brown in color when fresh. Pine squirrels cut them off in large numbers in the fall for food, and woe betide the luckless traveler who passes under a tree when these large cones are falling from 50 to 100 feet overhead.

A prevalent fungus disease, the white pine blister rust, attacks all the 5-needle pines and will wipe out an entire stand in a few years if not controlled. This disease must spend part of its life cycle on the leaves of wild currant or gooseberry and is unable to spread directly from tree to tree. For this reason it is controlled by crews of men who work through the white pine stands destroying all currant bushes in the vicinity.

The Eastern white pine (*Pinus strobus*), a close relative of this species, was much prized by the British Navy during Revolutionary times for masts for their ships. The Western white pine is no less valuable and is being heavily reforested and protected against disease throughout the west.

Distinguishing Features:

5 needles in a bundle, blue-green and flexible.

Large tree, growing at low elevations, mainly on western slopes.

Bark smooth on young tree, broken into small, square, dark gray blocks on older trees.

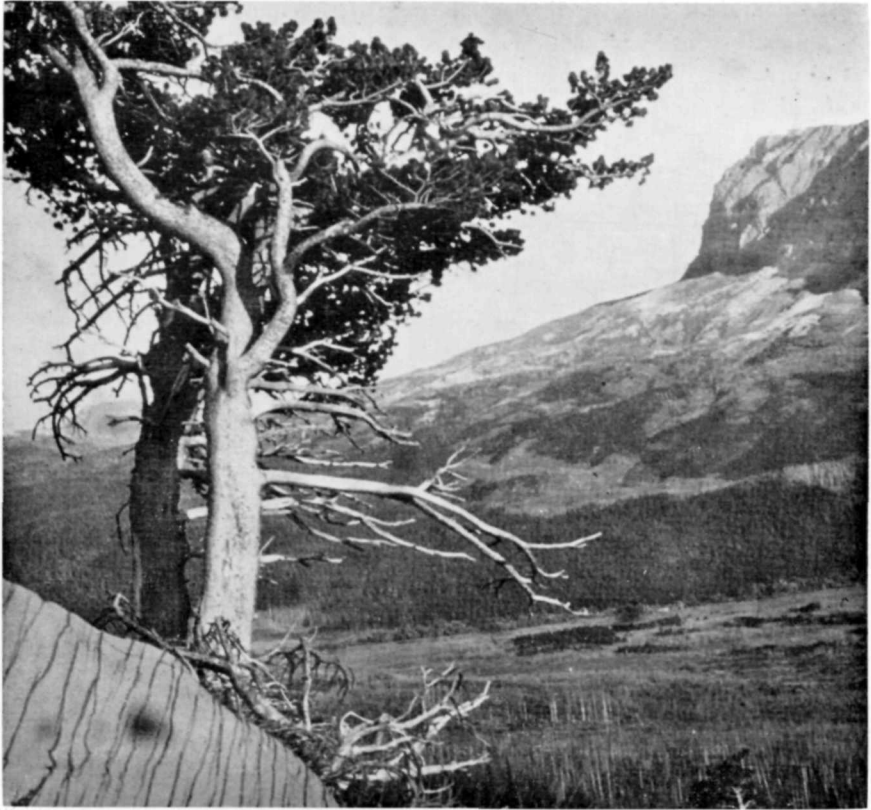
LIMBER PINE

Pinus flexilis James

Limber pine is one of the little-known white pines of the west, possibly because of the relative inaccessibility of its range. In the park it is found abundantly at middle elevations, mainly on the eastern slope. It is the gnarled and twisted veteran that is so frequently seen growing on the windswept ridges along the eastern foothills, defying the best efforts of the elements to uproot or destroy it. It occurs mostly on dry, rocky, east slopes, commonly associated with lodgepole pine and occasionally in pure, but seldom dense, stands.

The name, "limber" pine describes one of the peculiar characteristics that enable it to withstand the severe winds of the eastern slopes of the Rockies. The limbs and branches of this tree are very flexible, so much so that a limb $\frac{1}{4}$ inch in diameter may often be tied into a knot without breaking. It is a much-branched tree, seldom growing over 50 feet in height and up to 20 inches in diameter, usually stunted, with long slender branches. The bark on older individuals is dark gray or blackish with deep furrows between wide rectangular plates, or broken up into thin-scaled plates. Trees exposed to severe winds show a smooth, reddish, brown surface on the windward side where these plates have been torn away by the wind. Younger trees show a characteristic smooth, thin, silvery-gray bark, very similar to young western white pine.

The needles, clustered at the ends of the branches, grow five in a



A RUGGED, WEATHERBEATEN LIMBER PINE GROWING ON THE
ROCKY SLOPES OVERLOOKING MANY GLACIER VALLEY

bundle, as do all others of the white pine group. They range in length from $1\frac{3}{4}$ to 3 inches. The cones are from 3 to 10 inches long, with peculiar brownish-green scales, greatly thickened at the tip. This latter characteristic is the only reliable field difference between this species and its close associate, the whitebark pine, which has a somewhat smaller, deep purple cone.

Distinguishing Features:

5 needles in a bundle, heavier and stiffer than Western white pine. Usually a small or stunted tree, growing near timberline and lower on eastern slopes of the park, and rare on western slopes.

Cones with brownish-green scales, greatly thickened at tip.

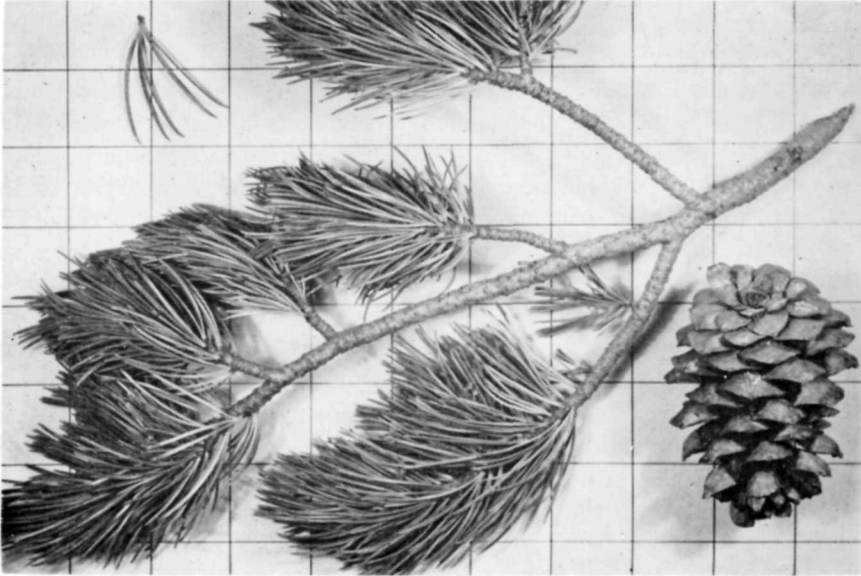
WHITEBARK PINE

Pinus albicaulis Engelm.

This third member of the white pine group also has the characteristic 5-needled bundle and resembles the limber pine very closely. The principal and most reliable difference is its small, deep purple cones, in contrast to the greenish cones of the limber pine.

Whitebark pine is strictly an alpine species, growing in a narrow belt on both sides of the Continental Divide at or near timberline. Like its close relative, the limber pine, it is generally a stunted, much-branched tree, often reduced to a sprawling shrub growing close to the ground on open, wind-swept slopes. The long, flexible limbs are very tough and able to withstand severe storms and deep snows without breaking.

The gnarled and twisted trunk seldom grows over 15 to 40 feet in height and from 10 to 24 inches in diameter. The bark, even on the older trees, is smooth, silvery or greenish-gray, except near the ground where



WHITEBARK PINE, SHOWING BRUSH-LIKE CLUSTERS OF NEEDLES. (BROCKMAN PHOTO)

it may be broken into thin whitish scales, peeling off to a reddish-brown inner bark.

The needles, five in a bundle, grow in clumps at the ends of the branches. They range from $1\frac{1}{2}$ to 3 inches in length, dark yellow-green. The cones vary from $1\frac{1}{2}$ to $3\frac{1}{2}$ inches in length, somewhat oval in shape, deep purple in color, with very thick scales and a stout point at the tip of each scale.

The high altitude and severe winds at this tree's range result in rigorous growing conditions. The crooked trunks, and branches all on the lee side of the tree attest to the force of the wind. In fact, small seedlings are often worn in two from being whipped against the rocks by the wind. This species and the alpine fir constitute the principal cone-bearing tree cover of many of our higher slopes, with occasional areas of limber pine. The latter tree is more common at lower elevations on the eastern foothills.

Distinguishing Features:

- 5 needles in a bundle, heavy, stiff needles.
- Small, stunted tree, alpine species only.
- Cones purplish instead of green or brown.

SUBALPINE FIR

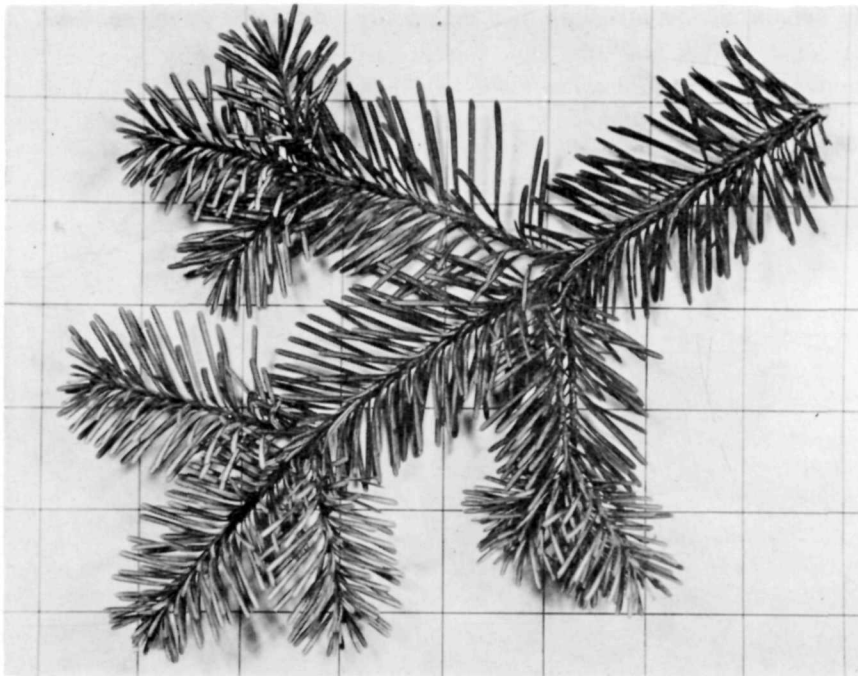
Abies lasiocarpa (Hook.) Nutt.

The true firs, of which this tree is a member, are peculiar to the other evergreen trees in the park in that their symmetrical, barrel-shaped cones stand erect on the top-most branches, often giving the appearance of small birds sitting on the branch, when seen from a distance. Subalpine fir, the most abundant of the two true firs found in the park, occurs commonly at high and middle elevations, and also extends down to the lower altitudinal ranges in many places on both slopes of the range. At high elevations it is very small and stunted, often growing along the ground like a sprawling shrub when in exposed localities, but at the lower elevation it grows into a fairly large tree with a spire-like dense crown, often up to 75 or 80 feet in height and up to 2 or more feet in diameter.

The foliage is very dense, deep green, the new needles having a silvery tinge. The needles are flat, blunt at the tips, and grow out from all sides of the branchlets, but characteristically curve and crowd toward the top side of the branchlet, giving it a brush-like appearance. They are borne singly on the twig and range from $\frac{1}{2}$ to $1\frac{1}{2}$ inches in length. The purplish cones are very symmetrical, almost barrel-shaped, before they open, ranging from $2\frac{1}{2}$ to 4 inches in length and about $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in diameter. When mature, they become lighter in color and fall apart on the tree, shedding their scales and seeds, leaving the core of the cone still attached to the twig for some time.

The bark is very thin, from $\frac{1}{4}$ to 1 inch thick, generally smooth and grayish in color or occasionally hard and shallowly cracked on older trees. The bark on younger trees is pocked with many conspicuous blisters, often up to 1 inch or more in length, which are filled with a sticky resin. This resin, or "balsam," is purported to be mildly antiseptic and

formerly was used for medicine. The limbs are very tough and hard, and droop characteristically toward the ground, giving the tree its spire-like appearance.



ALPINE FIR, SHOWING TWO LIGHT STRIPES ON UNDER SIDE OF NEEDLE

Distinguishing Features:

Needles grow singly on twig, blunt, $\frac{1}{2}$ to 1 inch long.

Needles crowd to top of twig, giving it a brush-like appearance.

Cones grow erect on branch, disintegrate on tree, purplish in color.

GRAND FIR (Great Silver Fir)

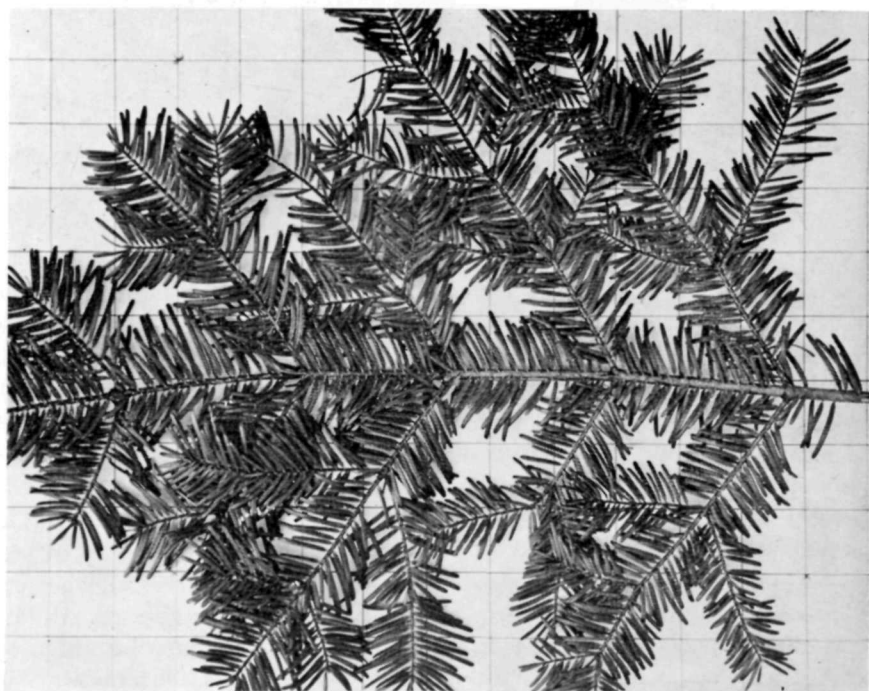
Abies grandis (Dougl.) Lindl.

Grand fir is commonly known by several names, depending upon the locality, the most common being "white fir," "balsam fir," or any other name that might happen to fit in that particular locality. For the sake of uniformity the name "grand fir" has been applied to it by foresters and botanists, mainly because of its stately appearance when mature.

This species is a native of the Pacific Coast region from British Columbia to California and from Washington and Oregon to Montana. On

the Pacific Coast it reaches heights up to 200 feet and diameters up to 4 feet, but in the park one seldom sees trees over 12 inches in diameter. It is not common in the park but may be found occasionally at the lower altitudes on the western slopes, where it grows considerably larger than the subalpine fir, although not commonly associated with it.

This species also has the characteristic smooth, ashy gray bark of the true firs, covered with the "balsam" blisters when small, and the typical erect cones. On older trees the bark may become rough and shallowly furrowed, reddish-brown, with occasional chalky patches, often



GRAND FIR. NOTE THE TWO-RANKED ARRANGEMENT OF THE NEEDLES

flinty hard and rarely over 1 inch thick. The branches droop down and out from the trunk, much like the subalpine fir, giving the younger trees a spire-like shaped crown. Older individuals often lose this spire.

The yellow-green foliage is less dense than that of the subalpine fir and the needles appear to grow straight out from opposite sides of the twig, giving it a two-ranked appearance. The needles are flat and blunt at the tips, from 1 to 2 inches in length, with a whitish cast on their under surfaces. The cones vary from $2\frac{1}{2}$ to $4\frac{1}{2}$ inches in length, yellow-green in color and cylindrical in shape, like those of the subalpine fir.

The park visitor will rarely see this tree because of its relative scarcity, although some people frequently mistake the more common sub-alpine fir for the grand fir, particularly on the valley floors where it is sometimes quite hard to distinguish except for the cones.

Distinguishing Features:

Needles grow singly on twig, blunt, 1 to 2 inches long.

Needles whitish on under surface only.

Needles grow out from opposite sides of twig, two-ranked.

Cones grow erect on branch, yellow-green, (not purplish.)

DOUGLAS-FIR

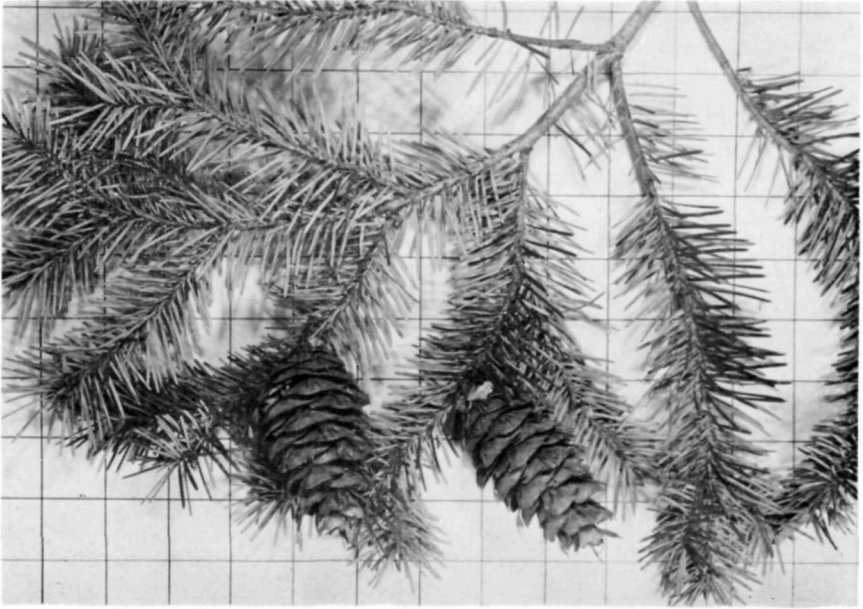
Pseudotsuga menziesii (Mirb.) Franco

Douglas-fir is one of the largest trees in the United States with the exception of the sequoias of California and possibly the sugar pines, but those in the park do not reach the size of the ones on the Pacific Coast. It is one of the important commercial trees in the west, being found from Canada to Mexico and east to the Rocky Mountains and the mountains of west Texas. In the park it is commonly found on both sides of the range, but is often stunted or gnarled when growing in exposed places on the eastern slopes. A typical east-side stand may be seen in and near the Rising Sun campground and along the Going-to-the-Sun Highway on the rock point overlooking St. Mary Lake, just west of the Rising Sun campground. A typical west-side stand may be seen along the North Fork truck trail, just before one reaches the Logging Ranger Station.

The foliage is sparse and yellow-green, closely resembling the grand fir, but not quite so thick nor two-ranked. The needles are borne singly, completely around the twigs. They are flat, usually blunt, and vary in length from $\frac{3}{4}$ to $1\frac{1}{2}$ inches. The cones of the Douglas-fir differ from those of the true firs in that they hang down from the twigs and do not disintegrate on the tree, but drop to the ground whole when mature. The most readily distinguished characteristic of this species is the long, flexible, 3-pointed bracts that protrude from between the cone scales. The cones are commonly $2\frac{1}{2}$ to 3 inches long and may be found in large quantities under mature trees.

The branches grow out relatively straight from the trunk, even upward near the top of the tree, giving it a more or less open crown. The bark on very young trees, resembles that of the true firs except for the blisters, which it rarely has. That on older individuals is deeply furrowed and corky, often up to 5 inches or more in thickness in the Rocky Mountain variety (the Pacific Coast variety may have bark up to 18 inches or more in thickness), and ranging in color from dark gray-brown to reddish-brown.

Douglas-fir is very commonly used for Christmas trees and large numbers are cut from different areas of Montana and shipped to points throughout the United States.



DOUGLAS-FIR NEEDLES AND CONES WITH THE PROTRUDING THREE-POINTED BRACTS. (BROCKMAN PHOTO)

Distinguishing Features:

Needles grow singly on twig, blunt, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long.

Needles grow out all around twig, foliage relatively sparse.

Cones hanging, long, 3-pointed bracts extending from between scales.

WESTERN HEMLOCK

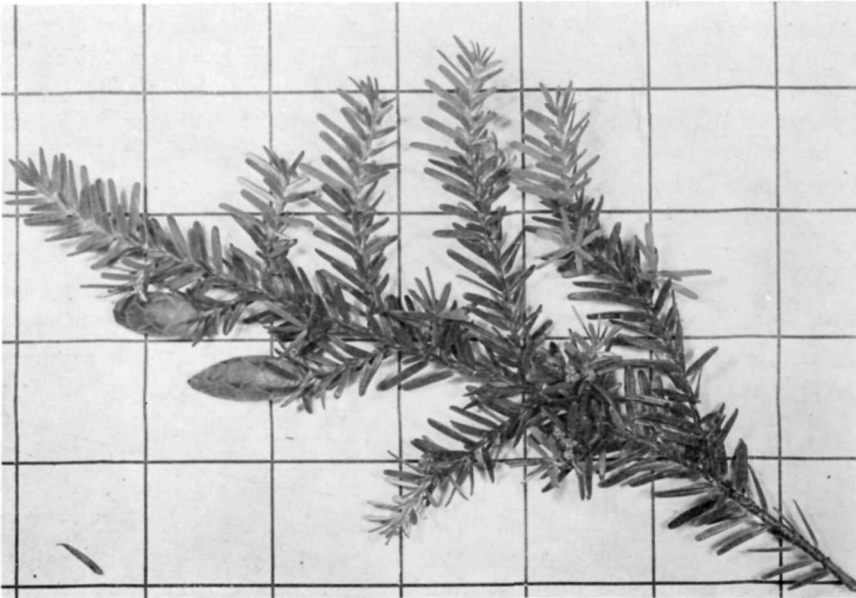
Tsuga heterophylla (Raf.) Sarg.

With rare exceptions, this tree and its common associate, the Western redbcedar, is found commonly only in the McDonald valley drainage. There it occurs in pure and mixed stands in large numbers, making up a large portion of the forest cover along the valley floor from the foot of Lake McDonald to above Avalanche campground. In some places it is so thick that the resultant shade prevents growth of any underbrush or plants except the mosses and lichens and a few ferns. The tree itself is very tolerant of shade and grows prolifically on rotten wood and duff on the forest floor. It is not uncommon to see young trees growing out of rotten stumps and logs under a heavy forest canopy.

Western hemlock is a Pacific Northwest species found from Alaska and British Columbia to Washington and Oregon and east to Idaho and

western Montana. It has a clean, smooth trunk, reaching up to a great height without limbs. The fine, lace-like foliage and the characteristic drooping leader on top of the tree serves to distinguish this species from any other with which it is associated. The bark on the younger trees is thin, scaly, and reddish-brown, while that of the older ones is 1 to 1½ inches thick, irregularly furrowed, often grayish-brown, and almost flinty-hard.

The foliage has a sparse appearance, with many drooping branchlets. It has a glossy, yellow-green appearance, with many short, singly-attached needles. The needles are flat, blunt, and about ¼ to ¾ of an inch long, with distinct short stems, appearing to grow mainly from opposite sides



WESTERN HEMLOCK HAS A SMALL CONE AND BLUNT NEEDLES. (BROCKMAN PHOTO)

of the branchlets, somewhat like the grand fir, but much shorter. The small, few-scaled cones are about ¾ to 1½ inches long, often nearly round when open. They are a rich reddish-brown when mature, turning to dark gray-brown after falling to the ground. The cones usually grow at the tips of the small branchlets, and fallen cones are usually found on the ground beneath the tree.

The ease with which this tree propagates itself in deep duff and rotten wood, and its tolerance of shade, explains the fact that it so often occurs in pure stands. Other species of trees that are less tolerant of shade and competition are soon crowded out and cannot reproduce

themselves, hence the hemlock is commonly referred to as a "climax" type, one that eventually takes over from the other types and becomes the sole occupant of areas in which the growing conditions are suitable.

Distinguishing Features:

Needles grow singly on twig, blunt, $\frac{1}{4}$ to $\frac{3}{4}$ inch long, with distinct stem.

Cones $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, nearly round when open.

Drooping leader on tip of tree.

WESTERN LARCH

Larix occidentalis Nutt.

In general, all cone-bearing trees are also considered evergreen. In other words, they do not shed all their needles in the fall. Two species of larch found in the park are the only exceptions to this rule. Western larch, or "tamarack" as it is sometimes called, is the largest of the North American larches. In the fall of the year its golden-yellow needles make a beautiful show of color, intermingled with the green of its common associates, the spruce, fir and lodgepole pine.

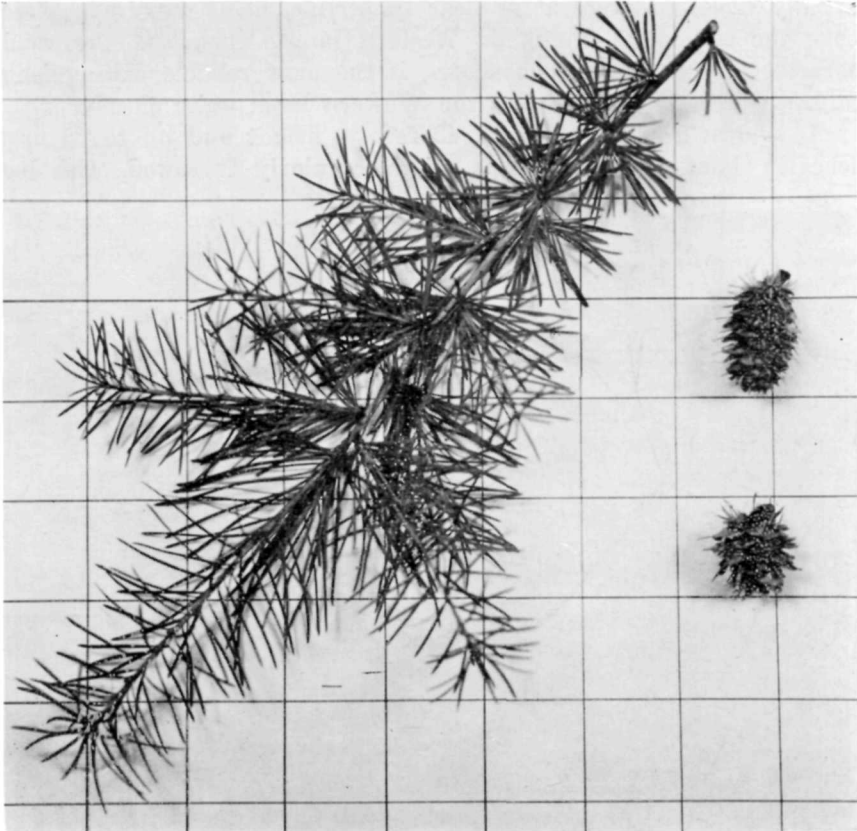
Western larch is found mainly in Washington, Oregon, Idaho, Montana, and British Columbia, and is quite common throughout the west side of the park in the valleys and on the low ridges at lower elevations.

The thick bark of this tall, slender, clean-boled tree often resembles that of the ponderosa pine. The large, yellowish-brown plates of bark are characteristic of the mature tree. Young individuals have thin, scaly bark, somewhat grayish in color. Mature specimens often reach heights of 150 to 200 feet and diameters of 3 or 4 feet. The slender trunks are clear of branches for 50 or 100 feet or even more, with a slender, tapered crown.

The foliage in the summer is pale yellow-green, becoming golden-yellow in the fall just prior to the time the needles are shed. In late September or October the needles turn yellow and fall from the tree, leaving the bare trunk and branches standing through the winter. The new needles in the spring are very soft and flexible and a beautiful pale green color very distinctive from those of the other needled trees. The needles are from 1 to 2 inches in length and occur in bundles of about 15 to 30, growing along the length of the small branchlets. The cones are small, yellowish-brown, about 1 to $1\frac{1}{2}$ inches long, with thin, flexible scales.

Western larch is a prolific seeder and is a close competitor to the lodgepole pine at seeding burned over areas. The tall, thick-barked mature larches often withstand the heat of forest fires and, if soil conditions are favorable, will seed heavily in the vicinity of the surviving trees.

This situation can be seen in several places on the western side of the park, one notable area being located on the northwestern side of Quartz Ridge, near the foot of Bowman Lake.



WESTERN LARCH WITH ITS CLUSTERS OF MANY NEEDLES

Distinguishing Features:

Needles grow 15 to 30 in a bundle, 1 to 2 inches long.

Trees found mainly on western side of park, at lower elevations only.

Needles are shed in the fall.

SUBALPINE LARCH

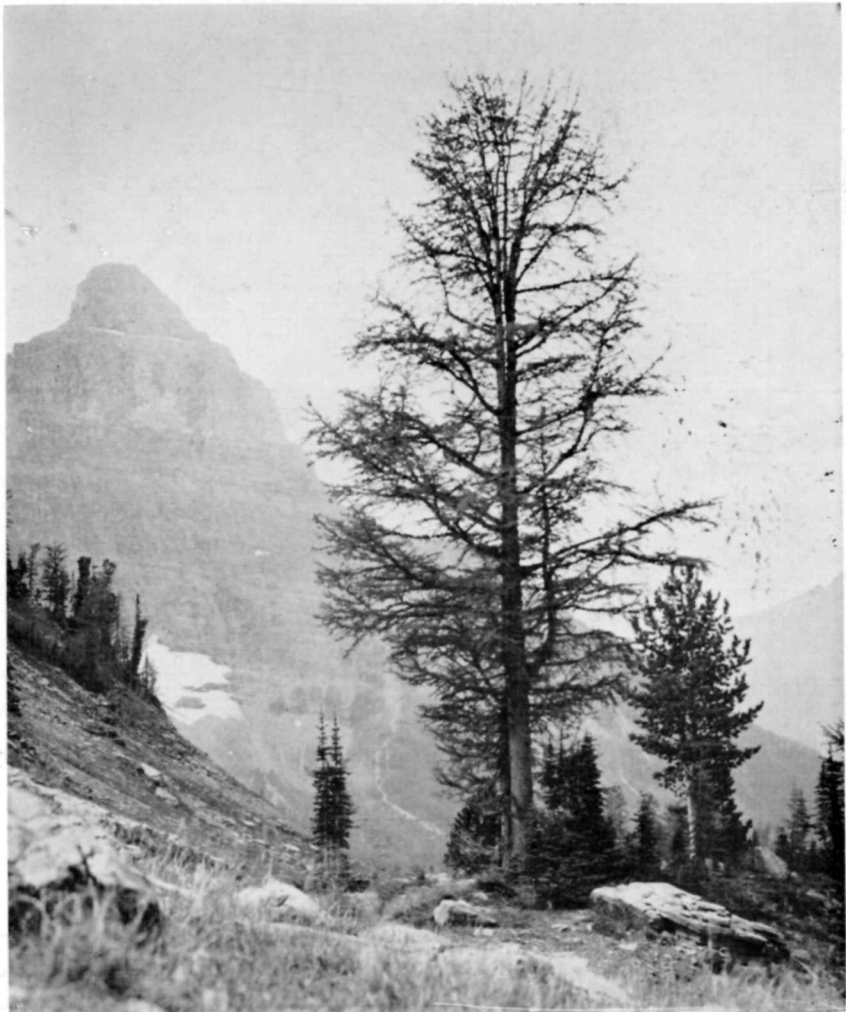
Larix lyallii Parl.

Subalpine larch is probably the most distinctive of the alpine conifers, because it grows relatively tall and stately in spite of the severe winds and snow at this elevation. It is rather startling to find, upon approaching timberline with its sprawling, scrubby trees, a clump of subalpine larch

growing erect and stately, even though somewhat weatherbeaten, defying the wind and storms.

The altitudinal range of this species serves as the best distinction from its close relative, the Western larch. Subalpine larch grows only in partially sheltered areas at or near timberline, many hundreds of feet above the uppermost limits of Western larch. This, and the woolly character of the new branch shoots, is the most reliable distinguishing feature. Otherwise it resembles the Western larch quite closely.

It seldom grows over 30 or 40 feet in height and up to 18 or 20 inches in diameter. The bark is thin, irregularly furrowed, with loose



ALPINE LARCH GROWING NEAR TIMBERLINE AT BOULDER PASS

scales of dark gray to purplish hue. The bark on young trees is smooth, somewhat ashy-gray in color.

The foliage is typical of larch, yellow-green to blue-green, turning bright yellow in the fall just before the needles are shed. These rare patches of bright yellow on the distant peaks and passes in the fall are sure indications of subalpine larch. The needles are about 1 to 2 inches in length and occur in bundles of from 20 to 40 in a cluster. The cones are about 1½ to 2 inches long, with deep purple bristly bracts protruding from between the scales.

Subalpine larch is not plentiful in Glacier, but can be found in small numbers in many of the higher passes and on the slopes of the high peaks near timberline. Boulder Pass, in the north end of the park has a relatively large stand of these trees, contrasting sharply with the scrubby timber and bare rocks in the immediate vicinity.

Distinguishing Features:

Needles grow 20 to 40 in a bundle, 1 to 2 inches long.

Trees found only at or near timberline.

New twigs somewhat woolly.

Shed needles in the fall.

ENGELMANN SPRUCE

Picea engelmannii Parry.

Engelmann spruce is very common throughout the park and is also found in the west from Arizona north through the Rocky Mountains and the intermountain region of British Columbia, and as far west as the western slopes of the Cascade range in Oregon and Washington.

This tree is sometimes erroneously called "blue" spruce because of the bluish cast on the needles of the younger trees. It is fairly tolerant of shade and competition from other species, hence it thrives both in pure stands and mixed with other species, such as hemlock, true fir, and lodgepole pine. It is found in the park at low and middle elevations and occasionally in the lower reaches of the timberline (Hudsonian) zone.

The needles are its distinguishing characteristic. Like the true firs, the Douglas-fir and the hemlocks, the spruce needles are attached singly to the branchlets, giving them a brush-like appearance. But, unlike the other similar trees, the needles are square in cross section, not flat. This characteristic is easily seen with the naked eye, or can be determined by rolling a needle between the thumb and forefinger. In addition, the needles are very sharp-pointed, so sharp in fact, that striking a branch smartly with the back of the hand is almost like striking an equal number of protruding pins. These two characteristics serve to distinguish this tree from any of its associates in the park.

The needles are stiff, about $\frac{3}{4}$ to 1 inch long, borne on minutely hairy twigs. The cones are about $1\frac{1}{2}$ inches long, somewhat egg-shaped, with flexible, papery scales. The cones do not remain on the tree but drop off in the fall in large numbers. The bark of the mature trees is thin and broken up into numerous dark gray, loosely attached scales.



THE SHARP-POINTED ENGELMANN SPRUCE NEEDLES ARE VERY CHARACTERISTIC
(BROCKMAN PHOTO)

One other spruce, WESTERN WHITE SPRUCE (*Picea glauca albertiana*), occurs in the park but is relatively rare and consequently does not warrant an attempt to distinguish it from the Engelmann spruce.

WESTERN REDCEDAR (Giant Cedar)

Thuja plicata Donn.

Western redcedar is commonly known in the west as "cedar" or "red cedar." The tree is not a true cedar, as is the genus *Cedrus*, nor is the

Mature specimens often reach diameters of up to 2 or 3 feet and heights of 90 to 100 feet. Under favorable conditions it grows tall and straight, with numerous limbs on the lower portion of the trunk of young trees but with relatively bare lower trunks on the older trees.

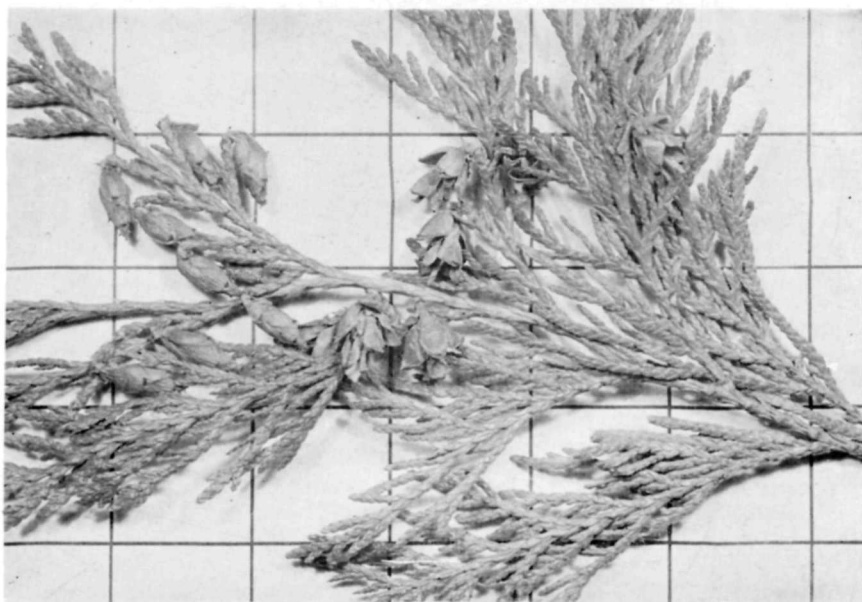
Distinguishing

Features:

Needles grow singly on twig, $\frac{3}{4}$ to 1 inch long. Needles square in cross section, sharp on the tip.

wood characteristically red, as is that of the eastern junipers, also commonly called "red cedar." The common name "arborvitae," meaning "tree of life" has been accepted as fitting by many botanists, but, because of long-standing common usage foresters still prefer the name "redcedar."

Although common in the Pacific Coast region, from Alaska to northern California, Western redcedar in the park is confined almost entirely to the floor of the McDonald Valley, occupying much the same range as the Western hemlock and commonly associated with the hemlock, spruce and fir. In the humid coastal regions of Oregon, Washington and British



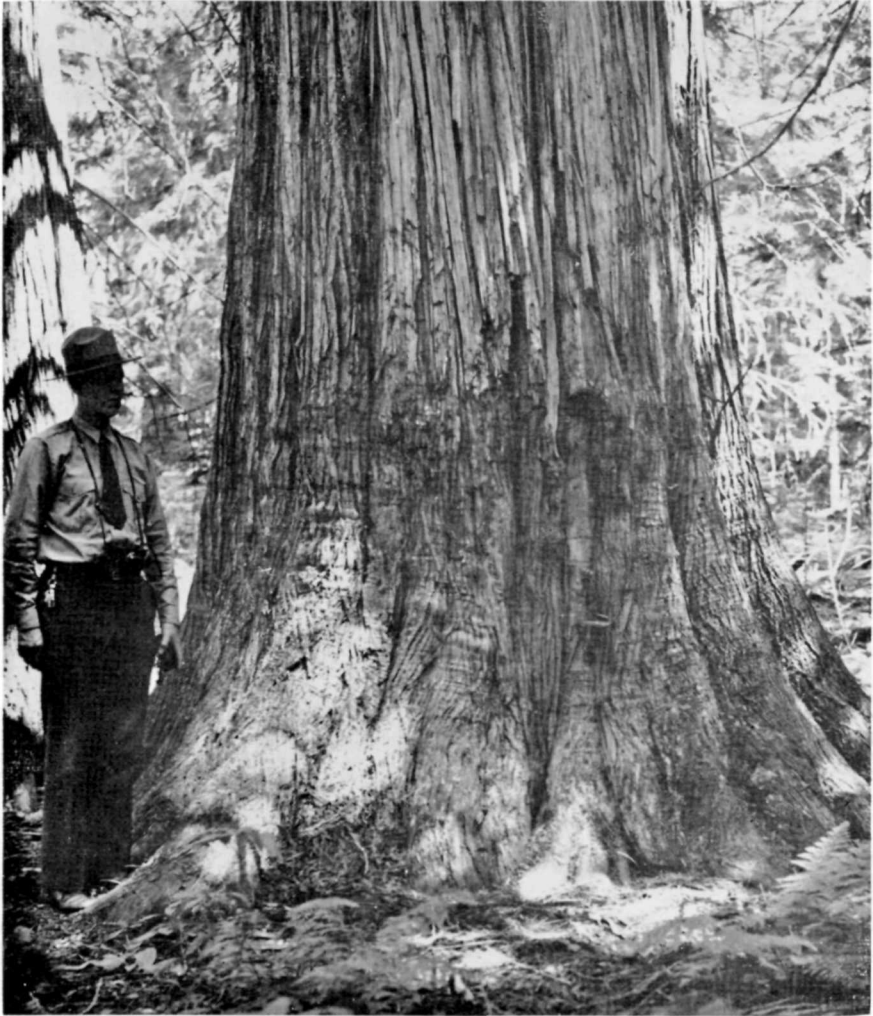
WESTERN REDCEDAR HAS FLAT, FERN-LIKE BRANCHES AND SMALL CONES. (BROCKMAN PHOTO)

Columbia this tree reaches diameters in excess of 10 feet, but in Glacier National Park it seldom grows over 3 feet in diameter and up to 100 feet in height. One unusual grove of seven trees ranging from 4 to 7 feet in diameter has been found in McDonald Valley not far above Lake McDonald.

A common question from the visitor is, "What is that tree with the fern-like leaves?" Although not a strictly accurate technical description, this does aptly describe one's first impression of the tree. The small, overlapping, scale-like needles are borne on short branchlets, and the branchlets are arranged in a flat spray, which, coupled with the size of the trunk, immediately distinguishes it from any other tree in the park.

The foliage consists of numerous small, flat, overlapping needles.

arranged in a flat spray that is characteristic of all trees of the genus *Thuja*. On the very young trees, these needles may be more lance-shaped and stand away from the branchlet. As the main stem of the branch grows and new needles are added, the older branchlets die and drop off after



BASE OF A LARGE WESTERN REDCEDAR IN MCDONALD VALLEY

two or three years. These conspicuous redish-brown branchlets scattered through the tree in the fall often give rise to the impression that the tree is dying.

The small, leathery, russet-brown cones, about one-third to one-half inch in length, mature and shed their seeds in August and drop from

the tree the following spring. In the higher country where the snow lies on the ground until late, one may often see thousands of these small cones scattered over the snow. The bark is thin, light brown to cinnamon-brown in color and has a stringy, fibrous appearance. Long strips may be peeled from it, resembling shreds of hempen rope. The lower limbs remain on the older trees, sweeping outward and downward in a long arch, giving the tree a very graceful appearance.

The wood is very light in weight and soft, somewhat aromatic and very resistant to rot. Buried logs will remain sound beneath the outside layer for many years. For this reason it is extensively used to make shingles, posts, telephone poles, and other items exposed to weather and moisture but not requiring great strength.

Distinguishing Features:

Small, overlapping scale-like needles.

Needles arranged in flat sprays on branchlets.

Light brown, stringy, fibrous bark.

JUNIPERS

Juniperus sp. L.

Three species of juniper are found in this locality, but only one, **ROCKY MOUNTAIN JUNIPER** (*Juniperus scopulorum*) approaches tree size. This juniper is found scattered along the North and Middle Forks of the Flathead River on the southern and western boundaries of the park and seldom grows over 10 inches in diameter and up to 15 or 20 feet in height.

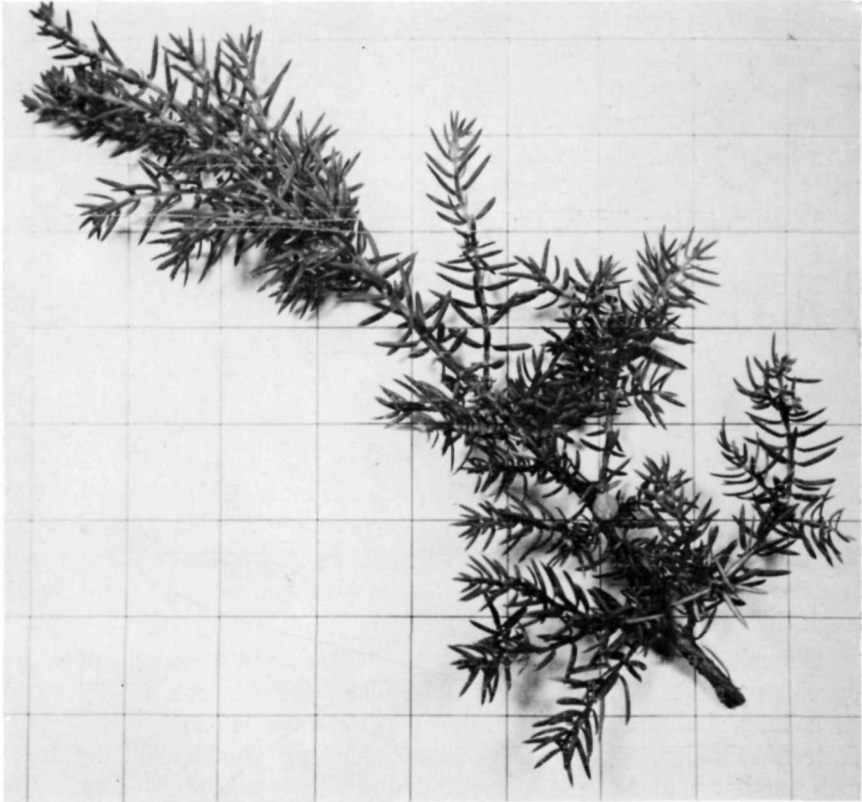
The minute scale-like to pointed needles occur in 4 rows of alternately opposite pairs on the four-sided twig. The back of each needle usually has a long, indistinct pit, or gland. The bark resembles the mature Western redcedar, with its fibrous, stringy appearance, but the tree is much smaller and is usually twisted and contorted, often with several stems growing out from the same root crown.

The most easily distinguished characteristic of all the junipers is the soft, blue, berry-like fruit. This fruit is really, morphologically, a cone, with a soft, pulpy exterior surrounding several hard seeds. These so-called "berries" are blue in color and have a very pungent odor and taste. Birds eat the fruit but the seeds are not digested and pass on through the digestive tract, a fact that accounts for the wide distribution of the juniper seed.

The two other species of juniper that occur in the park, **COMMON JUNIPER** (*Juniperus communis*), and **CREEPING JUNIPER** (*Juniper horizontalis*), are quite common, extending from the river valleys to and often above timberline. They are small, creeping shrubs, seldom over

3 feet in height and often form dense carpets or mats that are very difficult to walk through.

Both of the latter two species resemble each other very closely and differ from the Rocky Mountain juniper mainly in their form and growing habits. Common juniper also differs from the other two by having



COMMON JUNIPER, SHOWING THE SHARP, AWL-SHAPED NEEDLES

short, sharp-pointed, awl-like needles instead of being small and closely appressed to the twig. All species bear the characteristic blue fruit.

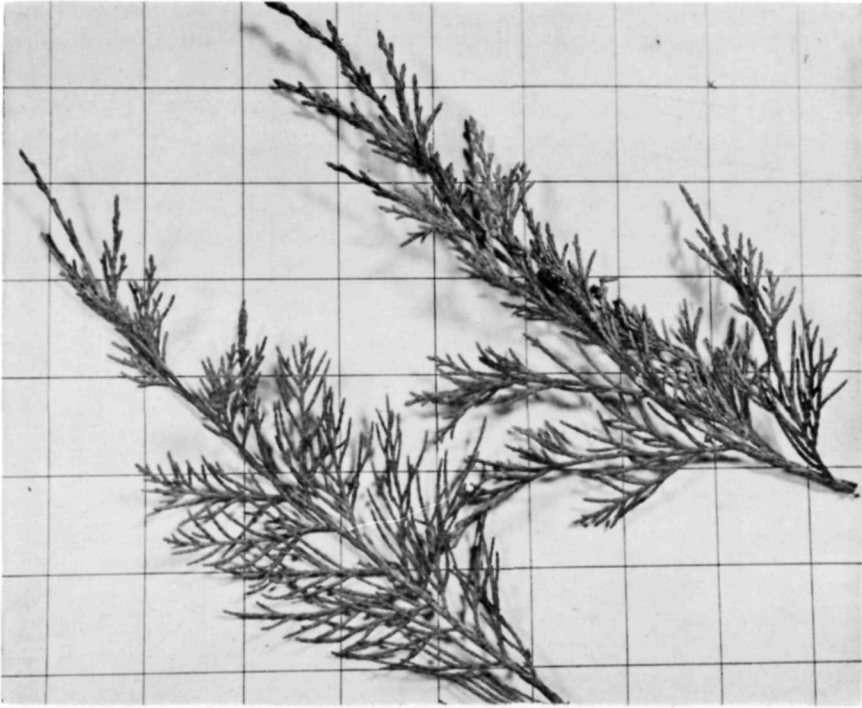
The wood of the juniper is very hard and durable because of its natural oils and slow growth. Fence posts of Rocky Mountain juniper are reported to have been in the ground twenty-five years or more without showing signs of rotting. The wood ranges in color from creamy-white to a deep reddish-brown, very beautiful when worked up into furniture or novelties.

Distinguishing Features:

Scale-like to awl-shaped, small needles.

Blue, berry-like fruit with pungent odor and taste.

Pungent odor to crushed needles.
Small, contorted tree or sprawling shrub.



ROCKY MOUNTAIN JUNIPER. THE MINUTE, SCALE-LIKE NEEDLES GROW CLOSE TO THE TWIG

PACIFIC YEW

Taxus brevifolia Nutt.

Pacific yew, locally known simply as "yew," occurs throughout the park, generally at low to middle altitudes. It is a little-known tree because it is commonly overlooked or mistaken for true fir or hemlock, with which it is usually associated. There are three species of yew in the United States, but only this one occurs in the west, ranging from Alaska to California and eastward as far as the northern Rocky Mountains.

Although the yew on the Pacific Coast often grows to tree size, those in Glacier National Park are shrubby, seldom over 3 or 4 inches in diameter and 10 to 12 feet tall. It quite commonly grows in clumps or small thickets, often with several long, curving trunks growing from one root crown.

The thin, reddish-purple bark is usually overlaid with thin, easily detached purplish-gray scales. The needles are flat and pointed, seldom over $\frac{3}{4}$ of an inch in length, ranging from yellow-green to deep green

in color, growing singly from all sides of the twig, but crowded to either side in a manner that gives the twig a two-ranked effect, much like the grand fir. Unlike the fir, the needles have a blunt point, not rounded or notched at the tip.

The fruit is the most reliable distinguishing characteristic of the tree. Similar to the juniper, the yew bears a berry-like fruit instead of a woody cone, consisting of a single hard seed covered with a bright



PACIFIC YEW. NOTE THE BERRY IN THE CENTER OF THE PHOTO. (BROCKMAN PHOTO)

red mucilaginous covering. Also, like the juniper, the yew depends upon the birds for dissemination of the seeds. Birds eat the fruit but are unable to digest the hard seed, which passes on through the digestive tract unharmed.

The wood of the yew is extremely hard and stiff, a characteristic that made the tree useful to the northwestern Indian tribes for construction of the bows that they used in tribal warfare. They also made use of the wood for canoe paddles and spears.

The fruit, the scrubby, much branched characteristic of the trunk, and the purplish, often smooth bark serves to distinguish this tree from the others with which it is associated.

Distinguishing Features:

Red, berry-like fruit.

Low, much-branched shrubby tree, resembling hemlock or fir.

Smooth or somewhat scaly, purplish bark.

Bluntly pointed needles.

BLACK COTTONWOOD

Populus trichocarpa Torr. and Gray.

This tree, often called "poplar," or just "cottonwood," is the largest broadleaved tree in the park, often reaching a diameter of four feet or more. It has been identified by some botanists as balsam poplar (*Populus balsamifera*), but the best available sources indicate that it is black cottonwood. Further studies are needed to determine if the latter species does exist in the park.

The cottonwoods and poplars, along with the birches and willows, are of very ancient origin, evidence of their existence having been found in the fossil remains of the early Cretaceous period, nearly one hundred million years ago. At the present time species of the genus *Populus* are widely distributed throughout the northern hemisphere.

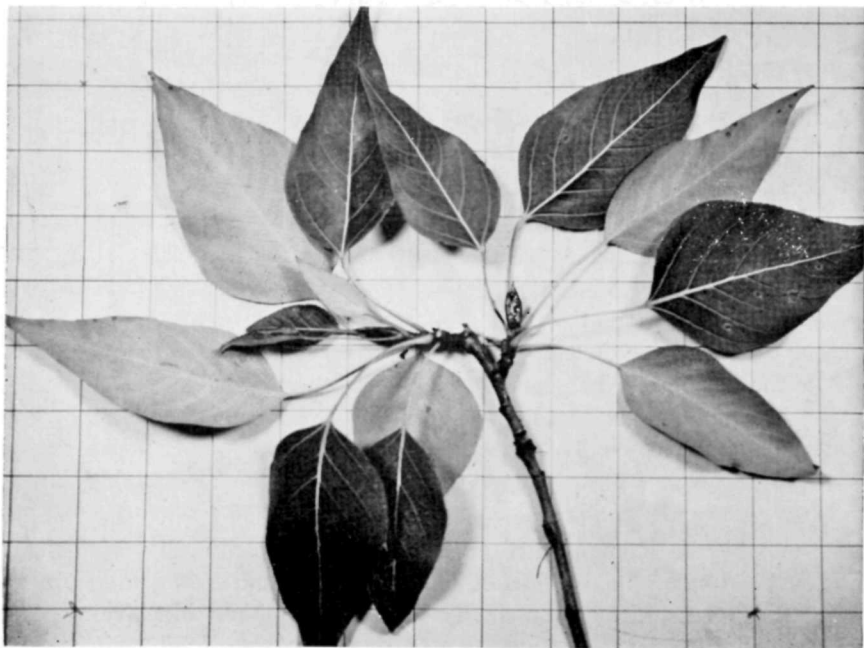
Black cottonwood is typically a Pacific Coast tree, seldom reaching as far east as the Rocky Mountains. In Glacier National Park it is found along watercourses and lakes at low elevations. On the west slopes it grows much larger than on the east, mainly because of the less severe weather and heavier forest cover. The largest known specimen of this tree in the park may be seen at the north end of Quartz Creek bridge on the North Fork truck trail, just across the road from the campground. This tree measures over 14 feet in circumference at 4½ feet above ground. Other large specimens may be seen on the floor of McDonald Valley.

The easiest means of recognizing this species is by the roughly furrowed gray bark on mature trees and the large, broadly ovate leaves which are often up to five inches in length. The bark on young trees is chalky to greenish-gray, and fairly smooth. Another identifying characteristic is the sticky, odd-smelling, brown "balsam," or resin, that is exuded from the buds at the ends of the twigs. The leaves are finely toothed at the margin, dark green above and whitish below, often blotched with a rusty brown color on the under side. The beautiful golden color of the cottonwood leaves in the fall is unequalled by any park tree except possibly the aspen and birch.

Wood of the cottonwood is soft and white, but very susceptible to certain forms of fungus disease that causes the tree to rot. Possibly as compensation for this, it has a very rapid growth and remarkable reproductive powers. The seeds are very small, but are attached to a soft cottony fuzz that is carried by the wind for great distances. At certain times of the year when the seeds are flying, the air seems filled with these small white fluffs of "cotton," floating along on the breeze.

In addition to its seeding ability, the cottonwoods and aspens have the power to put out new shoots from roots, cut stumps, and even from sections of green limb or tree stuck in moist earth. These characteris-

tics are valuable in areas where there are many beaver. Cottonwood bark is one of the favorite foods of the beaver and often they will cut down entire stands of the tree for food and construction of their dams and lodges. But, in a few years, possibly after the beaver have moved on in search of greener pastures, the cottonwood will put out shoots from the old stumps and start to replace the destroyed stand. This is a common sight around beaver areas.



BLACK COTTONWOOD, A NATIVE OF THE PACIFIC COAST

Distinguishing Features:

Large tree with grayish, hard, deeply furrowed bark.

Large, broad leaves, often spotted with rusty brown on the under side.

Sticky resin on buds.

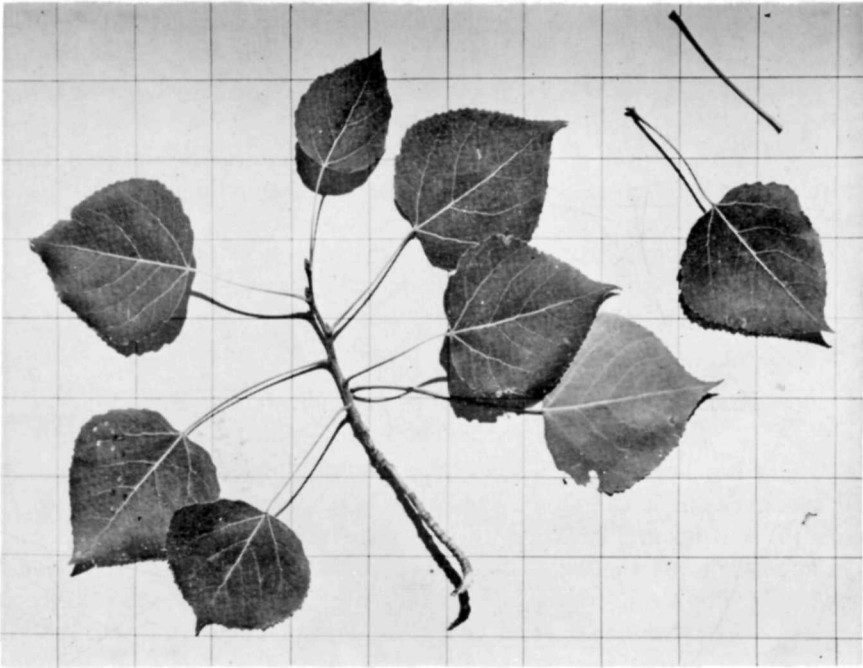
QUAKING ASPEN

Populus tremuloides Michx.

Quaking aspen is a very common tree in the United States and Canada, extending from Labrador to Alaska and as far south as New Jersey, Tennessee, western Texas, California, and even into northern Mexico. The plains Indians used its wood for fuel and often for the framework of lodges and ceremonial structures. The dense thickets along stream bottoms and foothills of the mountains afforded shade for their lodges

in the summer and shelter from the severe winds in the winter.

It is a small slender tree found throughout the lowlands of the park, but more commonly on the eastern slopes than the west. Along the eastern foothills extensive groves of stunted aspen often form a major portion of the forest cover, extending at times well out toward the plains. Here, where the winters are more severe and the trees are not protected from the fierce east-slope winter winds, they seldom grow over 25 feet tall, but, bunched in dense thickets, form a good protective cover-



QUAKING ASPEN. THE SLENDER, FLATTENED LEAF STEMS CAUSE THE LEAF TO TREMBLE IN THE SLIGHTEST BREEZE

ing for the wildlife. In the fall these thickets are a blaze of beautiful golden color, a mecca for the photographer and the painter. On the west slope, where they are mixed with the dense evergreen forests, the fall color is in sharp contrast to the solid green of the evergreen trees.

This tree is similar to the cottonwood in its seed distributing ability. The small, wind-borne seeds are scattered far and wide, a factor that contributes greatly to its ability to seed areas that have been burned over by forest fires. Also, like the cottonwood, it has the ability to send up shoots from the cut stumps and roots, rapidly replacing any cut-over or destroyed stands. Beaver are very fond of the bark and deer browse on the leaves, making its reproductive ability very valuable in perpetuating the species.

This tree grows up to 8 or 10 inches in diameter in protected places, and often reaches a height of 40 or 50 feet. The bark is hard and smooth, usually unbroken even on older trees, white to greenish-white in color. The lower trunk is usually marked with numerous black, curved scars where the lower branches have died and fallen off as the tree grew. The wood is soft, mostly white except for a brownish center or heartwood.

The leaves are much smaller than the cottonwood, usually up to 3 inches in length, nearly as broad as they are long. They are shiny yellow-green in color, rounded to triangular in shape, with a pointed tip and finely toothed margins. The leaf stem is long, slender and somewhat flattened, a characteristic which accounts for the common name, "quaking" or "trembling" aspen. Because of this stem the leaves seem to be in constant motion, twisting and turning in the slightest breeze. This nearly constant leaf motion is one of the most noticeable identifying characteristics of the tree.

Distinguishing Features:

Constantly trembling, triangular shaped leaves, long stems.
Thin, smooth, whitish bark, does not peel.

NORTHWESTERN PAPER BIRCH (Paper Birch)

Betula papyrifera subcordata (Rydb.) Sarg.

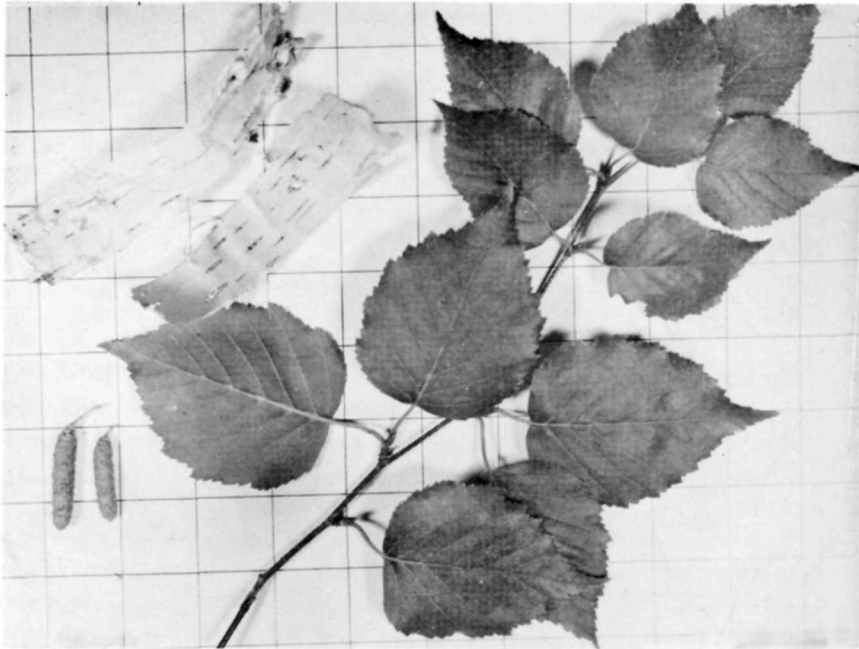
There has been considerable difference of opinion between botanists and foresters about the nomenclature of birches, which just adds to the layman's confusion. The Northwestern paper birch, classed by Sudworth as a sub-species of the common eastern paper birch, has been variously known as white birch, paper birch, canoe birch and numerous other common names. Paper birch seems to be the logical name and the one recognized by foresters, because of the white bark that peels off in layers like sheets of writing paper.

Of the four birches found in the park, only two reach tree size and will be considered here as trees. Although the range of Northwestern paper birch covers parts of the states of Montana, Idaho, Washington and Oregon and extends as far north as Alaska, it is reported from only two of our national parks, Glacier and Mt. McKinley. It occurs in Glacier National Park mainly in the valleys on the west slopes, at low and middle elevations. It is a stream-bottom tree and can be seen quite frequently along the Going-to-the-Sun Highway in McDonald Valley. There are some very beautiful trees along the shores of Lake McDonald and around the Lake McDonald Hotel.

This birch is one of the most easily recognized of the broadleaf trees in the park. The white bark readily peels off in thin, papery layers,

the under side of which is a dull orange in color. This characteristic has been the cause of much damage by unthinking and careless people who peel off rings of bark around the trunk, thereby not only spoiling its beauty, but in many instances doing damage to the tree itself.

This birch is small and symmetrical, seldom over 40 or 50 feet tall and 8 to 10 inches in diameter, with a fairly open crown of small, oval leaves. The leaves are seldom over 3 inches long, with rounded or wedge-shaped base and irregularly toothed margin. The fruit is a small woody



NORTHWESTERN PAPER BIRCH, SHOWING CONES AND A SECTION OF THE BARK

cone seldom over one inch in length. The bright yellow color of the leaves in the fall adds another bit of interest and color to the forests at their most beautiful time of the year. The visitor who has never seen Glacier National Park in October or late September can never fully appreciate the beauty of the park forests at that time of the year.

The wood of this birch is quite hard, but because of its small size is not used commercially except occasionally by hobbyist and novelty makers. The thin, easily peeled bark was used extensively by water-traveling Indians in making canoes. They peeled the bark off in large sheets and sewed it together to form very light, fast crafts.

Distinguishing Features:

White, easily peeled bark.

Symmetrical tree, with open crown.

Small, woody cone.

WESTERN PAPER BIRCH (Western Birch)

Betula papyrifera commutata (Reg.) Fern.

This tree is relatively rare in Glacier National Park, occurring only occasionally along the lower eastern slopes of the park. It is the largest of the birches and very similar to the Northwestern paper birch except that the bark is reddish-brown instead of white. This sub-species of the paper birch is found only in the northwestern states and was formerly known as WESTERN BIRCH (*Betula occidentalis*), which further complicates the layman's understanding of the different species of birches.

In the park it grows up to 30 or 40 feet tall, but reaches heights of from 80 to 90 feet in Washington and British Columbia. The leaves are very similar to the preceding species except that the young leaves are spotted with minute resinous glands, making them feel sticky to the touch. The bark is smooth, reddish-brown, and will peel off in thin layers like most of the other birches.

Distinguishing Features:

Typical birch foliage.

Reddish-brown bark that peels like Northwestern paper birch.

Minute sticky glands on leaves.

Although not classed as a tree, something should be said of the WATER BIRCH (*Betula occidentalis occidentalis*), a small, willow-like shrub in the park, although occasionally reaching tree size in other localities. Like the previously mentioned birch, it also has a brownish bark, but it will not peel, as does that of the paper birches. In addition, the small twigs are sometimes greenish and more or less covered with small shiny resinous dots that disappear as the twig grows and bark turns brown.

The other shrubby birch is the BOG BIRCH (*Betula glandulosa*), commonly called scrub birch. This plant is usually a very low shrub, with thick, leathery, but otherwise typical birch leaves. The bark is reddish-brown and the glandular twigs give them a distinct sticky feeling when grasped in the hand. This shrub is common on the eastern slopes and grows at nearly all elevations, often near timberline.

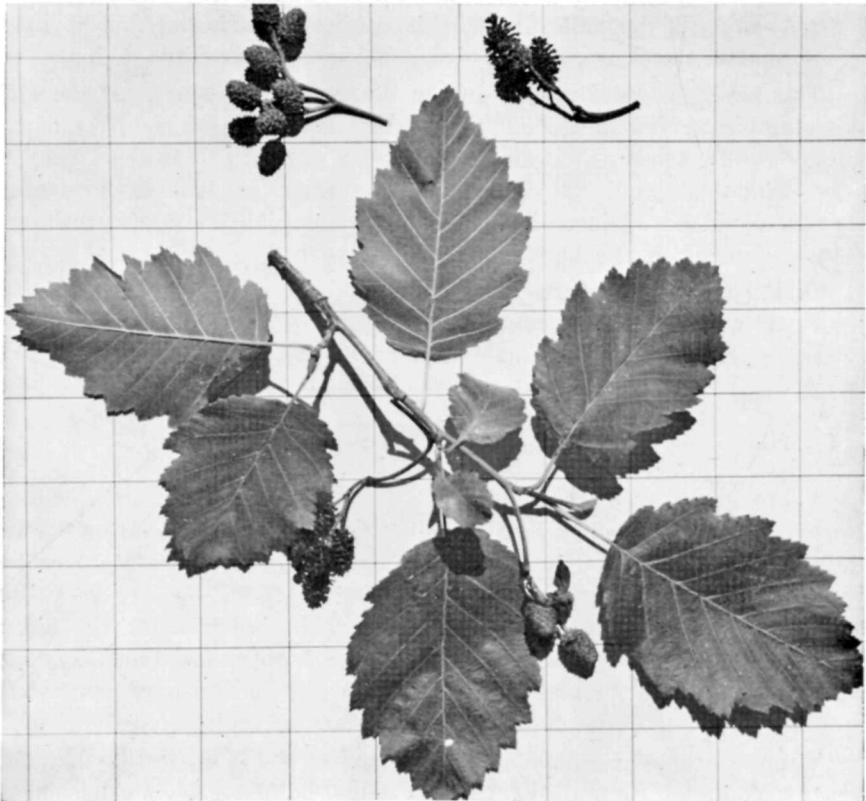
ALDERS

Alnus sp. B. Ehrh.

Two species of alder grow in the park, both of which are very similar and difficult for the layman to distinguish except by the difference in range and locality of growth. Both are shrubs and only rarely reach sizes that may be considered of tree status, but are considered here because of their occasional tree size and the fact that they commonly occupy the same range as the other species that are somewhat similar and do reach tree size.

The fruit of the alder, like the birches, is a small, woody cone, greenish when mature, later turning deep brown, developing from the female flower. The male flowers are long, greenish cylindrical bodies borne on the ends of the twigs in the early summer. They form conspicuous greenish clusters in the summer and fall, later turning brown and remaining on the twig until the following summer, at which time they may be as much as 4 or 5 inches long. Alders are usually easily spotted by these flower clusters or the cones.

The leaves are broadly ovate in shape, from 2 to 4 inches in length, and conspicuous for their straight, prominent veins in the body of the leaf. They are dull to dark green, occasionally shallowly lobed, with an irregularly toothed margin. The bark is normally grayish-brown to brown.



THINLEAF ALDER LEAVES AND CONES

One species, SITKA ALDER (*Alnus sinuata*), grows mostly in high or middle elevations, commonly along stream beds and in moist, sheltered places. It often forms dense thickets, up to 10 feet tall, in which all the

stems seem to grow down hill for some distance before turning up. The deep winter snows and the constant downhill pressure and movement of the heavy snow pack overlying the trees and shrubs in the winter causes this seeming downhill growth. Dense thickets of this brush are almost impossible to penetrate except by traveling directly downhill, the way the bushes lie.

This species is common both in the park and throughout its range, which includes the Pacific Northwest and the Pacific Coast from northern California to Alaska. It seldom reaches tree size except at lower elevations where it is protected from the movement of the winter snow pack.

The other species, THINLEAF ALDER (*Alnus tenuifolia*), is common at lower elevations along streams and water courses. It also forms dense thickets at times, but the trunks grow more or less erect or branching out in several directions, seldom over 15 feet in height. In general, if found along streams on the valley floor, this species is indicated, but if found higher on the mountain side in dense thickets, it is Sitka alder.

This alder is found mainly in the Rocky Mountain areas, from British Columbia to New Mexico. The Blackfeet Indians used the bark of this tree for saddle stirrups, covering them with rawhide to stiffen them and make them wear well. They also used the bark for medicinal purposes, a use from which was derived their name for the plant, "red mouth bush," because chewing of the bark turns the saliva red.

Distinguishing Features:

Fruit a small woody cone.

Long, green to brown, male flower clusters.

WILLOWS

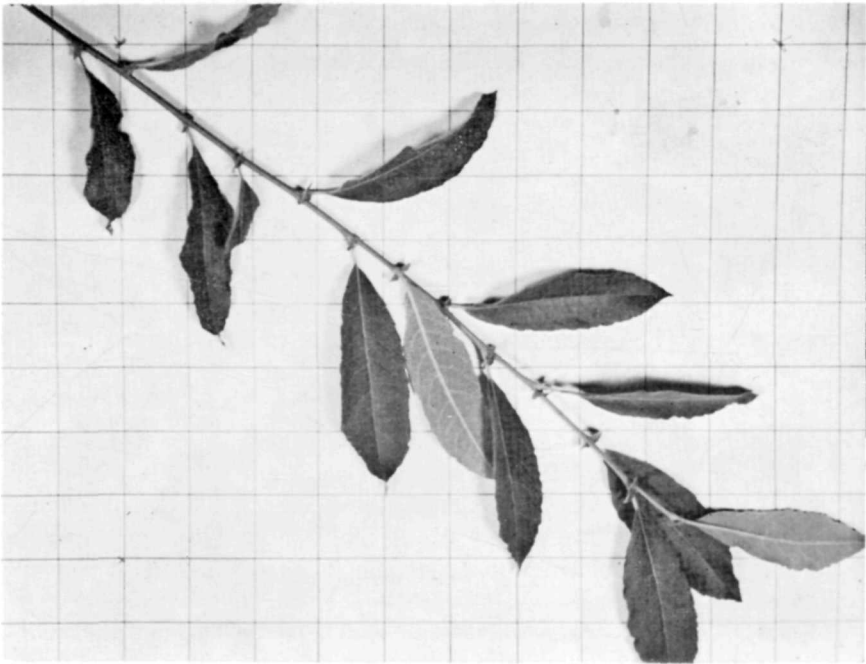
Salix sp. Linn.

There are over 75 species of willow found in the United States, approximately 25 of which have been identified in Glacier National Park. Only 3 of those found in the park reach tree size, and then only occasionally. With few exceptions the different species of willow are very difficult to identify, even for the experienced botanist, without the aid of hand lens or microscopic examination of the flowers and fruit. For this reason and the fact that so few reach tree size in the park, willows in general will be considered here rather than by individual species.

Willows are quite commonly recognized on sight by the layman, but in many instances, for want of a better name, he also classes other shrubs and small trees as willows. Ordinarily they can be immediately identified by the bitter, quinine-like taste of the bark. This, coupled with the general identifiable features, should enable one to distinguish this plant with little difficulty.

Willows are one of the most common shrubs in the park, occurring commonly in moist places. They range from the lowest valley floor to the alpine meadows. One species grows well above timberline on rocky, wind-swept slopes as a prostrate shrub, seldom over 6 to 10 inches in height. Others, along streams on the valley floors, often reach heights of 15 feet or more. Like the birches and cottonwood, the seed is minute and carried for great distances on the wind by tiny tufts of hair. Also, similarly, they are able to reproduce by sprouts from the roots and cut stumps or even buried twigs. Beavers cut them down in great numbers for their winter food supply and store them under water near their lodges. Here they are able to get at them after ice forms on the surface, the bark being utilized for food.

The leaves of the willow are generally long and narrow, occasionally with fine teeth along the margin or near the tip of the leaf. Willow leaves characteristically have a pair of large or small ear-shaped leaf-like growths at the base of the leaf stem. This factor alone will identify the willow in most cases, particularly during the growing stage of the leaf.



WILLOW FOLIAGE. NOTE THE SMALL LEAF-LIKE STIPULES AT THE BASE OF THE LEAF STEM

They are more noticeable on the vigorous growing shoots of the plant, where they usually remain until the leaf falls in the autumn, while on the older shoots they often fall off soon after the leaf reaches its full devel-

opment. The leaves may fall in autumn after seemingly just drying up and turning brown, or they may turn yellow before they fall, but seldom as bright and conspicuously yellow as those of the aspen and cottonwood.

The flowers are borne in fuzzy catkins, the familiar "pussy willow," which may appear before, with, or after the appearance of leaves. Seeds are formed in small, hard capsules which open when mature and release the minute seeds, each of which is equipped with a tuft of fine hairs that allows it to be carried great distances by the wind.

Distinguishing Features:

Quinine-like taste of the bark.

Small, ear-shaped pair of growths at the base of leaf stem.

Familiar "pussy willow" type of flower.

BLACK HAWTHORN

Crataegus douglasii Lindl.

The hawthorns, or haws, are a very large family, widely distributed throughout the world, over 100 species of which occur in the Pacific Northwest. In Glacier this hawthorn is common on the western slopes



BLACK HAWTHORN FOLIAGE, SHOWING FRUIT AND THE LONG, SHARP THORNS

at low and middle elevations, mainly along streams and lakes. In the eastern valleys it occurs occasionally at the lower elevations, and quite abundantly around the foot of St. Mary Lake.

This plant is usually a shrub, particularly on the east side, but some-

times reaches tree size in the valleys of the western slope. They commonly occur in dense, impenetrable thickets which can be traversed only by the smaller mammals and birds. The long, sharp thorns and stiff, wiry branches make it practically impossible for man or a large animal to penetrate a hawthorn thicket. In tree size it reaches heights of 15 to 20 feet, but the more common form is a thick, much-branched shrub from 6 to 12 feet in height. Hawthorn thickets furnish excellent cover and protection for small game and birds, as any hunter will verify if he has attempted to flush game from its cover.

The bark is reddish-brown, often becoming scaly on older trees. The leaves are relatively thick and leathery, smooth, deep green above and paler below, margins toothed and often deeply lobed. The flowers are white, similar to the pear or apple, forming a small, purplish-black, occasionally red, apple-like fruit. This fruit is edible but has a rather flat taste and contains several hard seeds. Numerous long, sharp thorns are scattered along the trunk and branches.

Distinguishing Features:

Long sharp thorns.

Small, hard-seeded fruit.

COMMON CHOKECHERRY

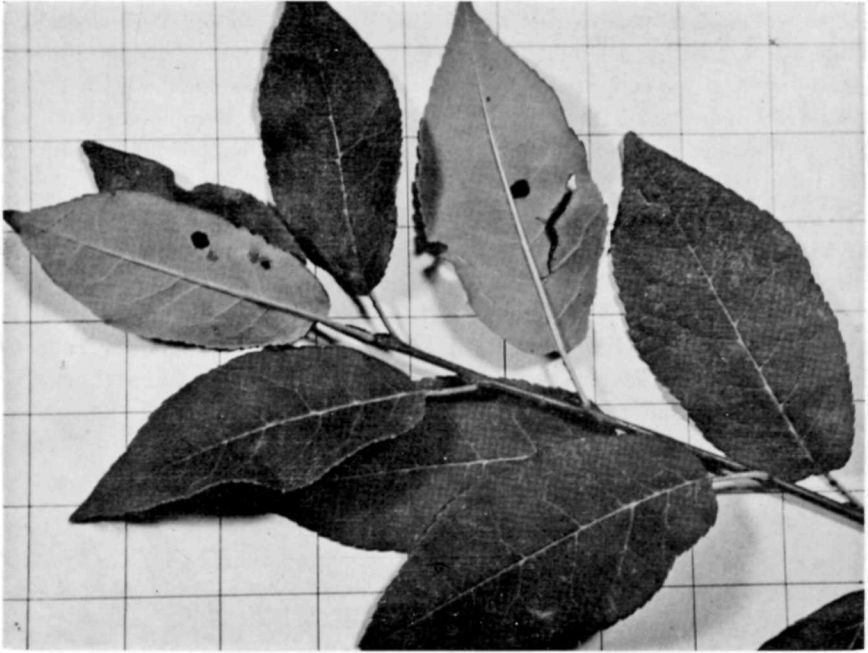
Prunus virginiana L.

The chokecherries belong to a large and well-known fruit-bearing family which also includes the plums, prunes, and cherries. It is also closely related to the almonds, apricots, and peaches. It is fairly common at low and middle altitudes in the park, particularly along stream bottoms and water courses of the eastern slopes. It usually grows in shrub form, up to 10 or 12 feet in height, but occasionally reaching tree size in sheltered locations.

The bark is reddish-brown, smooth, becoming scaly on older trees, is bitter to the taste, and has a distinct peach-like odor when crushed. The leaves are relatively thick, somewhat leathery, about 3 or 4 inches long, deep green on the upper side and paler below. The leaf margins are rimmed with small, sharp teeth. The fragrant clusters of white flowers are very noticeable during early summer, each blossom resembling a small cherry blossom.

The fruit consists of a cluster of small, reddish or nearly black, edible berries with a relatively large single seed, almost as large as a cherry seed. The berries have a somewhat "puckery" taste, especially when eaten before they are entirely ripe. Birds are especially fond of them and eat them in great numbers. Blackfeet Indians ate them raw or

ground them up, seeds and all, mixing them with dried meat to make "pemmican," a very nourishing and sustaining concentrated ration.



BLACK CHOKECHERRY FOLIAGE

Distinguishing Features:

Fragrant white flower clusters.

Clusters of dark red, "puckery" tasting, cherry-like fruit.

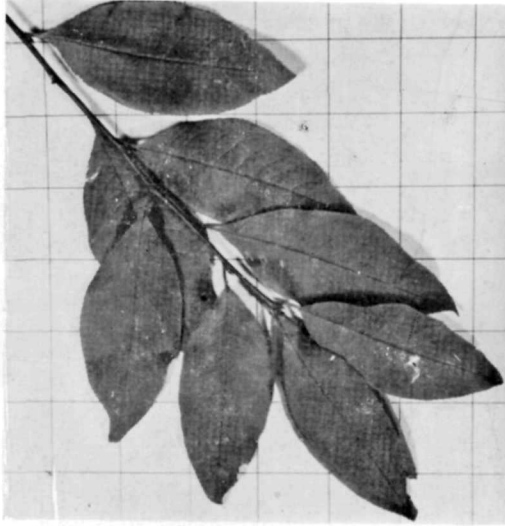
PIN CHERRY

Prunus pensylvanica L. f.

This species of cherry, somewhat similar to the chokecherry, is usually a small, single-stemmed shrub 5 or 6 feet high, but reaching small tree size in favorable locations. It is common on the western side of the park on open slopes at lower elevations. This cherry is a sub-species of the common eastern pin cherry, found only from Manitoba to Montana, Wyoming and Colorado.

The leaves are somewhat smaller than a chokecherry, ranging up to 3 inches in length, with rounded teeth on the margin. The flowers are white, smaller than, but closely resembling the domesticated cherry

blossom. The fruit is a small, red or red and yellow, cherry scattered along the branch or occurring in small clumps, very bitter to the taste.



FIN CHERRY FOLIAGE

Distinguishing Features:

Closely resembling a small cherry tree.

Fruit a small, red or red and yellow cherry, very bitter.

Flowers like cherry, scattered along stem or in small clusters.

DOUGLAS MAPLE (Mountain Maple)

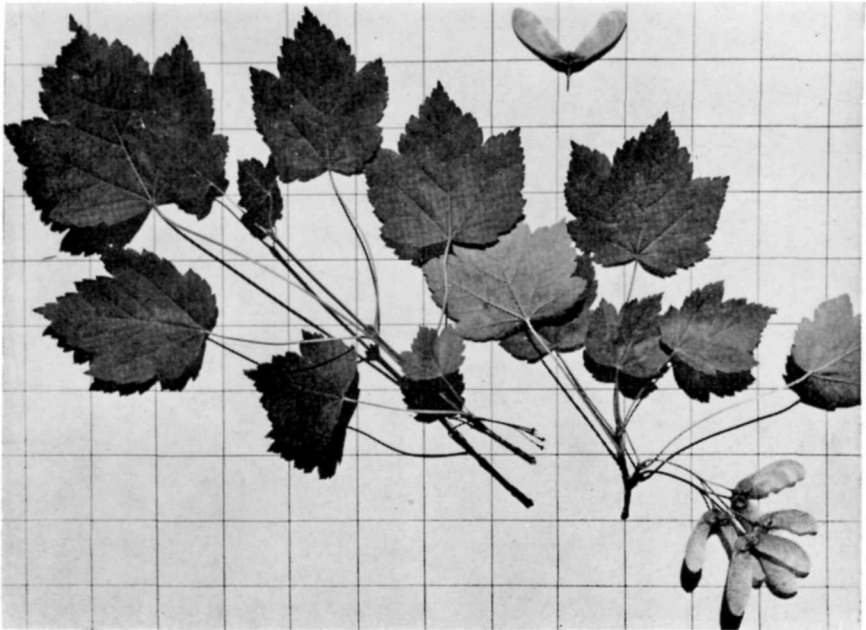
Acer glabrum douglasii (Hook.) Dipp.

This small species of maple is the only maple found in the park. It seldom reaches tree size, usually occurring as a small shrub 6 to 8 feet in height, but occasionally reaching tree size in the deeper woods under heavy forest cover. It is typically a northwestern tree, occurring from Alaska to the Pacific Northwest and Wyoming. In the park it may be found commonly throughout the lower and middle elevations, mainly in the woods or thickets.

This plant is very easily recognized by the typical 3 to 5-lobed maple leaves, growing in opposite pairs on the twig. These leaves range up to 4 inches in length, with a smooth, shiny upper surface, pale green below, irregularly toothed margin, and long, slender green to red leaf stems. The leaves may vary considerably in size and form on an individual bush and turn yellow or yellow-red in the fall before they are shed.

The bark is smooth, gray to gray-green in color. The fruit is typical

of the maple, consisting of a winged pair of connected nuts, which twirl slowly down from the tree when they mature and drop in the fall.



DOUGLAS MAPLE, WITH ITS TYPICAL MAPLE LEAVES AND WINGED FRUIT IS THE ONLY MAPLE IN THE PARK

Distinguishing Features:

Typical 3 to 5-lobed maple leaves.

Only maple in the park.

**AN EASY KEY FOR IDENTIFYING THE TREES OF GLACIER
NATIONAL PARK**

This simple key is designed for the trees of Glacier National Park only and may or may not be applicable for trees in other localities. To use the key one must first determine whether the unknown tree is CONE-BEARING (Section A) or BROADLEAVED (Section B). Then, under the proper section, find under Item No. 1 on the left-hand side of the page the characteristic that fits the tree in question. Immediately following the selected characteristic, on the right-hand side of the page will be found either the name of the tree or another number. If a number, locate this number on the left-hand side of the page and by a process of elimination select the tree characteristic that fits. Proceed in this manner until the name of the tree appears on the right-hand side of the page, following the last selected characteristic.

A—CONE BEARING TREES: Leaves needle-like, awl-shaped or scale-like; trees evergreen (except two species.)

- 1. Leaves needle-like, in cluster or bunches of two or more 2
- 1. Leaves needle-like, attached singly to twig 5
- 1. Leaves small, often overlapping, awl-shaped or scale-like 10
 - 2. Needles in bunches of 2 each, 1 to 2½ inches long
 - LODGEPOLE PINE
 - 2. Needles in bunches of 3 each, 4 to 10 inches long
 - PONDEROSA PINE
 - 2. Needles in bunches of 5 each, 1½ to 4 inches long 3
 - 2. Needles in bunches of 15 to 40 each, 1 to 2 inches long,
 - leaves shed annually 4
- 3. Trees tall and slender, needles slender and flexible; grows in valleys at lower elevations; cones 6 to 10 inches long, tan to light brown when mature WESTERN WHITE PINE
- 3. Trees generally gnarled and stunted; needles heavy and stiff; cones greenish; grows at or near timberline and on eastern foothills of the park LIMBER PINE
- 3. Trees similar to preceding species but cones purplish in color; strictly an alpine species WHITEBARK PINE
- 4. Needles in bunches of 15 to 30, 1 to 2 inches long; new twigs not hairy; confined to valleys and lower elevations; a large, stately tree WESTERN LARCH
- 4. Needles in bunches of 20 to 40, 1½ to 2 inches long; new twigs hairy; found only at or near timberline
 - SUBALPINE LARCH
- 5. Fruit a red berry, needles flattened and pointed, ½ to 1½ inches long; tree usually a small, sprawling, much-branched shrub; bark purplish PACIFIC YEW
- 5. Fruit a woody cone; needles flattened or square in cross-section; tree growing erect, up to 4 feet in diameter; bark grayish or dark brown 6
 - 6. Cones growing erect on branches; needles flattened. ½ to 2 inches long; cones disintegrate on branches 7
 - 6. Cones hanging down from branches; needles flattened or square in cross-section; cones may be found on ground under tree 8
- 7. Grows at lower elevations, on west slope of park only; not commonly seen; needles grow out on two ranks from either side of twig GRAND FIR
- 7. Grows mostly at high and middle elevations; needles grow out all around twig, curve to upper side like a brush
 - SUBALPINE FIR

- 8. Needles square in cross-section, sharp at tip -----
----- ENGELMANN SPRUCE
- 8. Needles not square in cross-section, needles blunt or rounded
at tip ----- 9
- 9. Needles dark green, 1/4 to 3/4 inches long, growing mainly from
opposite sides of twig. Tip of tree characteristically droop-
ing ----- WESTERN HEMLOCK
- 9. Needles usually deep yellow-green, 3/4 to 1 1/4 inches long, grow-
ing out all around twig; tip of tree erect ----- DOUGLAS-FIR
- 10. Fruit a woody cone; branchlets flat and fern-like; leaves
scale-like and overlapping; generally a large tree -----
----- WESTERN REDCEDAR
- 10. Fruit a blue berry, branchlets not flat, leaves scale-like or awl-
shaped; small scrubby tree or sprawling shrub ---- JUNIPER

B—BROADLEAVED TREES: Leaves not needle-like; shed in winter.

- 1. Leaves growing in diametrically opposite pairs on twig; typical
3 or 5-lobed maple leaf; a shrub or small tree -----
----- DOUGLAS MAPLE
- 1. Leaves growing alternately along twig; not maple-like ----- 2
- 2. Branches covered with numerous long, sharp thorns, a much-
branched shrub or small tree ----- BLACK HAWTHORN
- 2. Branches without thorns ----- 3
- 3. Younger leaves with a pair of small, leaf-like growths (stip-
ules) at the base of the leaf stem; minute seeds borne in a
hard capsule, each seed bearing a small tuft of hair; flowers
a fuzzy catkin; a shrub or occasionally a small tree...WILLOW
- 3. Leaf stem without stipules ----- 4
- 4. Fruit a woody, cone-like body; male flowers green to brown-
ish tassel-like bodies, persisting over winter; may be seen
on some trees at all times ----- 5
- 4. Fruit and flowers not as above ----- 7
- 5. Bark smooth, white or reddish-brown; readily peeled off in
thin, papery layers ----- 6
- 5. Bark smooth, reddish-brown only; does not peel off in layers;
leaves prominently ribbed; shrub or small tree -----ALDER
- 6. Bark white or whitish; a small tree -----
----- NORTHWESTERN PAPER BIRCH
- 6. Bark reddish-brown; largest of birches -----
----- WESTERN PAPER BIRCH
- 7. Fruit a fleshy berry containing a single seed; flowers white,
borne in clusters; bark smooth, reddish-brown; a shrub or
small tree ----- 8

7. Seed contained in a hard capsule; flowers small, greenish, bark white or grayish, smooth to roughly ridged on large trees..... 9
8. Flowers and fruit borne in dense, hanging clusters; fruit dark red to nearly black; leaves sharply toothed along margin; fruit has "puckery" taste --- COMMON CHOKECHERRY
8. Flowers and fruit scattered or in small clusters; fruit bright red or red and yellow; bitter to taste; leaf with rounded teeth along margin PIN CHERRY
9. Bark smooth and white; leaves about as long as broad; up to 3 inches in length; stems long and flattened, causing leaves to flutter constantly in light breezes QUAKING ASPEN
9. Bark smooth and grayish to greenish-white on young trees, roughly furrowed and gray on older trees; leaves broadly ovate, up to 5 inches in length BLACK COTTONWOOD

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The Association lists for sale a number of interesting and authentic publications for adults and children dealing with the Park and natural history, conservation, and national park subjects in general. Revenues derived from the sale of these items are used to publish additional interpretive material on Park subjects from time to time. Pamphlets at present available are listed as follows:

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- Bulletin No. 2—Glaciers and Glaciation in Glacier National Park, 1948 — 25 cents.
- Bulletin No. 3—Geologic Story of Glacier National Park, 1949 — 25 cents
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