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of MOUNT RAINIER
NATIONAL PARK

COVER: Deep forest of the transition zone, near Longmire, on the Indian Henry trail. Principal trees in view are Douglas fir (large specimen in center background with heavy bark), western hemlock (at left of large Douglas fir), and Pacific silver fir (smaller trees with mottled bark).

TREES
of
MOUNT RAINIER
NATIONAL PARK

by
C. FRANK BROCKMAN

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TREES

OF MOUNT RAINIER NATIONAL PARK

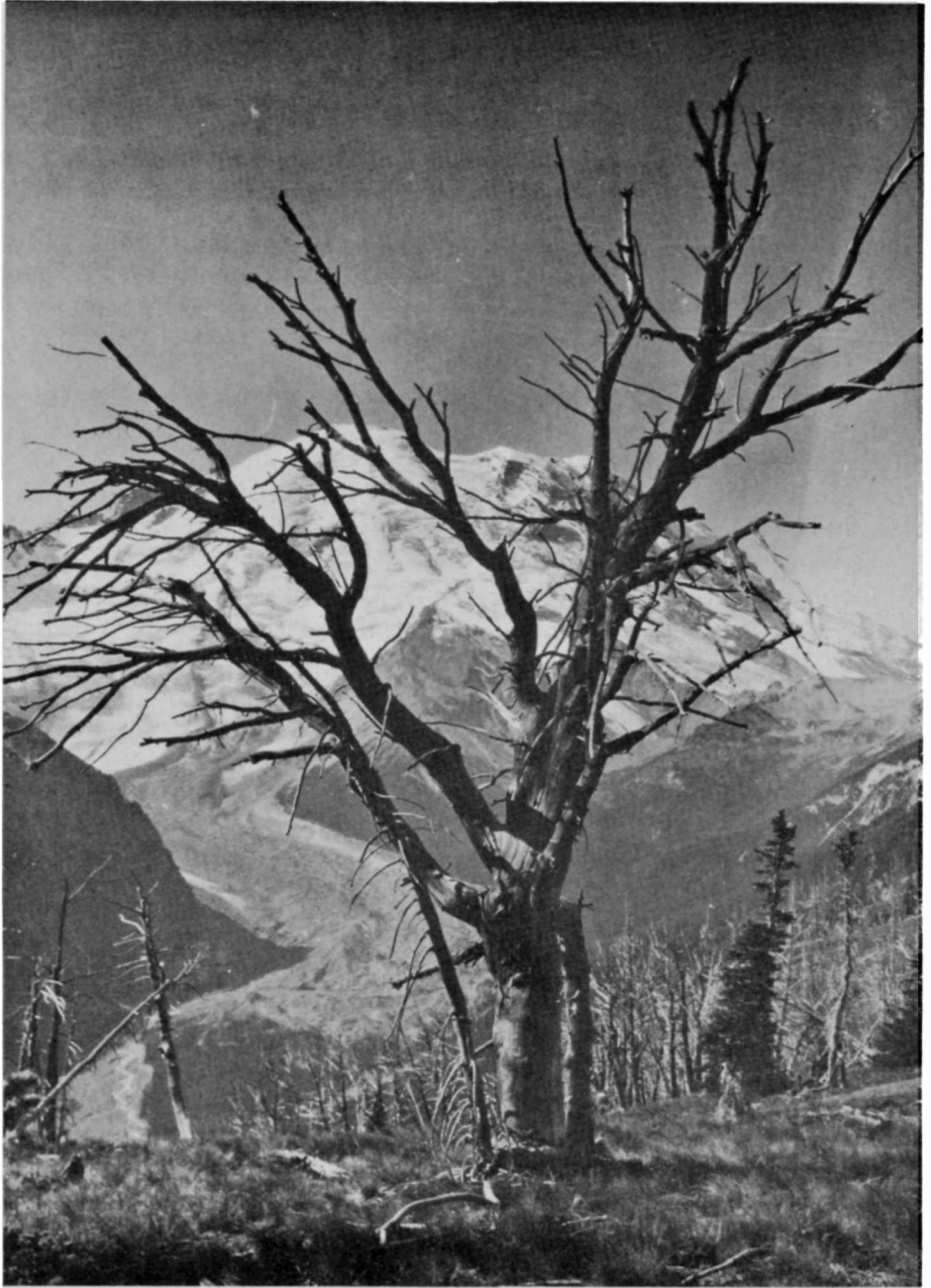
By C. FRANK BROCKMAN



INTRODUCTION

LIKE A BRILLIANT DIAMOND whose sparkling beauty is enriched by contrast with surrounding emeralds, the majesty of Mount Rainier is enhanced by the verdure of the forests that clothe the lesser ranges at its base. Viewed from a distance "The Mountain" stands alone and aloof, towering above the green-clad hills that rise, tier upon tier, to the glistening glaciers that clothe the upper slopes of the old volcano. It is a veritable "arctic island in a temperate sea." The upper elevations are characterized by a climate similar to that in the far north while the lower slopes reach down into the more temperate climes typical of the Puget Sound basin. To a great extent this accounts for the opportunity that exists in Mount Rainier National Park for the study of Pacific Northwest forests, for, although the park area is but a minute part of the Pacific Northwest, nearly 40 per cent of the trees native to this region are found here.

Of even greater importance is the fact that the major share of the original virgin forests of the Pacific Northwest has been cut. Even though scientific forestry is assuming greater importance, such activities do not and cannot be expected to maintain virgin conditions. A managed forest is not a wild forest. But the forests of Mount Rainier National Park, in keeping with the policy of the National Park Service, will be maintained forever in an undisturbed condition. They will stand as a veritable "outdoor museum" of the magnificent timber cover that was once characteristic of the entire region and which was, in many respects, one of the most remarkable in the world.



—Rainier National Park Co. photo

Skeleton of whitebark pine at Yakima Park. Note zonal distribution of timber from heavily forested areas at low elevations to higher alpine slopes.

Percentage of Timbered Area in Mount Rainier National Park

Of the 377.78 square miles (241,782 acres) within the boundary of Mount Rainier National Park, about 291 square miles (77 per cent) are timbered in some form. This includes not only the densely forested areas at the lower elevations but also the subalpine and timber-line regions, and those areas that in the past have been swept by fire. The latter are regarded as potential forest areas. Subalpine and timber-line regions are included because, in a national park, the esthetic values of the forest at the upper elevations are as highly regarded as are those of greater potential commercial importance at the lower elevations.

Forest Types and Associations

The significant changes in the character of the forest here, from the lower park boundaries to timber line, may be readily observed. These changes are largely due to differences in climate brought about by differences in altitude.¹ They are further complicated by conditions of soil and moisture which influence the formation of certain forest associations within the four principal timber zones.

Lowland forest: Penetrating the park by means of the principal river valleys, this heavily wooded zone, impressive in its somber beauty, great density of stand, and huge size of individual trees, extends upward to an elevation of about 4,000 feet above sea level. However, in some sections of the park it is not well defined above the 3,500-foot elevation. On the other hand one sometimes encounters it as high as 4,300 feet, particularly on the west side of the park.

This heavily wooded zone occupies an area of about 61 square miles, or roughly 16 per cent of the area of the park. The principal trees in this region are the western hemlock, Douglas fir, and western red cedar. Above the 2,500-foot level Pacific silver fir is quite abundant, while grand fir may be encountered in the lower portions of this zone. Although more characteristic of the intermediate forests, western white pine, noble fir, and Alaska yellow cedar are found as low as 2,700 feet. Lodgepole pine is not common but may be readily

¹ In the coastal area of the state of Washington about 75 per cent of the total annual precipitation falls from October to May. As Mount Rainier National Park lies entirely west of the crest of the Cascade Range, a part of which forms a portion of the eastern park boundary, its climate is similar to that of other areas of like altitude west of the Cascades. Meteorological data taken in the park indicate that the average annual precipitation at Longmire (2,760 feet) is, including snowfall, about 78 inches. At Paradise (5,557 feet) it is roughly 100 inches. The average annual snowfall at Longmire is about 15 feet, the maximum depth at any one time varying from 2 to 7 feet. At Paradise approximately 50 feet of snow falls annually, the maximum depth at any one time varying from 15 to 25 feet.

While no records are available for Yakima Park (6,400 feet) casual observations over many years indicate that, although this point is 900 feet higher than Paradise, the snowfall is considerably less. The usual maximum depth is 10 to 15 feet.

In addition, topographical features account for local variations in precipitation and, in general, windward slopes receive a greater amount of moisture than do leeward exposures.

In spite of its latitude, which is comparable to that of northern Maine, and its heavy snowfall, Mount Rainier National Park is characterized by comparatively mild winters. This is largely due to the proximity of the Pacific. On the other hand the summers are rarely hot for any extended period.

found at Longmire. Pacific yew is scattered throughout this zone up to 4,000 feet.

Among the more important deciduous trees are the red alder and northern black cottonwood. The former is quite abundant up to 3,000 feet in moist locations, while the latter may be readily found along streams up to nearly 4,000 feet. While not abundant both the big-leaf maple and the Pacific dogwood will also be noted. The latter is found primarily in the Ohanapecosh region.

Intermediate forest: This forest zone lies between the dense forests of the lower park elevations and the more open subalpine meadows. It occurs between the altitudinal limits of 4,000 and 5,200 feet, although in some instances intermediate factors may be noted as low as 3,500 feet or as high as 5,600 feet. A total of about 79 square miles or a little more than 21 per cent of the park area is included in this zone.

The principal tree species are noble fir, Alaska yellow cedar, western white pine, western hemlock, and Pacific silver fir. Mountain hemlock occurs in the upper levels. Engelmann spruce may also be found here but only in the northern part of the park, on Chenuis Mountain, for example, and in the vicinity of the terminus of the Emmons glacier. Douglas fir may also be noted occasionally but it is not abundant; its upper altitudinal limit here is 4,500 feet.

This zone is almost totally composed of cone-bearing trees. No deciduous species, other than a few willows, have been recorded.

The transition between the lowland and intermediate forests is not sharply defined. However, as one ascends to higher elevations in the park a gradual change is apparent. The western hemlock-Douglas fir-western red cedar combination dissolves. Douglas fir is only sparingly present, and western red cedar is entirely absent. Western hemlock is found, but the relatively greater abundance of noble fir, Alaska yellow cedar, and western white pine is pronounced.

Trees within this altitudinal range rarely exceed 36 inches in diameter. Usually they are much smaller, while the difference in the luxuriance and composition of the ground cover, as compared to that of the lower zone, is very evident.

Subalpine forest: Between 5,200 and 6,500 feet one finds beautiful subalpine meadows in which occur artistic groups of trees—largely alpine fir and mountain hemlock. In certain instances subalpine characteristics may be found as low as 5,000 feet and as high as 6,700 feet, but in general they lie between the levels already noted. This zone comprises about 77 square miles, or about 21 per cent of the park area.

In addition to the principal species, one also finds whitebark pine, Alaska yellow cedar, and, occasionally, Pacific silver fir and lodgepole pine. In this zone in the Yakima Park area Engelmann spruce is also present.

One interesting feature of this region is the very evident difference in tree associations in the Yakima Park area, on the northeast side of Mount Rainier, and in other sections of the park at the same altitudinal levels. As already



Snow-covered, spire-like alpine firs highlight this winter view of Mount Rainier and Paradise Valley (Hudsonian zone) as seen from Marmot Point.



This spot on the Narada Falls-Reflection Lake trail typifies the forest of the intermediate zone. Trees with shaggy bark are Alaska yellow cedar.

stated, the alpine fir and mountain hemlock are the two principal species in the subalpine zone, but in Yakima Park whitebark pine replaces the mountain hemlock as the chief associate of alpine fir.

Timber-line forest. As the name indicates, this zone forms the upper limit of tree growth. It is a narrow belt between the subalpine area and that rigorous region characterized by barren rock, glacier ice, and perpetual snow fields. Timber-line factors may be noted as low as 6,000 feet in some instances and as high as 7,200 feet in others, but generally the timber-line zone is confined between 6,500 and 7,000 feet. Included within this region are about 33 square miles, nearly 9 per cent of the park area.

Throughout most of this zone alpine fir, mountain hemlock, and whitebark pine play the dominant role. Frequently Alaska yellow cedar is found in this zone, and in the northern portion of the park Engelmann spruce occurs in some abundance.

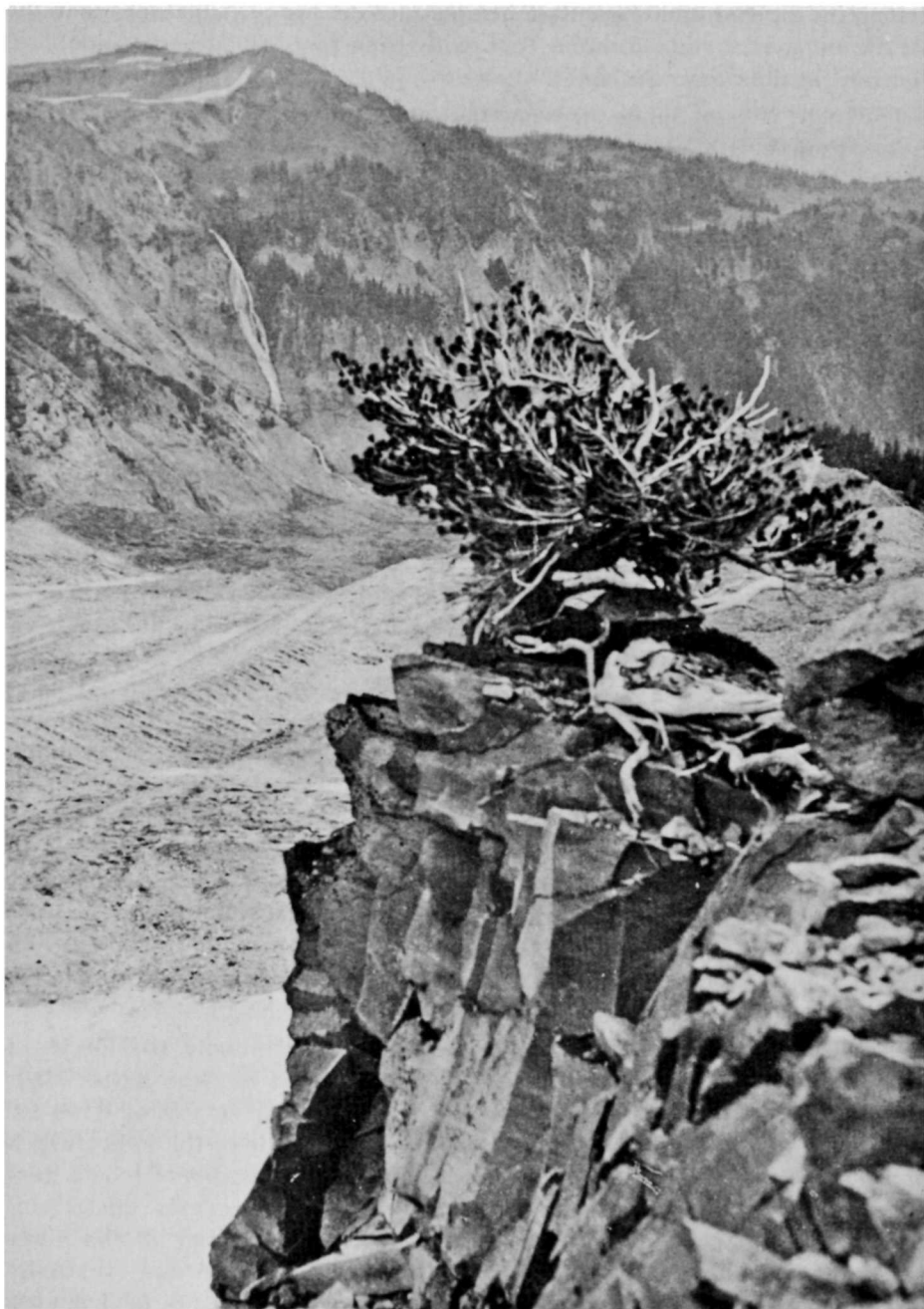
In many respects this is the most picturesque area in the park. It is characterized by extreme ruggedness and poor, rocky soil. Temperature extremes are considerable, the growing season is very short, and high winds patrol the crests almost incessantly. These, and related factors, account for the slow growth, dwarfed stature, and gnarled appearance of timber-line trees. Consequently they possess a picturesque grandeur that is emblematic of the rigorous nature of the "high country."

Enemies of the Forest

Fire, insects, and fungi are the principal enemies of the forest. Man should also be included in this category since his activities are often responsible for fires as well as for other damaging effects. For instance, in campgrounds and similar heavily used areas man contributes to the decline of the forest by his destruction, intentionally or otherwise, of its ecological balance by so packing the soil about the roots of trees that improper aeration of the soil and slow death of many trees results.

It should be pointed out that not all insects and all fungi are destructive. Many types of insects prey upon destructive species and are thus part of a natural condition that holds those that are damaging in check; for destructive species are always present under natural forest conditions, and it is only when their numbers exceed a normal population—an epidemic condition—that they do any appreciable harm. Many fungi also serve a useful purpose, primarily as scavengers. They aid in reducing forest litter, which otherwise would increase to prodigious proportions.

So much has been written about forest fires that the factors responsible for them should be well understood by the public. Since approximately 24 per cent of the fires in Mount Rainier National Park are man-caused, it behooves each visitor to this area to be doubly careful lest some careless or thoughtless act result in the destruction of the forest here. Because the danger from forest fires is ever present during the summer months, a vigilant organization is main-



—Natt Dodge photo

A whitebark pine, sentinel of the "high country," occupies this precarious spot overlooking the Cowlitz glacier.

tained by the National Park Service here for preventing their occurrence or, in the event that they do occur, for locating and extinguishing them in the shortest possible time. Six fire lookouts, located in various parts of the park, are the backbone of the protection organization.

The western white pine in the park has suffered greatly from damage by the white pine blister rust (*Cronartium ribicola*). This is an introduced European fungus disease that attacks all five-needled pines. It has destroyed millions of dollars worth of white and sugar pine in the western states in spite of efforts to control it. Since this disease cannot spread directly from pine to pine, but is dependent upon the presence of currants or gooseberries (*Ribes*) for the completion of its life cycle, control measures consist of the elimination of those plants in areas where pines susceptible to the disease are found. Since 1931 such control measures have been conducted in Mount Rainier National Park. However, in spite of this the white pine blister rust has become so firmly established in this area that the program has been confined to those areas where western white pine is an important member of the forest, or where its absence would leave a conspicuous void in the landscape. The disastrous effects of this disease can be most readily observed in the lower Stevens Canyon area.

Western white pine has another important enemy in the mountain pine beetle (*Dendroctinus monticolae*). The adult beetles bore through the bark and construct long, perpendicular galleries in the living tissue (cambium) beneath the surface. Eggs are laid on the sides of these galleries. Upon hatching, the grubs (larvae) excavate short feeding tunnels at right angles from the egg gallery. Thus, when these beetles are present in sufficient number, the result is a complete girdling, and consequently the destruction, of badly infected trees. The brown foliage of dead and dying western white pines on the slope of Rampart Ridge, as viewed from Longmire, is evidence of the activity of this destructive insect. The only control is the destruction of infected trees, which merely reduces the numbers of these beetles and prevents nearby healthy trees from being similarly attacked.

Miscellaneous Interesting Features

One of the first things that the visitor will notice about the forests of Mount Rainier National Park is the large percentage of clear length characteristic of the trunks of the larger trees. Often they will be free of limbs for 100 feet or more. The cause of this is the extreme density of the forest, which prevents ready infiltration of sunlight necessary for the process of food manufacture (photosynthesis) in the foliage. Consequently the trees grow tall to avail themselves of the maximum amount of sunlight. The foliage of the lower branches dies and drops to the ground, followed by the twigs and eventually the larger branches, which are sloughed off as the tree increases in diameter. This process is known as "self-pruning." The same trees, were they growing in more open situations where ample light could reach all portions of the crown, would bear branches nearly to the ground.

Only those species which have a high degree of tolerance for the intense competition that exists between all plants in the dense, shaded forest can endure and reproduce under such conditions. This accounts for the fact that while Douglas firs are invariably the largest trees in the forests of the lower elevations the abundance of that species there is relatively low. Douglas fir is a relatively intolerant species and requires ample sunlight for its best development. The larger trees that one finds are survivors from the days when Douglas fir was more abundant on the area. Western hemlock, a species that can grow and reproduce in dense shade, has gradually usurped the place of the Douglas fir. Numerous seedlings of western hemlock will be found. Often they will be seen growing on rotting logs or stumps, or even far above the ground where they have taken root in some dead, upright snag. On occasion fallen logs that span ravines support a veritable hedge of western hemlock seedlings. However, unless the roots of these seedlings can reach the soil at some later date when the log rots, breaks in two, and drops to the ground, they will never reach maturity.

Throughout large areas of the intermediate timber zone many trees are festooned with a gray-green lichen known locally as goat's-beard moss. During dry weather this materially increases the fire hazard, for it dries out quickly and offers a quick-kindling torch by which fire is rapidly carried into the crowns.

The subalpine region is characterized by alpine firs in symmetrical, artistic groups—each one made up of a number of large individuals surrounded by others of gradually diminishing size until, on the outer rim, one finds small seedlings only a few years old. Interspersed with open, flower-decked meadows, and framing a wide variety of alpine vistas, they are one of the most attractive features of this zone. These artistic groups of trees are the result of natural conditions. Soon after the cones of these trees mature the park enjoys its first touch of winter. The seeds, covered by early snow, are held near the parent trees where they germinate and take root. Where two such groups are close together they may eventually merge, and on sloping hillsides the taller and older trees are generally present upon the upper side, for the slope of the ground enables the seeds to scatter downhill a bit before coming to rest.

Timber line also holds varied interests. Often wind-swept ridges are crowned with a sparse growth of small, windblown trees, while immediately below, in more protected locations, trees are often conspicuous by their absence. It almost seems as if these timber-line trees selected the most harsh environment possible. One may account for this partially by the fact that these ridges were the first land to be freed from glacier ice and thus served as the first haven for plants in this rugged region. Likewise, these ridges are the first to be freed from winter snow, while the slopes of the valleys are actually more inhospitable to the establishment of trees, because of the sliding and avalanching of snowdrifts. Furthermore, in the evening cold air drains from the heights into the alpine valleys so that the temperature in such locations may often be too low to permit the germination of tree seed or the development of a forest cover.

WESTERN WHITE PINE

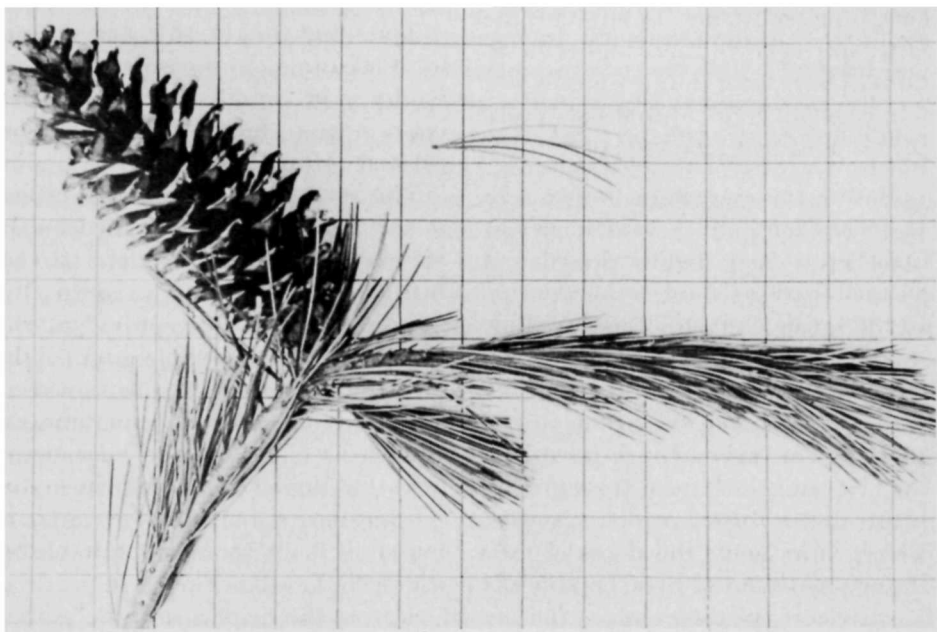
Pinus monticola Dougl.—Pine Family (*Pinaceae*)

Although it may be found at sea level in western Washington, this tree is essentially one of the middle and upper mountain slopes. In Mount Rainier National Park it is most prevalent between the 3,500-foot and 4,500-foot levels. Here it may be most readily noted in old burns, where it is an important species in the natural reforestation of such areas.

Unfortunately the western white pine is subject to great damage by the white pine blister rust, an introduced European fungus disease, and by the mountain pine beetle. Both have caused disastrous losses, not only in Mount Rainier National Park, but elsewhere in the range of this tree.

The brown foliage of dead and dying western white pine seen on the slope of Rampart Ridge from Longmire is evidence of beetle damage. The effects of blister rust in the park are most evident in lower Stevens Canyon.

In both youth and maturity the western white pine is a handsome tree. Under crowded forest conditions mature specimens possess a long, clear bole with an open, short-branched crown. Smaller trees, particularly those growing in the open, are characterized by whorls of regularly spaced branches throughout the length of the trunk. Of rapid growth, particularly in youth, the tree may reach an age of 200 to 500 years, a height of about 150



feet, and a diameter of 2 to 3 feet. Mature trunks are characterized by dark, ash-gray bark, broken up into a distinctive pattern of small square or rectangular plates. None of its associates has bark of a similar appearance.

The foliage, however, offers the best means of identification. Like all pines (with the exception of one species which is confined to the southwest), its needles are borne in "bundles." In this case they are borne five in a "bundle," are slender, flexible, 2 to 4 inches long, and blue-green in color. This readily separates the western white pine from the lodge pole pine, which has needles borne two per "bundle." And although five-needled "bundles" are also characteristic of the whitebark pine, the third common member of the pine group in Mount Rainier National Park, the needles of the whitebark pine are stouter. In addition the latter species is typical of higher elevations. Thus, since the two species are found at different altitudinal levels, they should never be confused.

Mature cones are dark brown, 6 to 12 inches long and 2 to 3 inches in diameter, stalked, slightly curved, and characterized by hard, woody scales. In the spring clusters of bright-yellow staminate flowers may be found on the lower branches, while near the ends of the branches higher in the tree one may observe the purple pistillate flowers which will develop into cones after fertilization. Erect at first, they later become pendent, and in the summer of the second year, just before



Immature western white pine.

maturity, they are very resinous and light green to purplish-brown in color.

The wood is light, soft, and of uniform texture, possessing qualities that render it of considerable commercial importance in areas where it may be cut and utilized.

The western white pine grows throughout a wide area in the west. It may be found in the southern part of British Columbia, eastward to the western slope of the Continental Divide in western Montana, and southward in the Blue Mountains, Cascades, and coast ranges of Washington and Oregon—at successively higher elevations—to the Sierra Nevada in southern California. In the latter case it is found as high as 10,000 feet above sea level.

WHITEBARK PINE

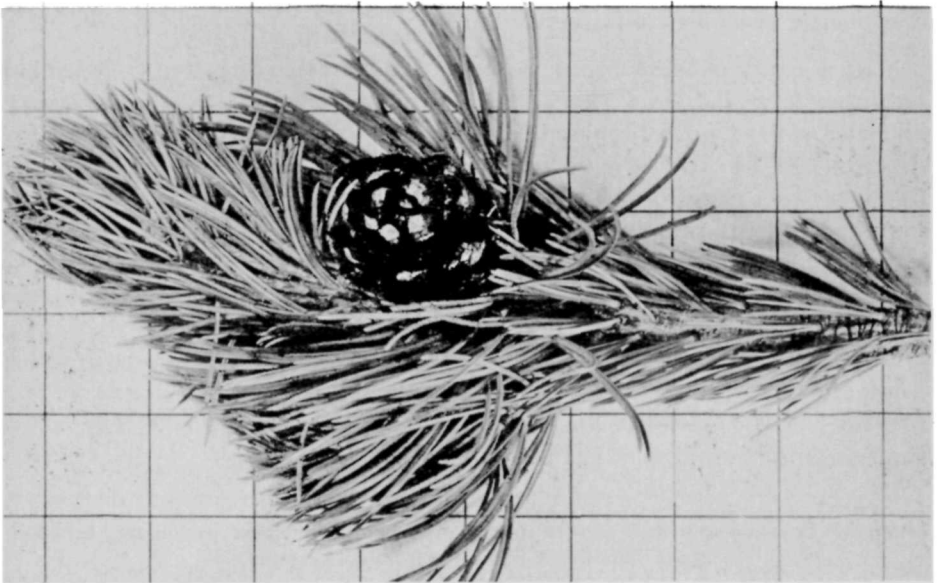
Pinus albicaulis Engelm.—Pine Family (*Pinaceae*)

This tree, an arboreal pioneer, is a typical inhabitant of the rigorous timber-line region in Mount Rainier National Park. There, growing on poor, rocky soils in exposed situations, and buffeted and mauled by the elements, it often assumes a variety of picturesque forms. Its tough, flexible branches are gnarled, twisted, and pointed in the direction of the prevailing winds. Its form is stunted and irregular. Occasionally it is little more than a sprawling shrub; a loose, prostrate mat. Even in better, more hospitable soils in more protected locations the whitebark pine never reaches large size. Under such conditions it is usually 30 to 50 feet tall and 6 to 18 inches in diameter, although larger individuals may often be found. It never occurs at low elevations. While its altitudinal limits lie between 5,400 and 7,500 feet, it prefers the narrow

upper fringe of tree development at or just below timber line, where it occurs with alpine fir and mountain hemlock, its principal associates, which are also tree pioneers. The most easily accessible spots where this tree may be seen here are in Yakima Park, where it replaces the mountain hemlock as the principal associate of the alpine fir, and along the sky-line trail above Paradise.

The needles, like those of the western white pine, are borne five in a "bundle." However, unlike those of the western white pine, the needles of this species are dark yellow-green, 1 to 3 inches long, densely clustered at the ends of the branches, stout, stiff, and somewhat incurved. They remain on the branches from four to seven years.

The cones are egg-shaped, about 1½ to 3 inches long, greenish to brownish-purple in color, and char-



acterized by very thick scales which are each armed with a blunt point at the apex. Two years are required for the cones to mature. They are unique among pine cones in that they disintegrate from the central axis after maturity, a feature which aids in scattering the plump, chocolate-brown seeds. The seeds are eagerly sought after by chipmunks and ground squirrels, and these animals may often be seen foraging in the branches of the whitebark pines in late summer and early fall.

The bark, as indicated by the common name, is smooth and light gray in color. Only occasionally is it broken up into thin, brownish to gray scales at the base of larger trunks. As one might suspect from the nature of its rigorous habitat, this tree grows slowly; maturity is reached in from 200 to 300 years.

The whitebark pine occurs in Washington at elevations of 5,000 to 7,000 feet in both the Cascades and the Olympics. Beyond the borders of this state it is found in similar locations in the Selkirks of western British Columbia, on the high crests of the Rockies which form the border between British Columbia and Alberta, in the Bitterroot Mountains of northern Idaho and the high Rockies of western Montana and northwestern Wyoming, in the Blue Mountains, Cascades, and Siskiyou of Oregon, and in California south to the central Sierra Nevada.



—Victor Scheffer photo
Whitebark pine at Yakima Park.

As its range extends southward, it is found at successively higher elevations, maintaining its relative position as a tree of the "high country."

Like all five-needled pines, it is subject to damage by the white pine blister rust. However, the whitebark pine generally occurs singly or in scattered groups, and since only a few species of currants and gooseberries are found in the alpine situations in close proximity to these trees, the danger of infection is greatly reduced.

LOGGEPOLE PINE

Pinus contorta Dougl.—Pine Family (*Pinaceae*)

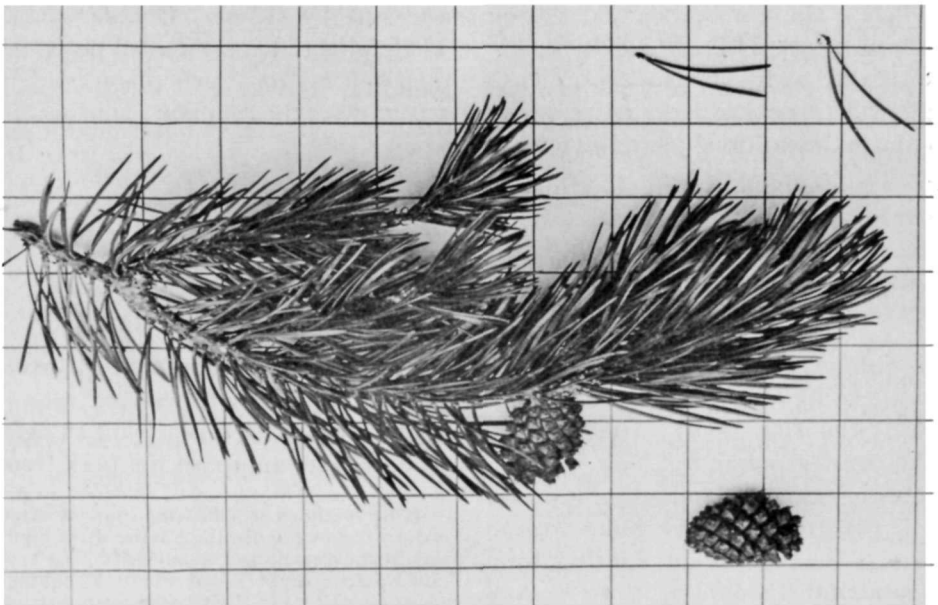
While relatively unimportant in Mount Rainier National Park, the lodgepole pine is of interest here largely because of its irregular distribution, for it adapts itself to a wide variety of soil, moisture, and climatic conditions. It is most abundant in the rocky soils along the north and west bank of the White River, and it may be readily found in the White River campground (4,500 feet). Isolated specimens are occasionally noted in a variety of situations up to elevations as high as 6,500 feet—such as on the divide between Mystic Lake and Moraine Park. A small grove of these trees will also be found in the meadow near the mineral springs at Longmire (2,700 feet), although in this case it

is likely that they originated from introduced seed.²

Within the park this species is a small, scrubby tree. It is rarely more than 20 to 40 feet tall and 6 to 18 inches in diameter. The bark is scaly, about an inch thick, and dark gray to black in color. The crown is long and composed of stout, stiff, and often forked branches.

The foliage, however, offers the best means of identification, for the needles

²Lodgepole pine is quite abundant on the prairie near Yelm, site of the original Longmire ranch, and since hay was hauled from that point to the springs in the early days, it seems likely that seeds of the lodgepole pine were transported with the hay. The lodgepole pines at Longmire are relatively uniform in size and of an age group that at least hints strongly of that possibility.



Cones and foliage of lodgepole pine. Note that needles are two per "bundle."

are stout, stiff, 1 to 3 inches long, and borne two per "bundle." This latter feature sets the lodgepole pine apart from all other trees in this region. The cones are round to egg-shaped, 1 to 2 inches long, asymmetrical at the base, with thick, woody scales, each of which has a stout prickle at the apex. They ripen in the fall of the second year but remain on the branches for long periods — even after they have opened and discharged their seeds.

The lodgepole pines found in Mount Rainier National Park in general appearance resemble others of the same species found in the coastal section of its wide range. This includes a considerable area in the west, at elevations ranging from sea level to timber line, from southeastern Alaska and the Yukon southward through the Rockies to southern Colorado, and to southern California in the Sierra Nevada. There is also a small detached section in the Black Hills where lodgepole pine may be found. However, due to the wide variety of soil, moisture, and climatic conditions encountered in

this wide range, the lodgepole pine does not maintain a uniform appearance. The inland form, which is occasionally found on the eastern side of the Cascades at elevations of from 3,000 to 6,000 feet, is most typical of the Rocky Mountain and Sierra Nevada regions. It differs widely from the scrubby coastal type, being tall and slender, from 50 to 75 feet in height and 10 to 30 inches in diameter, with a short, open crown and thin, scaly, gray to cinnamon-brown bark.

Since the seeds of lodgepole pine retain their vitality for long periods, and since the tree is a prolific and early seeder — frequently producing cones at ten years of age — it is often able to restock areas that have been destroyed by fire. This is particularly true in the Rocky Mountain region where, under such conditions, it often forms stands of great density, characterized by slender, flexible stems. The plains Indians obtained poles for their tepees from such places, which accounts for the common name of this tree.

PONDEROSA PINE

Pinus ponderosa Dougl.—Pine Family (*Pinaceae*)

Although this tree grows throughout a wider range than any other American cone-bearing tree, and although it is one of the most common trees in eastern Washington, it occurs so sparingly in the more humid region west of the Cascade summit that, from a practical standpoint, it can be considered almost nonexistent. In Mount Rainier National Park it is so rare that

it is extremely unlikely that the average visitor will see it here.³

However, since it is a familiar sight to those who approach the park from

³One specimen will be found on the slope a short distance above the Yakima Park highway at an elevation of about 4,500 feet. Several others will be noted in the Laughing-water Creek area of the Ohanapecosh district. These are the only known representatives of this species found in Mount Rainier National Park.

Yakima and other eastern Washington cities, it deserves mention here. Mature specimens are trees of majestic beauty with massive, straight, cylindrical trunks characterized by bright orange-yellow to cinnamon-brown bark that is divided into large, irregular plates. Close examination will reveal that the bark is further composed of tightly compressed scales which fit together like pieces of a jigsaw puzzle. The bark of younger, more vigorous trees is quite different, being dark brown to black, and being divided into narrow, longitudinal plates. Such individuals are commonly known as "bull pine" or "blackjack pine."

The needles are borne two to three per "bundle" with both two- and three-needled clusters being found on the same tree. They are 5 to 10 inches long, flexible, bright yellow-green, and arranged in characteristic tufts near the ends of the upturned branches. The cones, which are often clustered on the branches, are 3 to 6 inches long and $1\frac{1}{2}$ to 2 inches in diameter with



Trunk of mature ponderosa pine illustrating typical bark.

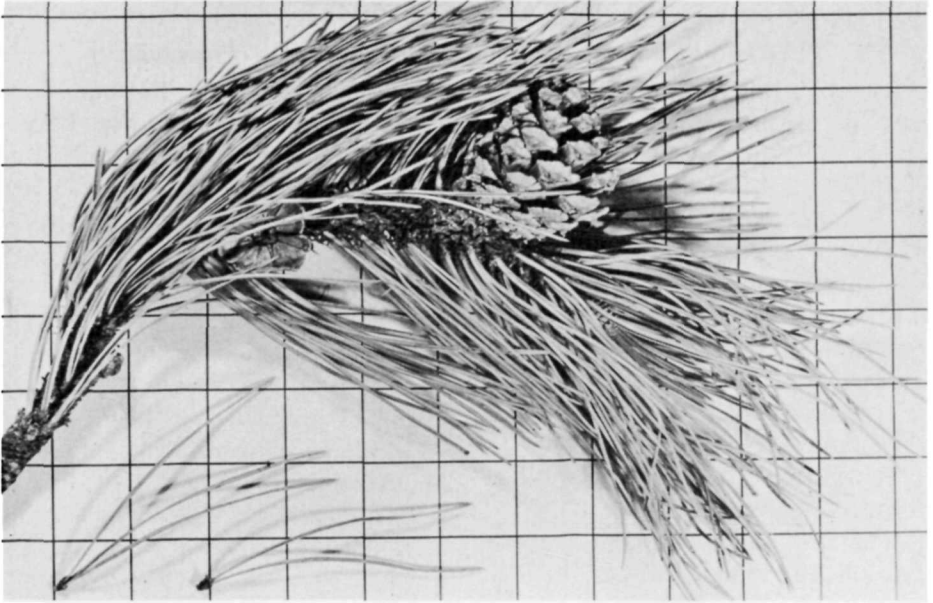
scales that are each armed with a sharp prickle at the tip.

WESTERN LARCH

Larix occidentalis Nutt.—Pine Family (*Pinaceae*)

Although not found in Mount Rainier National Park, this tree will be observed along the Chinook Pass highway, east of the Cascade crest, by visitors approaching the park from Yakima. It is unique among northwestern cone-bearing trees in that it is not evergreen. Each fall the needles, which are borne in distinctive, brush-like clusters, turn pale lemon-yellow and drop from the branches. Thus

these trees are stark and naked during winter, but with the coming of spring they are again enlivened by fresh, yellow-green foliage. Mature specimens present a handsome appearance, being characterized by a short, open crown, distinctly thinner in appearance than those of associated conifers, and straight, clean trunks having scaly, reddish-brown bark.



Cone and foliage of ponderosa pine. Note that needles are two or three per "bundle."



Foliage and cones of western larch. Note that needles are borne in brush-like clusters.

—Asahel Curtis photo

ENGELMANN SPRUCE

Picea engelmanni (Parry) Engelm.—Pine Family (*Pinaceae*)

Although this tree, a typical inhabitant of the upper mountain slopes, occurs widely throughout the west,⁴ it is found only in the northern section of Mount Rainier National Park. Chenuis Mountain, in the northwest section of the area, and places along the Wonderland Trail support numbers of these trees. However, it may be most readily found in the White River-Yakima Park region at elevations ranging from 4,500 to 6,500 feet. Many will be noted about the White River campground.

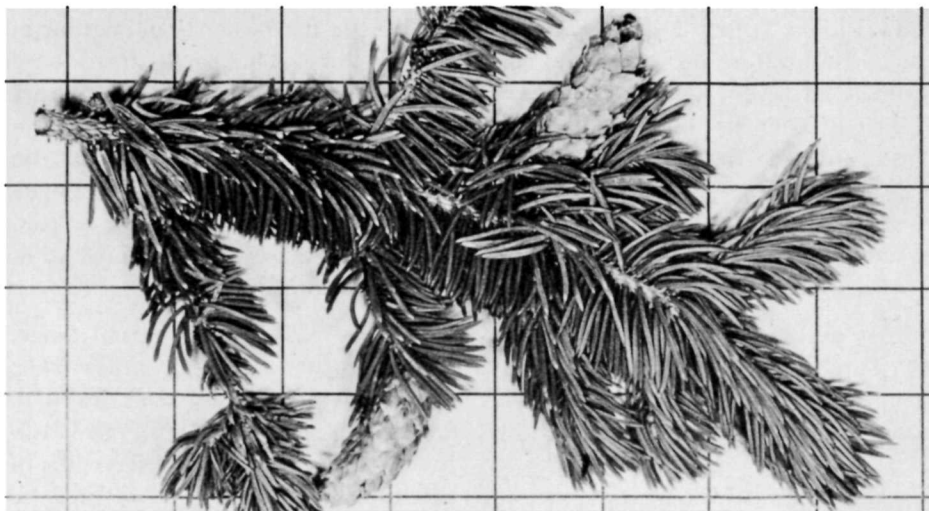
The stiff, prickly needles that are four-sided in cross section are its most

striking characteristic. Further, these needles are about 1 inch long, have a tendency to point toward the tip of the branch, and grow from distinctive woody, peg-like bases that remain on the branches after the needles have dropped off. Thus the naked twigs have a rough, "warty" appearance.

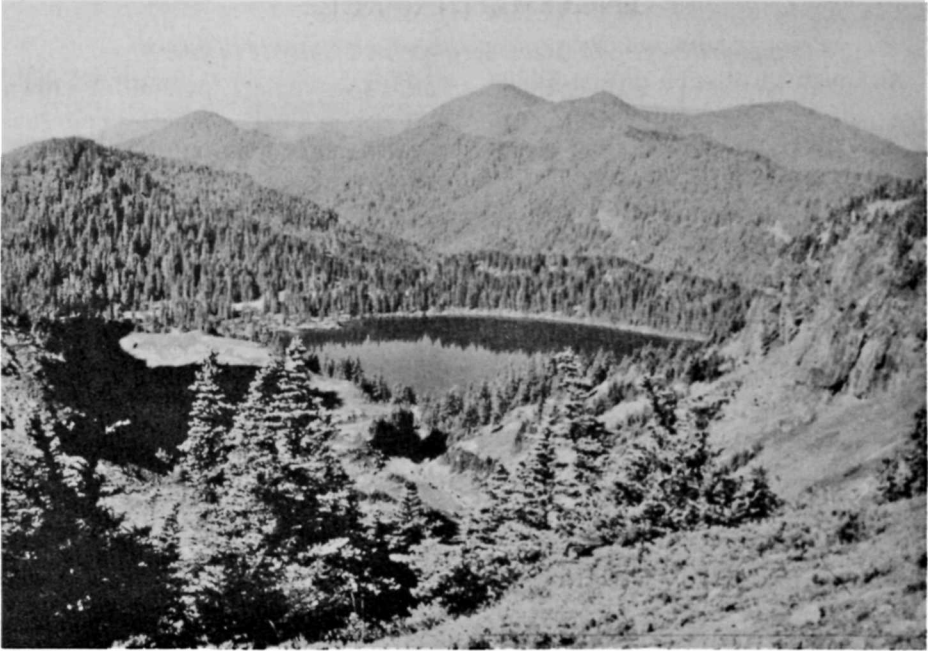
Numerous cones are borne near the top of the long, dense, spire-like crown. These cones are from 1 to 3 inches long, light brown in color, and are composed of numerous thin, papery but stiff scales—each one being irregularly indented at the apex.

Although in many parts of its range it attains fair size, the Engelmann spruce in Mount Rainier National Park is only a small tree from 20 to 60 feet tall. Its name commemorates Dr. George Engelmann, a noted physician and botanist of St. Louis, who first described it in 1863.

⁴It is common in the Rocky Mountain area from Alberta south to Arizona and New Mexico. Farther west it may be found in the Bitterroots of northern Idaho, the interior ranges of British Columbia, and in the Cascades and Blue Mountains of Washington and Oregon. As its range progresses southward it occurs at steadily higher elevations—between 8,500 and 12,500 feet toward the southern limits.



Cones and foliage of Engelmann spruce. Note that needles are stiff, pointed, and 4-sided in cross section.



Mowich Lake in the northwest section of the park.

SITKA SPRUCE

Picea sitchensis (Bong.) Carr.—Pine Family (*Pinaceae*)

This is the largest and most important of American spruces. However, it is of such limited occurrence in Mount Rainier National Park that it is very unlikely that visitors will find it here. Only a few isolated specimens have been reported at low elevations in the North Puyallup and Carbon River valleys near the west boundary.

The needles are $1\frac{1}{2}$ inches long, sharp and prickly to the touch, yellow-green, but with a silvery tinge on the under side. Like those of all spruces, they are borne upon small, woody, peg-like bases which persist on the twigs after the foliage drops off. But unlike those of other spruces, the

needles are flat rather than angular in cross section. The cones are 3 to 4 inches long and except for their larger size resemble those of the Engelmann spruce. The thin, scaly bark is also somewhat similar to that of the Engelmann spruce, except that it is purplish-gray to silver-gray in color rather than reddish-brown.

It occurs in a narrow coastal range, not more than 40 to 50 miles wide, from Kodiak Island in Alaska to Mendocino County in California. In Washington the best place to observe it is in the forests on the west side of the Olympic Peninsula, particularly in the Olympic National Park.

WESTERN HEMLOCK

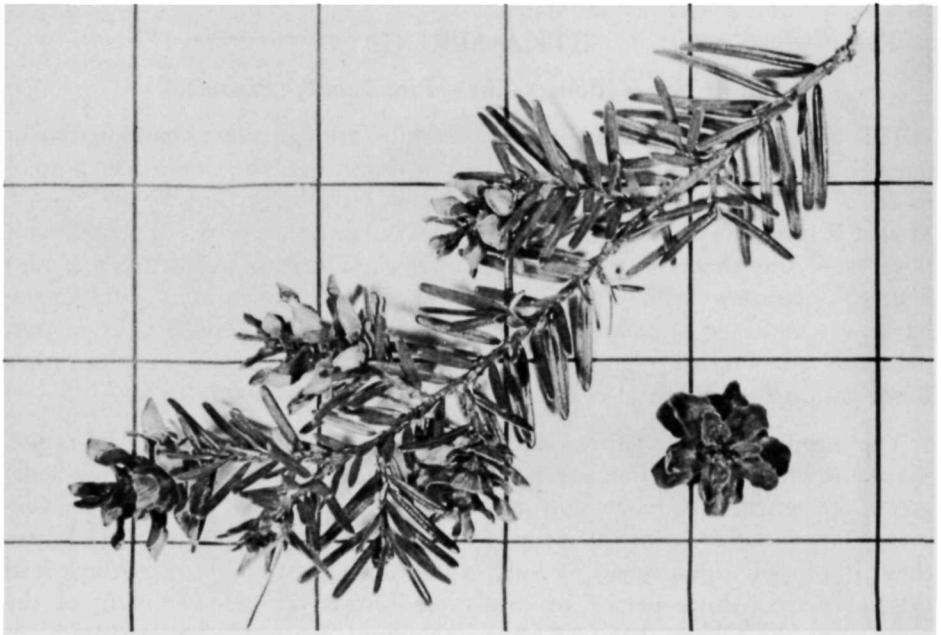
Tsuga heterophylla (Raf.) Sarg—Pine Family (*Pinaceae*)

This, the largest of 4 native American hemlocks, is the most common tree in Mount Rainier National Park. It occurs from the lower park boundaries to an upper altitudinal limit of 5,000 feet. It is particularly abundant in the dense forests of the lower elevations, where its principal associates are Douglas fir and western red cedar. Being a very tolerant tree and a prolific seed producer, it thrives under such conditions and often forms pure forests over considerable areas.

It is a tall, stately tree. Mature specimens are up to 150 feet in height and from 2 to 4 feet in diameter with a columnar, cylindrical trunk that under crowded forest conditions may often be free of branches for 50 to 75

feet. The loosely pyramidal crown is composed of slender, pendulous branches. The bark on mature trees is about 1½ inches thick and is separated into narrow, scaly, longitudinal ridges by deep fissures. The surface color of the bark is deep russet to reddish-brown while the inner bark is a bright reddish-purple. Young trees have thin, scaly, gray-brown to reddish-brown bark.

Two features are of particular importance in the identification of this tree. The first is the weak, drooping central leader which is typical of all hemlocks. The second is the delicate, lacy appearance of the dark, glossy-green foliage, which is due to the varying length of individual needles. In-



Mature cones and foliage of western hemlock.

dividual needles are from $\frac{1}{4}$ to $\frac{3}{4}$ inch long, flat, soft to the touch, blunt and rounded at the apex, and with two conspicuous silvery bands (one on each side of the midrib) upon the underside. In addition they are narrowed at the base into a short, slender stem or petiole by which the needle is attached to a small woody "cushion" on the twig.

The distinctive cones, which are produced in great numbers and which are not more than one inch long, nod from the ends of the branchlets. Before maturity they are bright green, but by late summer or fall, before the scales open so that the seeds may be discharged, they turn brown. The ground below these trees is usually littered with an accumulation of these cones. Only one season is required for

the development and maturity of the cones. In the spring one may find small, yellow, pollen-bearing flowers near the base of the needles toward the ends of the twigs, while at the same time purple pistillate flowers are borne at the tips of the branchlets.

Western hemlock is one of the most important forest trees of the Pacific region. It may be found along the coast from southeastern Alaska to northern California, and inland through the mountains of northern Washington and southern British Columbia to northern Idaho and northwestern Montana. It is particularly abundant in the forests of western Washington, where its range extends downward to sea level. East of the Cascade crest its altitudinal limits lie between 2,000 and 5,000 feet.



Typical forest of western hemlock.

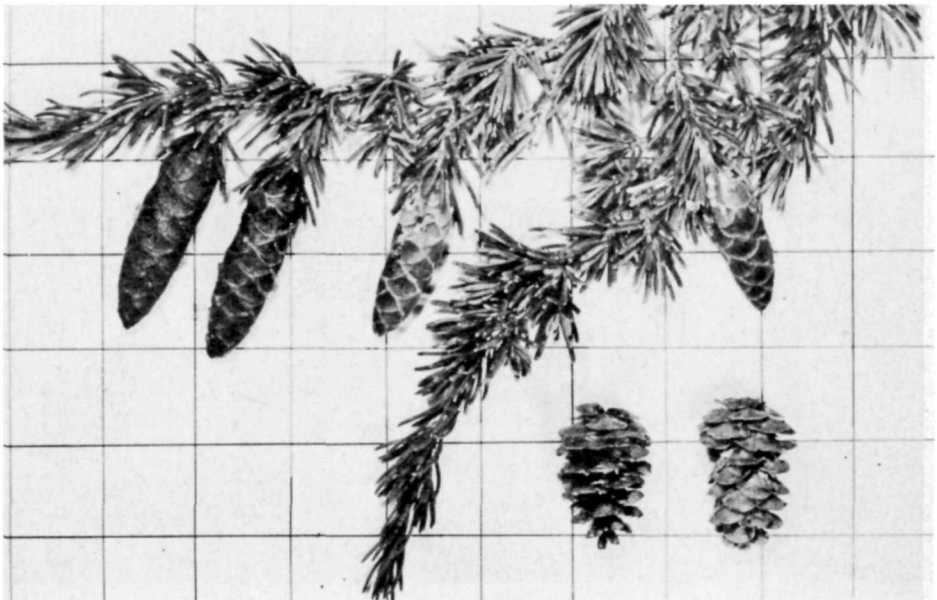
MOUNTAIN HEMLOCK

Tsuga mertensiana (Bong.) Carr.—Pine Family (*Pinaceae*)

This is one of the most common trees of the subalpine and timber-line zones and is the principal associate of the alpine fir, except in the Yakima Park area where it is replaced by the whitebark pine. It may be easily distinguished from the spire-like alpine fir by the weak and drooping central leader—typical of all hemlocks—and the graceful sweep of its branches which lift upward at the ends so that, in silhouette, its form bears a resemblance to the architecture of a Chinese pagoda. In the more rigorous timber-line region, where it is buffeted by high winds and weighed down by snowdrifts, it of course takes on a more rugged appearance. But regardless of its general appearance it adds a distinct touch of interest to the "high country."

The mountain hemlock is not a large tree. Even under the most advantageous conditions mature specimens never achieve a height greater than 50 to 75 feet, while the diameter may vary from 6 to 24 inches. The bark is rough, scaly, deeply furrowed, and dark gray on the outer surface. The inner bark has the maroon-red shade typical of the western hemlock which grows at lower levels.

Differing from the foliage of the western hemlock, which is flat, the needles of this tree are plump (semi-circular in cross section). In addition they are about $\frac{3}{4}$ inch long, deep blue-green in color, densely clustered on the branches, and while they grow from all sides of the twigs, they are distinctly crowded toward the upper side. However, as is typical of all hem-



Cones and foliage of mountain hemlock. Note densely clustered, plump needles.

locks, the needles are variable in length and distinctly narrowed at the base into a short stem (petiole) by which they are joined to small woody "cushions" on the branches.

The cones are one of the most attractive features of this tree. They are usually produced in a considerable number and in the fall before maturity are a deep violet-purple in color (occasionally yellowish-green), 1 to 3 inches long, suspended from the tips of the branches in the upper portion of the crown. Only one year is required for their development, and upon maturity, when the scales open to liberate the seeds, their color changes to brown. Although the cones are usually shed during the winter following maturity, one often finds some of the previous year's cones attached to the branches as the current crop is developing.

As implied by the high elevations where it grows, the mountain hemlock

is a tree of slow growth. One specimen less than 5 inches in diameter was more than 100 years old. Consequently it is likely that some of the larger mountain hemlocks are from 300 to 400 years of age.

In the state of Washington this tree is abundant at high altitudes throughout the Cascades and Olympics and, to a limited extent, in certain parts of the Blue Mountains. It is not present in the Okanogan highlands, however. Beyond the borders of Washington the mountain hemlock may be found from southeastern Alaska in the vicinity of Sitka, where it grows at sea level, southward at gradually ascending elevations in the coast ranges and interior mountains of British Columbia, in northern Idaho and northwestern Montana, in the coast ranges and Cascades of Oregon, and along the upper slopes of the Sierra Nevada in central California. There it is found at elevations from 9,000 to 11,500 feet.



Mountain hemlock and alpine fir with Tatoosh Range in background. Note spire-like crowns of alpine firs and upswept branches of mountain hemlocks.

DOUGLAS FIR

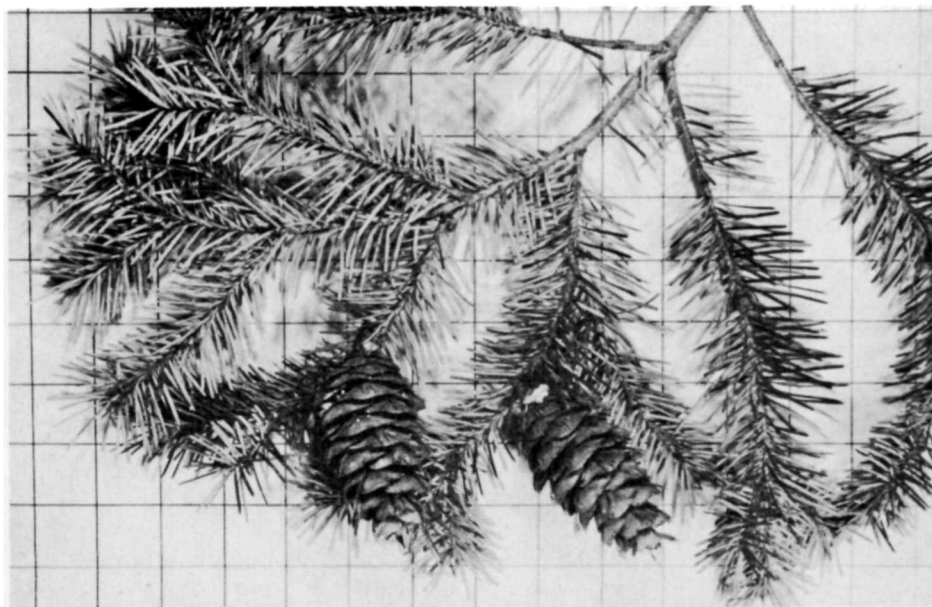
Pseudotsuga taxifolia (Poir.) Britt.—Pine Family (*Pinaceae*)

This is perhaps the most important cone-bearing tree in the world and, with the exception of the sequoias, the largest and most magnificent species on the Pacific Coast. While not as abundant as the western hemlock in Mount Rainier National Park, its great size and commanding appearance stamps it as "king" of the local trees. It is found here up to an elevation of 4,800 feet but is most common in the deep woods of the lower slopes.

Mature Douglas firs, growing under crowded conditions in the deep forest, can be easily recognized by their massive, columnar trunks—occasionally as much as ten feet in diameter—that are characterized by thick, deeply furrowed, cinnamon-brown bark. The

"Columbus Tree" along the Nisqually highway, about three miles above the Nisqually entrance, is a good example. The inner bark of such veterans presents a mottled cream and brown pattern, with a light brown base color interlarded with streaks of cream. Trees 10 to 24 inches in diameter have dark, ash-gray bark, while in the case of very young specimens the bark is thin, smooth, ash-brown, and often mottled with gray patches.

The foliage is yellow-green. Individual needles are about 1 inch long, flat, soft to the touch, and blunt and rounded at the tip. They are narrowed at the base into a distinct but short stem, and grow from all sides of the branch. Pendent side branches characterize the crown, which is short on



Foliage and mature cones of Douglas fir. Note distinctive 3-pointed bracts protruding from between cone scales.

trees growing in the dense forests and long on trees growing in open situations.

The cones are the most distinctive feature of the Douglas fir. At maturity these are 3 to 4 inches long, pendent, and are characterized by 3-pointed bracts that protrude from between the scales to give the cone a unique "feathered" appearance. No other tree in this region has cones of that character. In the spring small clusters of yellow staminate flowers and bright-red pistillate flowers add spots of color to the foliage.

In addition to being an early and prolific seeder, it is a tree of rapid growth. Consequently it quickly re-establishes itself on denuded lands, provided that such areas are properly protected from fire—a factor that has achieved due recognition throughout a large part of the lumber industry in the Pacific Northwest. But while the Douglas fir quickly re-establishes itself in open situations, it is not as capable of continued reproduction in the dense shade of heavy virgin forests. Thus, under thoroughly natural conditions certain other species which are able to reproduce and develop in spite of the lack of sunlight—such as the western hemlock—eventually replace the Douglas fir. Such a condition exists in Mount Rainier National Park. In the lowland forest here the larger and older trees are invariably Douglas fir. They are survivors of a more extensive Douglas fir forest that, over many years, has been gradually replaced by the more tolerant western hemlock.

Although the Douglas fir achieves its greatest size and maximum importance in the humid coastal region,



Trunk of mature Douglas fir illustrating bark character.

west of the Cascades in Oregon, Washington, and British Columbia, it is found throughout a considerable area in the west. It grows from British Columbia to central California on the coast and, inland, from British Columbia south throughout the Rocky Mountain area to northern Mexico. As its range extends southward it is found at progressively higher elevations.

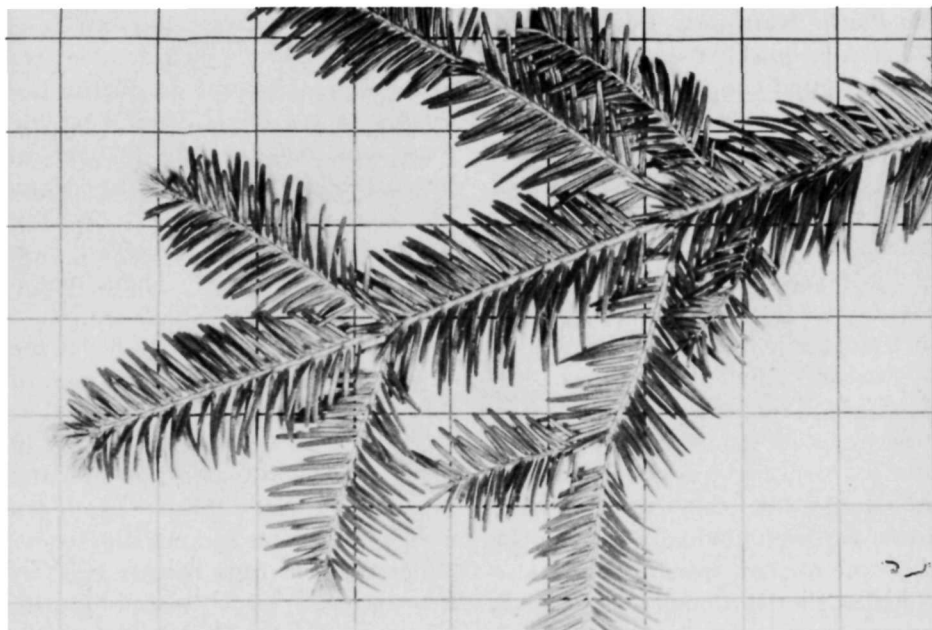
Differences in the appearance of the wood of the Douglas fir are so marked that the terms "red fir" and "yellow fir" are commonly used by loggers in the Pacific Northwest. The age and rate of growth in different trees is primarily responsible for such differences. Older trees, or trees characterized by slow growth, have narrow growth rings, and the wood has a yellow tinge. Younger, more vigorous, and faster

growing trees have wider growth rings and a reddish tinge to the wood. In fact both "red fir" and "yellow fir" may be derived from the same tree due to the differences in rapidity of growth during the early and late stages in its life history.

The existence of this tree was first brought to attention by Archibald Menzies, the naturalist who accompanied Captain George Vancouver on his memorable journey to the North Pacific, in the interests of Great Britain, in 1792. He first saw it on Vancouver Island.

Both its common and its scientific name are of more than passing interest. On various occasions it has been referred to as Douglas spruce and Oregon pine, for it is not truly a fir. Douglas fir, the accepted common

name, commemorates David Douglas, the great Scotch explorer-botanist who made early botanical collections in the Pacific west during the early part of the last century. The scientific name—*Pseudotsuga taxifolia*—is a combination of Greek, Latin, and Japanese and means "false-hemlock-with-foilage-like-a-yew." It is indicative of the puzzle which this tree presented to early-day botanists. However, the Douglas fir is quite different from the pines, spruces, hemlocks, true firs, and yews. It belongs to a distinct group (genus) of trees which includes but four or five species. Only one other—the big-cone spruce, found in the mountains of southern California—grows naturally in North America. The other species are native to China, Japan, and Formosa.



Foliage of grand fir. Note two-ranked pattern of needles.

GRAND FIR

Abies grandis Lind.—Pine Family (*Pinaceae*)

This tree, one of the most common of the true firs of Washington, is primarily an inhabitant of low elevations in the Puget Sound basin. Consequently, it is rarely found in Mount Rainier National Park except at about the 2,000-foot elevation. It may be readily noted in the vicinity of the Nisqually entrance, and a few specimens have been planted about the Administration Building at Longmire.

The grand fir may be easily recognized by the way in which the foliage grows from either side of the branches, in a definite two-ranked pattern and with the twigs plainly visible, "like hair parted in the middle." This character enables one to readily distinguish it from the Pacific silver fir with which it is often associated.

The color of the foliage of grand fir is yellow-green. Individual needles are flat, blunt or notched at the tip, and from 1 to 2½ inches long. As in the case of all true firs the needles, which are broadened at the base somewhat in the manner of a miniature suction cup, leave conspicuous, round leaf scars on the twigs when they are removed or when they drop off.

The cones, which mature in one season, ripen in the early fall. They are 3 to 4 inches in length, slender, and generally light yellow-green in color. Thus they are quite distinct from the plump, deep blue to purple cones of the Pacific silver fir. As in the case of all true firs the cones stand upright on the branches and disintegrate upon maturity.

In spite of its name, which it truly deserves in the better sites at low elevations in the Puget Sound basin, it is not an imposing tree in Mount Rainier National Park. Most specimens here are from 18 to 24 inches in diameter and about 75 feet tall. Thin, smooth, gray-brown bark characterizes young trees, while older and more mature individuals have pale, reddish-brown bark with an ashy tinge, usually furrowed longitudinally into narrow ridges.

Beyond the borders of Washington this tree may be encountered in southern British Columbia, northern Idaho and western Montana, in the Cascades and Blue Mountains of Oregon, and in the coastal forests of northern California to a point as far south as San Francisco Bay.

PACIFIC SILVER FIR

Abies amabilis (Dougl.) Forbes—Pine Family (*Pinaceae*)

This, the most widely distributed and most abundant true fir in the state of Washington, is also the most common of the true firs in Mount Rainier National Park. It will be encountered here from the lower park boundaries to an elevation of approx-

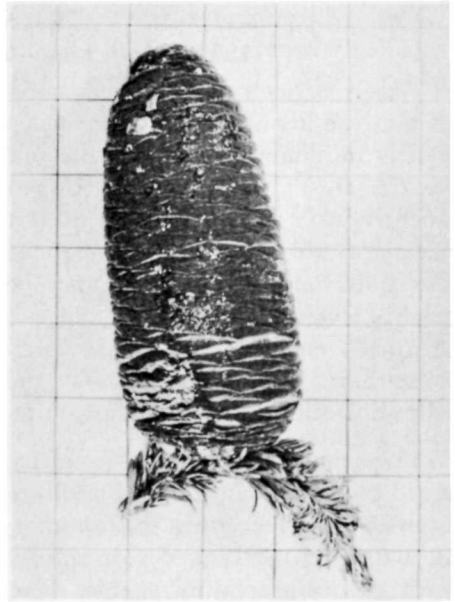
imately 5,300 feet, but is particularly abundant between the 2,000-foot and 4,500-foot levels.

Locally it is often known as lovely fir—a name that it truly deserves—for it is a handsome tree that can be readily recognized under forest con-

ditions by the character of its bark. Even on fairly large trees the bark is smooth, ash-gray, and distinctly marked with conspicuous chalky areas; only rarely, and then near the base of the larger trees, is it furrowed and ridged. Although larger specimens may be found, the height usually varies between 75 and 150 feet and the diameter between 18 and 36 inches.

The foliage is dense, glossy blue-green on the upper side and silvery white below. Individual needles are 1 to 1½ inches long, flat, soft to the touch, grooved on the upper side, and either blunt-pointed or notched at the apex. They clothe the branches thickly, growing from both sides of the twig and along the top as well. This feature readily separates the Pacific silver fir from the grand fir with which it is associated at the lower elevations and with which it is occasionally confused. In the upper portion of the crown the needles are generally densely massed toward the upper side of the branches.

The handsome cones are an additional feature of distinction. These are deep purple in color, 3 to 6 inches long and about 2½ inches in diameter, and are characteristically barrel-shaped in form. They stand erect upon the upper branches of the tree and disintegrate upon maturity, which is typical of the cones of all true firs. Often one finds large numbers of these cones along the trails in the late summer and early fall, for they are cut from the trees in quantity at that season by the Douglas squirrels that feed upon the seeds. If one should happen to pass through an area where these animals are engaged in such activity, he will generally find it necessary to be on the



Cone of Pacific silver fir.

alert so that he will not be struck on the head by these rather potent missiles. A direct hit by one of these heavy, compact cones would be anything but pleasant.

It is likely that the larger specimens of this species are from 250 to 300 years old, for trees 16 to 24 inches in diameter are from 175 to 225 years of age.

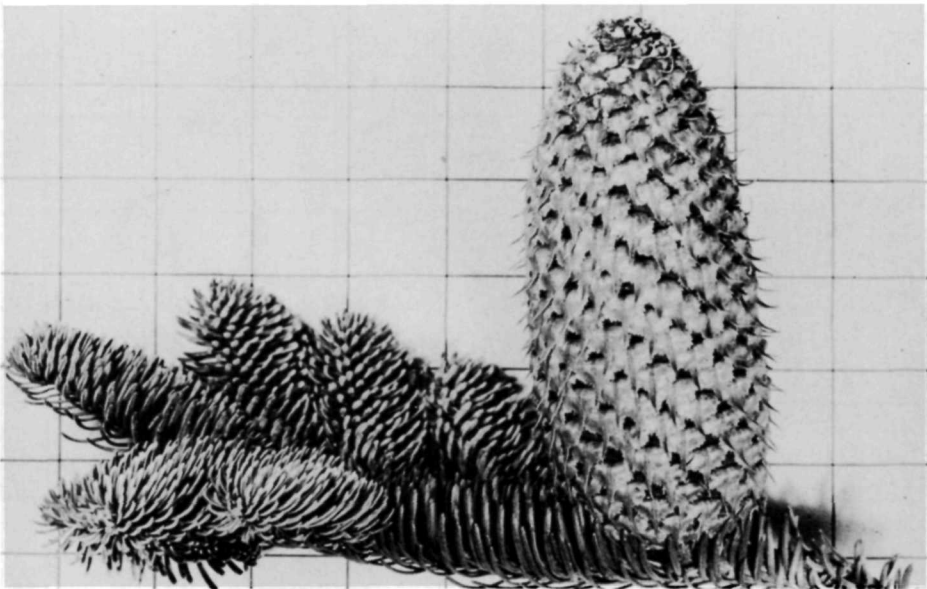
The Pacific silver fir is widely distributed in the Northwest. One may find it from southeastern Alaska (in the vicinity of Sitka) to the southern Oregon Cascades. In the north it occurs from sea level to an altitude of 1,000 feet. Farther south it grows at higher levels, in the state of Washington from 1,000 to 5,500 feet, and occasionally to 6,000 feet, on both sides of the Cascades and in the Olympics, and in Oregon at slightly higher levels.

NOBLE FIR

Abies nobilis Lind.—Pine Family (*Pinaceae*)

This is the largest of the true firs in the state of Washington and, in many respects, is the most handsome and magnificent representative of the group in Mount Rainier National Park. Although larger specimens may be found in this area, mature specimens are usually from 75 to 150 feet tall with a straight, scarcely tapered trunk that varies from 1½ to 3 feet in diameter. It is generally free of limbs for at least one-half its length. It is further characterized by dark, purplish-gray bark that is broken up into narrow seams and ridges of irregular size and a crown that is an open, round-topped cone composed of short, densely needled branches. Immature trees have a smooth gray bark, often with numerous resin blisters.

The most distinctive features of this tree are the foliage and cones which are quite different from those of other true firs. The needles are 1 to 1½ inches long and a deep blue-green with a silvery tinge; and although they are sessile (not constricted at the base into a short petiole but growing directly from the branch) and leave a distinctive round leaf scar on the twig when they fall, they are plump or even four-sided in cross section instead of flat as in the case of the other true firs. This character is especially typical of the needles on the upper branches of the crown. Here they are also densely clustered, brush-like, toward the upper side of the branch. On the lower branches the needles are not so distinctly four-angled; sometimes they



Cone and foliage of noble fir. Note distinctive bracts extending from between cone scales.

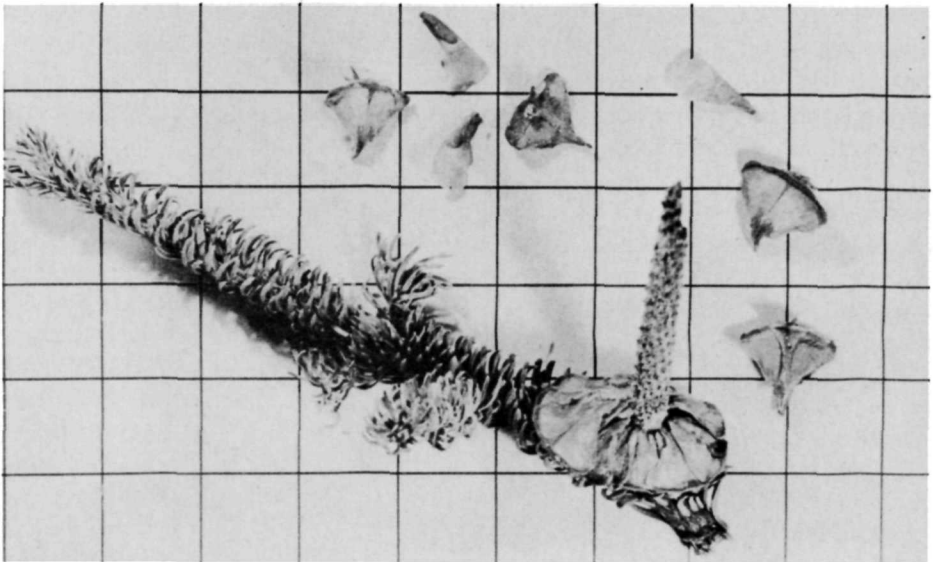
are almost flat, and they lack the brush-like appearance typical of the foliage nearer the top of the tree.

The cones are most distinctive and handsome. The noble fir is the only species of true fir native to Washington in which the bracts are longer than the cone scales. These are bright green in color and extend downward along the cone, completely covering the surface, to give it a shingled appearance. In addition these cones are the largest among the cones of the true firs here, being 4 to 6 inches long, 2 to 2½ inches in diameter, cylindrical, and flat-topped. Standing erect on the topmost branches of these trees, they are quite conspicuous even from a distance. They ripen in late summer and early fall and disintegrate by October, leaving slender, stiff spikes on the branches.

This tree is typical of the intermediate timber zone in Mount Rainier Na-

tional Park. While it may be occasionally noted at slightly lower or higher elevations, it is most common between the 3,500-foot and 4,800-foot levels. Park visitors will find it most readily along the Paradise highway in the vicinity of Glacier Bridge and Canyon Rim.

The noble fir, often referred to erroneously as "larch," has the most limited distribution of our true firs. It may be found in a small area in southern British Columbia, in the Cascades and Olympics of Washington, in the Cascades and Siskiyou of Oregon, and to a very slight extent in the northwestern corner of California. Its existence was first reported by David Douglas, the Scotch explorer-botanist, during one of his memorable journeys of botanical exploration on the west coast in the early part of the last century.



Spike of noble fir cone. Cones of all true firs disintegrate at maturity, leaving a similar distinctive spike on the branches.

ALPINE FIR

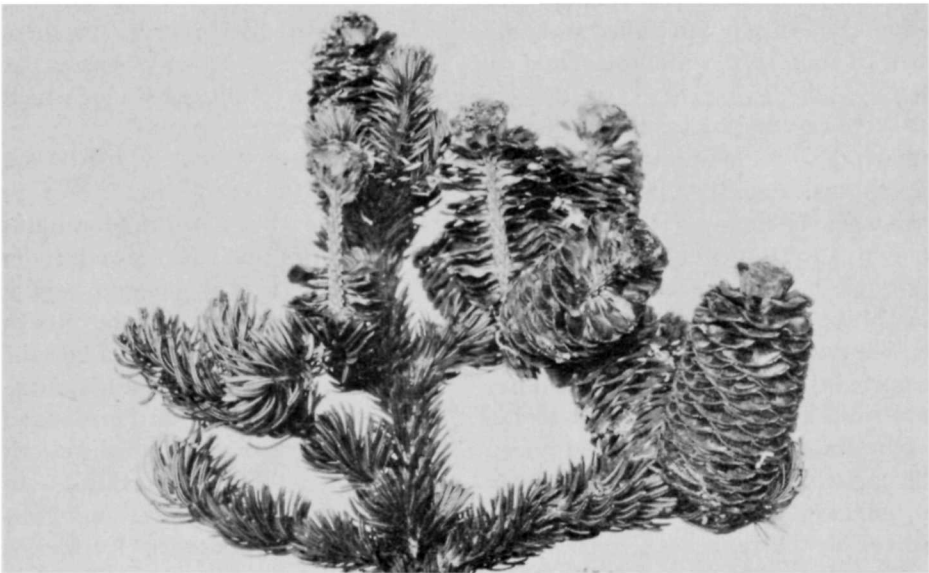
Abies lasiocarpa (Hook.) Nutt.—Pine Family (*Pinaceae*)

Those who love the "high country"—that rigorous, rocky, and wind-swept timber-line region, characterized by far-flung vistas of inspiring mountain grandeur, with flower-strewn meadows in summer and the silent expanse of glistening snowdrifts in winter—are well acquainted with this tree. The alpine fir is typical of such regions, not only in Mount Rainier National Park, but elsewhere in its wide range. In the park it is the most common tree between the 5,000-foot and 6,500-foot elevations.

In many respects it is one of our most distinctive and beautiful trees. Its habit of forming artistic "family groups," with the larger trees in the center surrounded by smaller individuals on a gradually descending scale, and its compact, pyramidal, spire-like crown make this tree one of

the most attractive features of the sub-alpine meadows. In winter after each snowfall, when its branches are shrouded with a heavy blanket of purest ermine, it figuratively strikes the high C of beauty in our snow-clad wonderland. In contrast to the form of these trees in the more protected meadows, one finds the form at timber line to be gnarled, twisted, with the branches pointing in the direction of the prevailing winds. Often, in such situations, the trunk and branches lie prostrate on the rocky terrain, forming a dense and almost impenetrable mat of vegetation—visible evidence of the rigors endured by this tree in this lofty region.

The alpine fir is the smallest of our true firs. Under the best conditions mature trees will generally be from 50 to 100 feet tall and from 1 to 2 feet



Disintegrating cones of alpine fir.

—Asahel Curtis photo

in diameter. On exposed sites they are naturally much smaller. The bark is thin, hard, smooth, and generally dark ash-gray on the surface with a reddish-brown tinge beneath. A reddish-brown tinge is also often typical of the edges of the narrow ridges that sometimes characterize the base of older and larger trunks. Numerous resin blisters characterize the smooth, ash-gray bark of young individuals.

The crown is dense, very long—usually extending to the base of the trunk. It is pyramidal in outline with a stiff, erect, spire-like tip that readily distinguishes it from its few associates—notably the mountain hemlock which is typified by a weak, drooping central leader. The branches are possessed of a graceful outward and downward sweep which enables this tree to shed excessive snow in winter.

Individual needles are flat, 1 to $1\frac{3}{4}$ inches long, and broadened at the base like those of other true firs so that when they drop or are pulled from the twigs a conspicuous round leaf scar remains. These needles are densely clustered on the branches and have a tendency to curve upward so that they are massed upon the upper side of the branches. In the upper portion of the crown the needles are somewhat pointed, but in the lower crown they are blunt and rounded at the tip.

The cones are borne upright on the upper branches of the crown. They are from 2 to 4 inches long, 1 to $1\frac{1}{2}$ inches in diameter, flat-topped and a deep purple in color. At maturity they disintegrate, leaving erect woody spikes on the branches.

The alpine fir is not a long-lived tree, nor do conditions characteristic



Trunk of western red cedar illustrating fibrous character of the bark.

of its habitat promote rapid growth. Individuals not more than 12 inches in diameter may be about 200 years old. However, age and size are not closely related in this case, for these factors are largely dependent upon the nature of the conditions under which this tree grows.

The alpine fir is widely distributed throughout the West. In addition to the high elevations in the mountains of Washington, it is also found under similar conditions in Oregon, and it is widely distributed in the Rocky Mountain region from Alaska and the Yukon south through British Columbia, western Alberta, northern Idaho and western Montana, northwestern Wyoming, and high elevations in Utah, Colorado, Arizona, and New Mexico. In the southern Rockies it occurs between 9,500 and 11,500 feet above sea level.

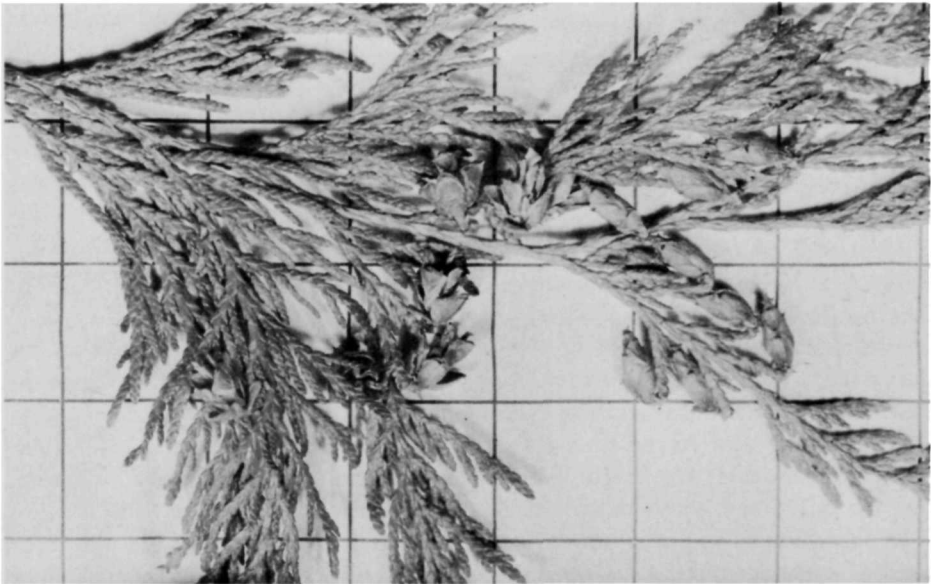
WESTERN RED CEDAR

Thuja plicata D. Don—Cypress or "Cedar" Family (*Cupressaceae*)

In spite of its name this tree is not truly a cedar. True cedars, of which there are four species, belong to the genus *Cedrus* in the Pine Family. None are native to North America, although the deodar cedar, the Atlantic cedar, and the Lebanon cedar have been introduced into the United States and are widely used in parks and about homes on the west coast as a feature of landscape decoration. The true cedars differ so radically from those of our native conifers that are erroneously known as cedar—particularly in the matter of foliage and cones—that it is difficult to form a clear and logical opinion as to why this common name should be so applied. In the case of the western red cedar perhaps a more logical name would be western or giant arborvitae since it is

related to the smaller arborvitae (also known as northern white cedar) which is common in the Lake States and the Northeast. However, the common name as noted here has become so firmly fixed in general use that its replacement by another is practically out of the question. It serves as an example of the misuse of common names, the meanings of which in the case of many trees, as well as other plants, often vary greatly in different localities.

However, no apology needs to be made for the western red cedar. It is one of the most common, most beautiful, and most distinctive of the Northwest's trees. It is most common in regions of abundant moisture and high humidity, being typical of moist to even wet soils from sea level to an



Foliage and cones of western red cedar.

elevation of 4,000 feet. Consequently, in Mount Rainier National Park it is a common species in the lowland forest, where it attains considerable size. Under conditions suited to its best development mature specimens may be from 150 to 200 feet tall and from 3 to 8 feet in diameter, but even larger individuals are not uncommon. In the cedar swamps of the Ohanapecosh area one will find western red cedars up to 12 feet in diameter.

The trunks of larger trees exhibit excessive taper, being greatly expanded and fluted at the base. In the deep forest the trunk is usually free of limbs for a considerable distance, and one may readily observe the character of the distinctive bark. This is thin, of a reddish to cinnamon or gray-brown color, and of a shreddy and fibrous texture.

The crown is usually irregular and typified by long branches that have a graceful downward sweep with slightly upturned ends and numerous pendent side branches. This, together with the fact that the foliage is scale-like and dark lustrous green in color, gives the branches a handsome fern-like appearance that is distinctive among associated trees.

The small, oblong cones are equally distinctive. Borne in great abundance, they are less than $\frac{1}{2}$ inch long, erect on short stems, and characterized by only a few scales that are joined at the base. Small spines characterize these scales near the tips. In the spring and early summer they are bright green, but by fall when they mature they take on a reddish to cinnamon-brown hue. These cones often remain on the branches after they have opened and

shed their small, double-winged seeds, and one may find old cones still adhering to the branches as a new crop is forming.

The wood, varying in color from yellow to brown, is straight-grained, very durable, and has a pleasant, aromatic "cedar" odor.

The western red cedar is not only of importance in our present day economy; it was also of great value to the Indians of the northwest coast in the early days. From it they derived, either directly or indirectly, the three essentials of life—food, shelter, and clothing. From the huge trunks of these trees they fashioned large dugout canoes, which were used as a means of transportation and for purposes of obtaining food from the sea. Some of these canoes were large enough to accommodate 60 men. Their lodges were constructed of long slabs split from large logs, and since the inner bark of this tree is tough and strong, it was used in the manufacture of mats, baskets, and articles of clothing. Early white settlers in the Northwest quickly became aware of the admirable qualities of the wood of the western red cedar, and many of the pioneer cabins, of which the Longmire homestead cabin is an example, were fashioned from this material.

The western red cedar is widely distributed throughout a large part of the Northwest. One may find it along the coast of southeastern Alaska, British Columbia, Washington, Oregon, and northern California, as well as inland to northern Idaho, western Montana, and the inland mountains of British Columbia.

ALASKA YELLOW CEDAR

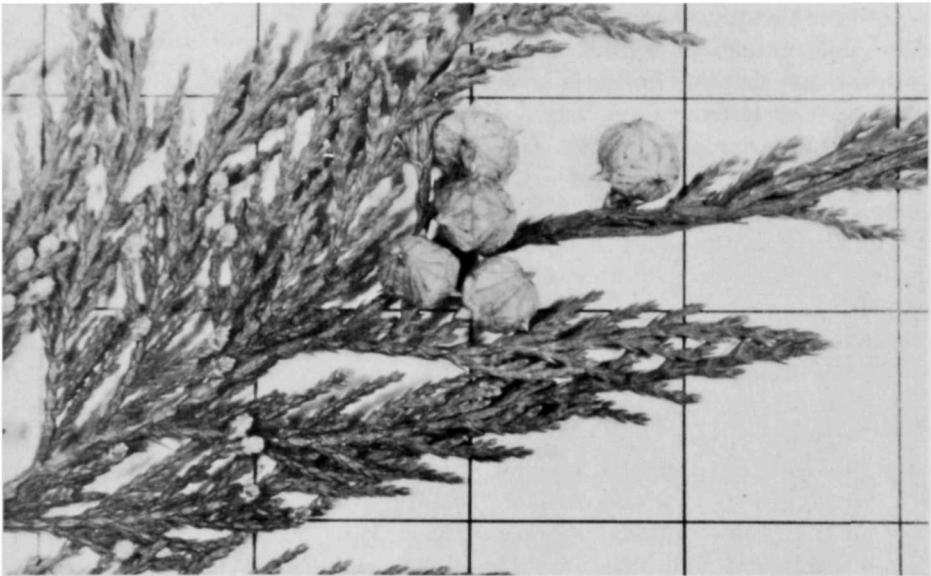
Chamaecyparis nootkatensis (Lamb.) Spach.—Cypress or "Cedar" Family
(*Cupressaceae*)

As in the case of the western red cedar the common name of this tree is misleading, for it is not properly a cedar. Also like the western red cedar the foliage of this species is scale-like, but the two trees will rarely be confused because of several distinctive differences. In the first place they are common to different altitudinal levels—the Alaska yellow cedar being found at elevations of 2,500 to 6,500 feet and being most common in the intermediate forest zone from 3,500 to 5,500 feet. The western red cedar is normally a tree of lower elevations. In the second place the cones of the Alaska yellow cedar are round rather than oblong, as in the case of the western red cedar, and its bark is ash-gray in color and flaky in texture rather than brownish-gray and fibrous. And finally the

branches of the Alaska yellow cedar have a characteristic pendent or "wilted" appearance by which it is rendered distinct from its associates, and the wood is yellow rather than brownish as in the case of the western red cedar.

Visitors to Mount Rainier National Park will find it most easily along the Paradise Valley highway in the vicinity of Canyon Rim and Narada Falls.

As an inhabitant of the higher timbered zones where the growing season is short, it is generally a medium-sized tree from 75 to 100 feet tall and from 1½ to 2 (occasionally 3) feet in diameter. When encountered in the sub-alpine and timber-line zones it is, of course, much smaller. In exposed situations at these levels it exhibits the typical rugged and wind-blown ap-



Foliage and cones of Alaska yellow cedar.

pearance characteristic of other tree pioneers.

The trunk is quite conical in outline and swollen at the base, with thin, ash-gray bark characterized by large, loose, flaky scales. When growing on steep slopes, the base of the trunk is generally bent or "pistol-butted," primarily because of the downhill pressure of the winter snowdrifts. The scale-like foliage is dark yellow-green and harsh to the touch in contrast to the softer character of western red cedar foliage, and the distinctive, round cones are $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter.

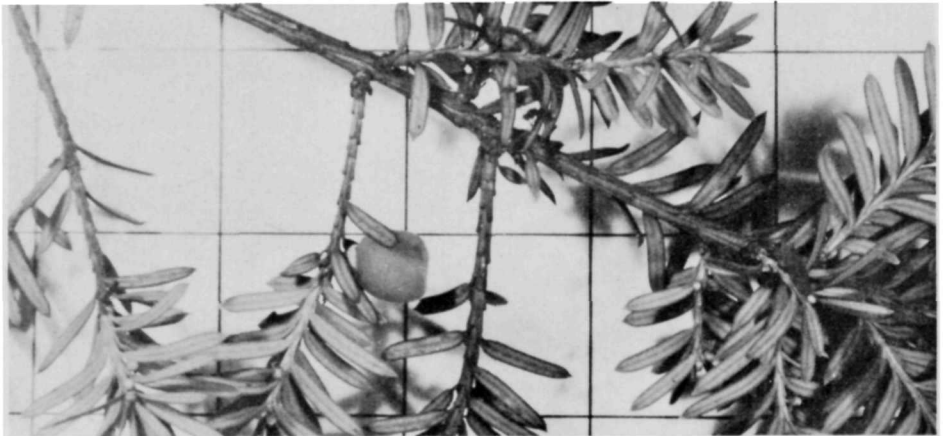
Two years are required for the cones to mature. Bright green at first, they later change to a russet-brown color at maturity. Each cone is comprised of from 4 to 6 shield-shaped scales, which are attached to the central stalk by a short stem at the base. The scales are also characterized by a small point or tip in the center.

The wood is very durable, of a beautiful, light-yellow color, and it takes an excellent polish. The wood of this tree, obtained from fire-killed indi-

viduals in the "Silver Forest,"⁵ was utilized for desks, tables, and other features of interior finish in the Administration Building at Longmire, the Paradise Community House, and Paradise Inn.

This tree occurs throughout a rather limited and narrow range along the Pacific Coast from southeastern Alaska, in the vicinity of Cordova, south through the coastal forests of British Columbia, in the Olympics and Cascades of Washington, and in the Cascades of Oregon. It is found at sea level in the more northerly latitudes but grows at increasingly higher altitudes as its range progresses southward.

⁵The "Silver Forest" is an old burn along the Paradise Valley highway in the vicinity of Canyon Rim. The fire that destroyed the forest here occurred about 1885. It was apparently a "ground fire" which killed the trees by simply destroying the living tissue (cambium layer) just beneath the bark. The fire-killed Alaska yellow cedars here remained standing as ghostly snags and eventually weathered to a silver-gray color—which accounts for the popular name of this area. Nearly 50 years later they were cut and utilized for the purposes mentioned, a tribute to the durable qualities of the wood of this species.



Foliage and fruit of the Pacific yew.

PACIFIC YEW

Taxus brevifolia Nutt.—Yew Family (*Taxaceae*)

Although the Pacific yew is not a cone-bearing tree, its needle-like, ever-green foliage so closely resembles that of certain of the conifers with which it is generally associated that it often goes unnoticed. Consequently its many interests are usually unknown to most people.

It is not a large tree nor is it abundant, but it is not uncommon in the moist, humid forests of the state of Washington up to an elevation of 4,000 feet. Although larger specimens may be found, it is generally from 15 to 25 feet tall and up to 12 inches in diameter in Mount Rainier National Park. The trunk is characteristically ridged and fluted, and the thin, reddish-brown to purplish-red outer bark scales off in thin, irregular plates to expose the rose-red inner bark to view. Its crown is loose and open, often extending to a point quite near the ground, with numerous small shoots growing from the trunk.

The needles are flat, soft to the touch, about an inch long, dark glossy yellow-green above and a pale green below. A short, slender point at the apex renders the Pacific yew distinct from certain of the true firs with which the yew is often confused. Needles of the true firs are blunt-pointed or notched at the apex. The needles of the Pacific yew are also narrowed at the base into a distinct petiole or stem, which extends down the twig from its point of attachment and, while the needles are arranged spirally on the branches, a slight twist at the base gives them the appearance of being arranged comb-like on either side.

In the late spring one will notice the small, bud-like, yellowish staminate or pollen-bearing flowers on the under side of the branches. Greenish pistillate flowers, also borne on the under side of the branches, are not as numerous, but these later develop into a small but very handsome fruit. This consists of a hard, green, conical seed partly enclosed by a fleshy, gelatinous, bright-red cup (aril) about $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. Birds, attracted by the bright color of the fleshy aril, eat the fruit, thus aiding in its dissipation, for the hard seed is not injured by the digestive process.

The wood of the Pacific yew is durable, hard and heavy, and reddish in color. In the early days it was widely used by the Indians of the northwest coast in the manufacture of harpoons, canoe paddles, and similar articles.

It is a tree of slow growth and presumably attains a considerable age. One specimen, collected a number of years ago for the park museum, was 8 inches in diameter but possessed 150 annual rings.

The range of this species includes an area along the coast from southeastern Alaska to Monterey Bay in California; also in the Cascades and inland ranges of British Columbia, Washington, Oregon, and Idaho east to the western slope of the Rockies in western Montana, and in the northern portion of the California Sierra Nevada. It reaches its best development in the moist, humid forests west of the crest of the Cascades in British Columbia, Washington, and Oregon.

WILLOW

Salix spp.—Willow Family (*Salicaceae*)

Although there are more than twenty species of willows native to Mount Rainier National Park, only a few of these achieve the stature of small trees, and then only at low elevations. The most common of these is the *Sitka willow* (*Salix sitchensis* Sanson). This is characterized by spatulate leaves, from 2 to 4 inches long, that have smooth, untoothed margins, and which are a shiny, deep yellow-green above and densely covered by silky white hairs below. One may also note the *mountain willow* (*Salix scouleri-ana* Barratt), the leaves of which are broadest near the apex, 1 to 4 inches long, with toothed margins, dark green above and slightly hairy below. A third species is the *black willow* (*Salix lasiandra* Benth.), which is characterized by lanceolate leaves that are 4 to 5 inches long, deep yellow-green above

and powdery white below, with small rounded teeth on the margins.

Since the novice will have difficulty in identifying the various species in this complex plant group, the term "willow" is sufficiently distinctive for the average person. And, as a group, the willows possess certain well-defined features that are readily recognizable.

All willows are deciduous and the leaves are simple and alternate on the branches. The staminate and pistillate flowers are borne on different trees in narrow, elongated clusters (catkins). The fruit is a capsule which contains many seeds, each bearing a tuft of hair at the base by means of which they are dispersed by the wind. The leaves, which are generally elongated and short-stemmed, have a pair of ear-like growths (stipules) at the base of the leaf stems, and the buds are covered by a single, cap-like scale.



NORTHERN BLACK COTTONWOOD

Populus trichocarpa var. *bastata* Henry—Willow Family (*Salicaceae*)

Although not a tree of any particular beauty, the northern black cottonwood is of interest because it is the largest broad-leaved tree in Mount Rainier National Park. It occurs here up to an elevation of about 4,000 feet, commonly along streams and river bars.

Young trees, as well as the branches and upper trunks of mature specimens, have smooth, pale yellowish-gray bark. On old trunks, however, the bark is dark gray, heavily ridged, and deeply furrowed.

Although it grows rapidly it does not attain great age, 150 to 200 years being about the maximum for larger trees. Mature specimens are generally 75 to 100 feet tall and 1½ to 2½ feet in diameter, although larger individuals are occasionally found.

Perhaps this tree can be most easily recognized by its large, thick, somewhat leathery leaves, which are characterized by conspicuous veins and numerous small, rounded teeth on the margins. They are 5 to 6 inches long, broadest at the base, and taper to an acute point near the apex. The upper surface is shiny green, but the lower surface is pale to silvery white or, in late summer, rusty brown. In the fall before dropping from the tree the leaves turn a dull, yellowish-brown.

The flowers and seeds are the most interesting characters. In common with all members of the willow family the staminate (male) and pistillate

(female) flowers are borne on different trees. Staminate or pollen-bearing flowers are produced in great numbers and appear as pendent, tassel-like clusters about 1 to 2 inches long. Pistillate flowers, also borne in pendent clusters, are 4 to 5 inches long at maturity when they appear as grape-like bunches of light-green capsules. Each capsule contains a multitude of tiny, brown seeds attached to tufts of soft, cottony filaments that aid in their dissemination by the wind. It is to this character that the tree owes its name, for in the late spring or early summer, when the capsules open, the air in the vicinity of these trees is filled with wind-borne seeds, and the ground nearby is often covered with a carpet of downy white "cotton."

The twigs, which vary in color from orange-brown to greenish-brown, bear distinctive buds which are narrowly conical, often incurved, up to ¾ inch long, covered by 6 to 7 overlapping scales, and characterized by fragrant, gummy resin. The latter factor accounts for the name of "balsam cottonwood" by which this tree is often known.

The natural range of the northern black cottonwood embraces an extensive area of the Pacific west. It is widely distributed in Washington and, in addition, is found in southern Alaska, the Yukon, British Columbia, northern Idaho, western Montana, Oregon, and northern California.

QUAKING ASPEN

Populus tremuloides Michx.—Willow Family (*Salicaceae*)

Although not found in Mount Rainier National Park, this tree, a close relative of the northern black cottonwood, will be observed at several points along the Chinook Pass highway on the east side of the Cascades—particularly in the vicinity of Naches.

The quaking aspen, never a large tree, is characterized by smooth, cream-white bark that is often marked with black, wart-like protuberances. Another feature that renders it distinctive is the fact that its small, roundish leaves quiver at the slightest breeze, due to the long, laterally flattened petioles. It is to this character that it owes its common name.



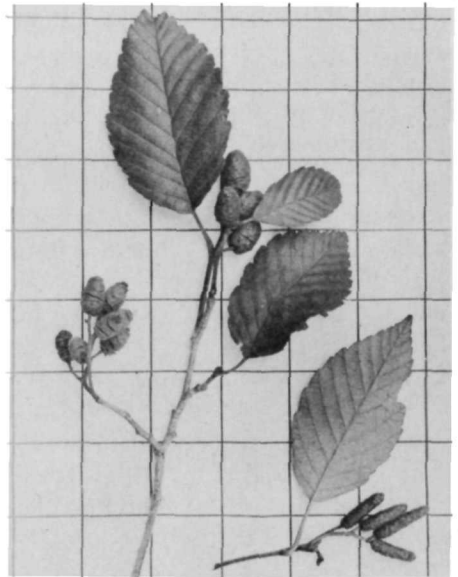
Quaking aspen illustrating bark character.

RED ALDER

Alnus rubra Bong.—Birch Family (*Betulaceae*)

This, the most common deciduous tree in the Pacific Northwest, occurs in Mount Rainier National Park up to an elevation of 3,500 feet. It is generally found in moist situations and may be most easily recognized by its smooth, light-colored, ash-gray to steel-gray bark.

However, a number of other characters lend it additional interest. Chief among these are the unique, seed-bearing strobiles which, before maturity, are compact, bright-green bodies $\frac{1}{2}$ to 1 inch in length. However, in the fall soon after they open to liberate the seeds they turn black and bear a striking resemblance to small pine cones with which they are often confused by the novice. While the majority of these drop from the tree by the end of fall,



Foliage, pistillate cone-like strobiles, and staminate catkins of red alder.

numbers remain attached to the branches through the winter, and even during the following summer. This tree is equally distinctive in the late winter and early spring, before the leaves appear, when tassel-like, pollen-bearing catkins, 5 to 6 inches long, hang from the naked branches and serve as harbingers of the coming season. The leaves, which are 5 to 6 inches long, widest near the middle and tapering toward both ends, have little to recommend them insofar as beauty is concerned, but they are distinctive in the coarsely double-toothed margins, which also show a tendency to be curled under. The leaves are also deep yellow-green above, while beneath they are a lighter green and covered with numerous short, rusty-brown hairs. In the winter when this tree is devoid of foliage, it may be readily recognized by its distinctive buds. These are large, distinctly

stalked, reddish-brown, and covered by 2 to 3 valvate scales, that is, the scales do not overlap. No other tree in this region has buds of that character.

In Mount Rainier National Park the tree reaches a height of about 50 feet and a diameter of from 12 to 18 inches, although at lower elevations in the Puget Sound basin it often attains greater dimensions. And although it grows rapidly it is not long-lived. Specimens up to 18 inches in diameter may be little more than 50 years old. Since it is generally found near streams, it is often utilized by beaver, the branches and smaller trunks serving as material for dams and the bark serving as food. Beaver activity may be readily found in the Longmire meadow.

The red alder may be found in a narrow coastal range, never more than 50 miles from salt water, from southeastern Alaska to northern California.

PACIFIC DOGWOOD

Cornus nuttallii Aud.—Dogwood Family (*Cornaceae*)

This, distinctly one of the most attractive native deciduous trees of the Pacific Coast region, is a highlight of arboreal interest in the forests of western Washington. Its beauty in spring, when it is characterized by great numbers of showy, cream-white blossoms, vies with its interest in the fall. In the latter season it is outstanding because of the brilliance of its bright crimson or orange foliage and its clusters of showy red seeds. Unfortunately, however, it is rare within the boundaries of Mount Rainier National Park. It is found in this area only in the Ohanapecosh district at low elevations, al-

though a few specimens have been planted about some of the residences in the headquarters village at Longmire.

The Pacific dogwood is not a large tree. Mature specimens in the park are 20 to 30 feet tall and 4 to 8 inches in diameter, with a straight, slender trunk characterized by thin, smooth, gray-brown to reddish-brown bark. The crown is rather narrow, with short branches standing out more or less at right angles from the trunk.

The leaves are borne opposite on the branches. They are 3 to 5 inches long and ovate in outline, that is, they

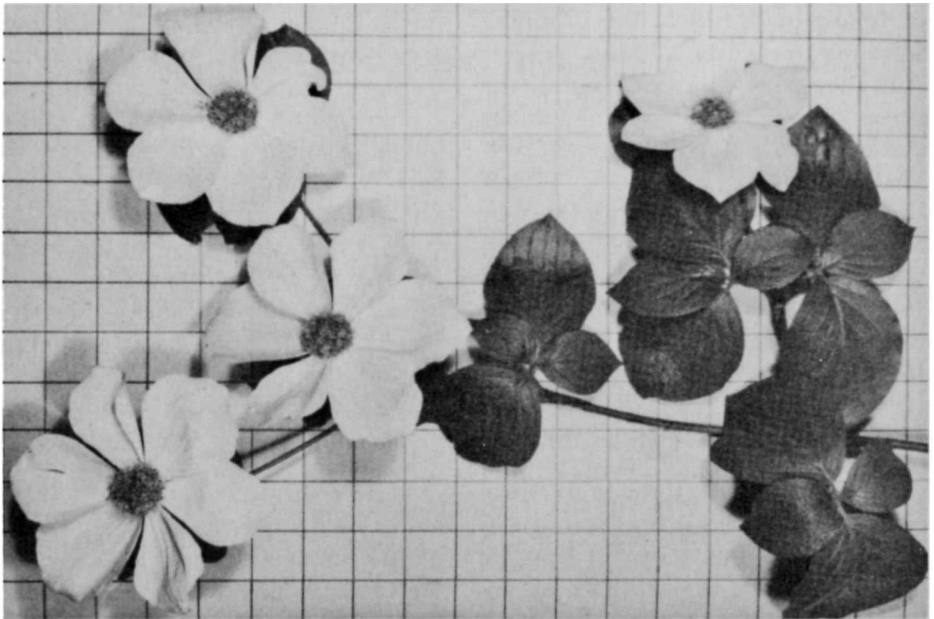
are widest near the middle and tapered toward both ends, and are further characterized by conspicuous veins.

The large blossoms are often considered as single flowers, an erroneous impression fostered by the petal-like appearance of the cream-white bracts which surround the actual flower cluster. These bracts are 4 to 6 in number. The flowers, which contain merely stamens and pistil, are greenish and are borne in compact heads. With the bracts they are partially formed during the summer; the following spring they develop fully into handsome, eye-compelling blossoms. Toward the end of the blooming period the showy bracts wither, turn brown, and drop off; and by mid-summer the formation of the seeds is well advanced. Be-

ing a bright crimson in color and contained in compact clusters, they lend a distinctive note to the tree at that season. In addition, many trees produce a second and midsummer crop of blossoms so that it is not unusual to find both fruit and blossoms on the Pacific dogwood in this region at the same time.

In winter the Pacific dogwood may be easily recognized by its slender twigs, the character of its smooth, dull-gray bark, the opposite leaf scars, numerous small, dormant flower clusters, and the distinctive elongated buds characterized by two valvate scales.

This handsome tree may be found along the coast from the southern part of British Columbia to the San Bernardino Mountains in southern California.



Foliage and blossoms of Pacific dogwood.

BIG-LEAF MAPLE

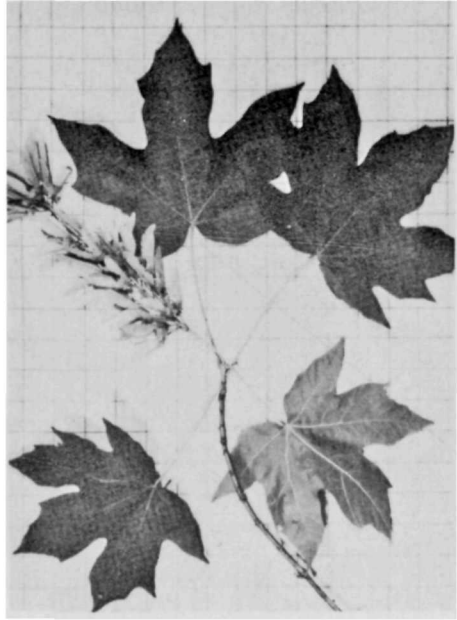
Acer macrophyllum Pursh.—Maple Family (*Aceraceae*)

This is the only large maple which grows naturally on the Pacific Coast, but although it is one of the more conspicuous deciduous trees at lower elevations in the Puget Sound basin, it is not common in Mount Rainier National Park. However, it may be found here in moist situations, particularly along streams, up to an elevation of 2,500 feet.

The foliage is especially noteworthy since the leaves are larger than those of any other maple, occasionally being 12 to 14 inches across. They are borne on stems 4 to 6 inches long, occur opposite on the branches, are somewhat thick, and are a dark glossy green above and a lighter green below. Unfortunately, however, they do not exhibit the vivid fall shades characteristic of certain eastern maples; instead they assume rather unattractive shades of yellow or brown before dropping from the tree in the autumn.

In the spring, at about the time the leaves unfold, large pendent clusters (racemes) of attractive, fragrant, yellow flowers, 4 to 6 inches long, festoon this tree. These are soon replaced by equally distinctive clusters of winged seeds, borne in pairs. Bright green before maturity, they are ripe by late summer or early fall, at which time they are 2 to 3 inches long and of a tawny brown color. That portion of the winged fruit occupied by the large seed is covered by numerous stiff brown hairs.

The big-leaf maple grows rapidly, especially in youth, and sprouts vigorously from the stump. Maturity is



Foliage and fruit of big-leaf maple.

reached in from 150 to 200 years. The bark of young trees, as well as that of the upper branches of older specimens, is smooth and light gray to reddish-brown in color. Gray to reddish-brown bark with hard, scaly ridges is characteristic of older and larger trunks.

In winter this tree can be easily recognized by the stout greenish-brown to reddish-brown twigs that are generally characterized by numerous lenticels, the opposite V-shaped to U-shaped leaf scars which bear 5 to 9 distinctly separate vascular bundle scars on the surface, and the stout, conical, scaly buds. Buds at the apex of the twigs are usually in multiples of three with a large bud flanked by two smaller ones.

BITTER CHERRY

Prunus emarginata mollis (Dougl.) Brewer—Rose Family (*Rosaceae*)

This occurs only occasionally in Mount Rainier National Park in moist situations up to 2,500 feet in elevation. Although it grows to larger size in better sites at lower elevations in the Puget Sound basin, it is only a small tree here, being 10 to 30 feet tall and 3 to 12 inches in diameter. It may be easily recognized by the dark, chestnut-brown bark that is conspicuously marked by elongated, horizontal lenticels as in the case of cultivated cherry trees. The leaves are narrow and short-petioled, 1 to 3 inches long, alternate on the branches, and the margins are

finely toothed. The small but attractive white flowers are about $\frac{1}{2}$ inch in diameter, have five petals and numerous stamens, and are borne in loose clusters (corymbs). The bitter fruit is oblong, about $\frac{1}{4}$ inch in diameter, bright red, and has a large pointed stone that is grooved on one side and ridged on the other. One of the easiest places to find this rather unimportant tree species in Mount Rainier National Park is in the vicinity of Sunshine Point, near the Nisqually entrance.

WILD CRAB APPLE

Malus diversifolia (Bong.) Roemer—Rose Family (*Rosaceae*)

This is a rare and unimportant species in the forests of Mount Rainier National Park but may be occasionally noted in moist situations up to an elevation of 2,500 feet. It rarely exceeds a height of 10 to 30 feet and a diameter of 3 to 10 inches. The leaves are ovate-lanceolate in outline (occa-

sionally 3-lobed) with finely toothed margins. The small white flowers are borne in loose clusters (cymes) and are characterized by five petals and numerous stamens. The fruit is small, apple-like, oblong and flattened at each end, and green to purplish in color. The twigs are occasionally spiny.

MADRONA

Arbutus menziesii Pursh.—Heath Family (*Ericaceae*)

Although this tree is not actually found within Mount Rainier National Park, it is listed here because, like the Oregon white oak, one or two small specimens have been noted just outside the park boundary in the vicinity of Ohanapecosh. In addition it will be readily noted at low elevations along various highways that approach the park from the west.

It is essentially a coastal species, rarely growing very far from salt water, and in the state of Washington is confined to elevations below 2,000 feet. While it may be found along the Pacific Coast from southern British Columbia to southern California, it makes its best growth and attains its greatest abundance in areas of high humidity where moisture-laden winds,

sweeping in from the Pacific are often accompanied by dense, penetrating fogs. Such conditions are quite prevalent in western Washington throughout a large part of the year, particularly in the Puget Sound basin where this tree is especially abundant.

Easily recognized by its thick, leathery, dark, glossy, evergreen foliage and its thin, scaly, reddish-brown bark, the madrona is one of the most distinctive trees in western Washington. Individual leaves are 2 to 5 inches long and oval in outline. In the spring the tree is rendered distinctive by large

clusters (panicles) of drooping, white, urn-shaped flowers, but it is of greatest interest in the fall. At that time it is brilliant with abundant clusters of small, bright orange-red, berry-like fruit about $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. The distinctive red bark is thin and smooth on the trunks of small trees as well as on the upper trunks and branches of older specimens, and peels off in thin, irregular plates to expose sections of lighter purple-red bark beneath. The bark near the base of older and larger trunks is broken up into small, loose scales.

OREGON WHITE OAK

Quercus garryana Dougl.—Beech Family (*Fagaceae*)

Although this tree is not actually found in Mount Rainier National Park, it is listed here, not only because it is the only oak native to the state of Washington, but also because several small trees of this species were found just outside the park boundary in the Ohanapecosh district in the summer of 1937.

Since the characters of the oaks are generally well known by the average person, and since this is the only native oak of this region, no further description seems necessary. However, it might be pointed out that in Washington this tree is small (rarely over 30 to 60 feet in height and 10 to 30 inches in diameter), with a short, crooked trunk and round-topped, bushy crown characterized by rather large limbs. It is confined in this area largely to the drier, gravelly soils and is not uncommon on the prairie south of Tacoma. It is also relatively abund-

ant in some places near Mount Adams, at certain points in Yakima County and nearby areas, and it is occasionally noted on some of the islands in Puget Sound.

The leaves, which are somewhat leathery in texture, are 4 to 6 inches long and 2 to 5 inches wide, and are characterized by 5 to 7 obtuse, rounded lobes. The characteristic fruit—an acorn—is 1 to $1\frac{1}{2}$ inches long, light brown in color, and enclosed at the base by a shallow, scaly cup.

Although this species may be found as far north as the southern tip of Vancouver Island and as far south as central California, it attains its best development in the intermountain valleys of the southern Cascades and Siskiyou of southern Oregon and northern California. Here, on deep, rich, loamy soils it grows to considerable size, being the largest oak of the Pacific Coast region.

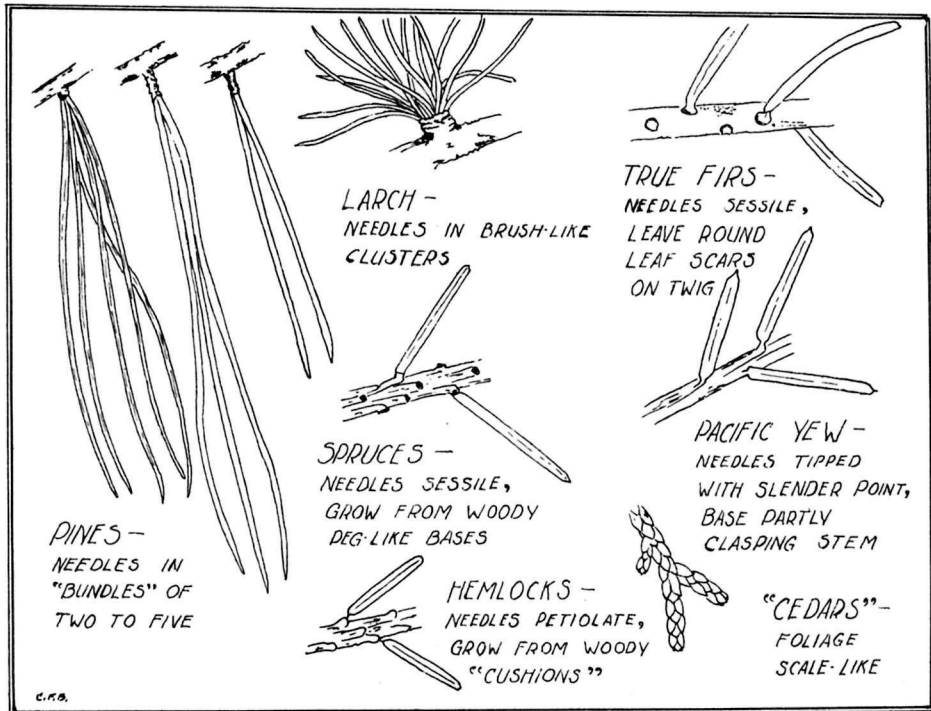
FIELD KEY TO THE TREES OF MOUNT RAINIER NATIONAL PARK

A field key which emphasizes basic characters offers a quick, easy means of identifying the various trees which one finds in this area. This key offers a continuing pair of possibilities from which the more logical is selected. Thus, beginning with 1 on the left, one merely selects the character noted in either description that is appropriate to the tree being studied. This done, the observer is then referred to another pair of possibilities by the number on the right, from which the next selection is made. Continuing in this manner, one progressively eliminates those characters that do not apply to the specimen at hand, eventually narrowing the unknown tree down to its proper identity.

For the sake of completeness and greater usefulness of this booklet, a number of trees not found within the borders of Mount Rainier National Park, but present along the highways approaching the area, are included.

1. Foliage needle-like or scale-like.....	2
1. Foliage not needle-like or scale-like; broad-leaved trees.....	18
2. Foliage evergreen.....	3
2. Foliage deciduous, dropping from tree each fall; needles in brush-like clusters on short spur shoots; not found in park but common along Highway 410 east of park boundary at Chinook Pass.....	Western larch (<i>Larix occidentalis</i>)
3. Foliage needle-like.....	4
3. Foliage scale-like.....	17
4. Needles borne in "bundles"; 2 to 5 needles per "bundle".....	5
4. Needles borne singly on the stem.....	8
5. Needles five per "bundle".....	6
5. Needles two or three per "bundle".....	7
6. Needles 2-4 inches long, slender, flexible, blue-green; cones 5-15 inches long and stalked.....	Western white pine (<i>Pinus monticola</i>)
6. Needles 2-3 inches long, stout and rigid; cones ovoid and about 2-3 inches long; a tree of high elevations, common at timber line.....	Whitebark pine (<i>Pinus albicaulis</i>)
7. Needles two per "bundle," 1-3 inches long; cones round to oblong and about 2 inches long; bark thin and scaly.....	Lodgepole pine (<i>Pinus contorta</i>)
7. Needles either three or two per "bundle," 5-11 inches long; cones 3-6 inches long, ovoid; bark of mature trees cinnamon-brown and broken up into large, irregular plates; very rare in Mount Rainier National Park but common in eastern Washington.....	Ponderosa pine (<i>Pinus ponderosa</i>)
8. Needles growing from peg-like, woody bases or "cushions" on the twigs.....	9
8. Needles growing directly from the twigs, never from woody peg-like bases or "cushions".....	12
9. Needles stiff and prickly to the touch, growing from peg-like bases which remain on branch after needles have fallen to give naked twigs a rough, "warty" appearance; cones with thin, papery, but stiff scales.....	10
9. Needles not prickly to the touch, growing from woody "cushions" and narrowed at base into a short but distinct stem.....	11

10. Needles 4-sided in cross section; cones 1-2½ inches long; bark scaly and purplish to reddish-brown; tree of upper elevations, common on north side of park.....
Engelmann spruce (*Picea engelmanni*)
10. Needles flat in cross section, silvery in appearance and very sharp-pointed; cones 2-4 inches long; bark scaly and gray to purplish-gray in color; very rare in Mount Rainier National Park.....**Sitka spruce (*Picea sitchensis*)**
11. Needles flat, blunt at apex, dark green above with two conspicuous white lines (stomata) below; cones ¾-1 inch long and ovoid; bark dark russet-brown and divided into long, flat ridges, inner bark purplish-red; a very common tree of lower elevations in the park.....**Western hemlock (*Tsuga heterophylla*)**
11. Needles plump and roundish in cross section, crowded toward upper side of branch, ¾-1 inch long; cones ¾-3½ inches long, oblong and deep purple at maturity; a tree of high elevations, common in alpine meadows and at timber line.....
Mountain hemlock (*Tsuga mertensiana*)
12. Needles rounded, blunt or notched at apex..... 13
12. Needles distinctly tipped at apex with short, slender point, dark glossy green above and pale green below, base of needle partially clasping stem; not a cone-bearing tree; fruit a small seed partly surrounded by a bright red, fleshy aril; bark thin, purplish-red, scaling off in thin plates; found at lower elevations.....**Pacific yew (*Taxus brevifolia*)**



13. Needles narrowed at base into short but distinct petiole or stem, $\frac{3}{4}$ -1 $\frac{1}{2}$ inches long and extending from all sides of twig; cones pendent, 3-4 inches long, with distinctive 3-pointed bracts protruding from between scales; a large tree of the lower forest zone.
Douglas fir (*Pseudotsuga taxifolia*)
13. Needles not narrowed at base, leave conspicuous round leaf scar on twig when they drop or when they are pulled from branch; cones upright, disintegrate upon maturity.... 14
14. Cones 4-6 inches long and 2-2 $\frac{1}{2}$ inches in diameter with numerous greenish bracts protruding from between scales; bracts lie along sides of cone to give it a "shingled" appearance; needles upon upper branches plump to 4-angled in cross section, pointed and generally clustered toward upper side of branch; foliage often with silvery tinge; a common tree of intermediate elevations..... Noble fir (*Abies nobilis*)
14. Cones smaller, without bracts extending from between scales; needles flat..... 15
15. Needles $\frac{1}{2}$ -2 inches long, 2-ranked in a "comb-like arrangement" on branches, and with stomata on underside only; cones 2-4 inches long and 1-1 $\frac{1}{2}$ inches in diameter, light green in color; a tree of lower elevations in park..... Grand fir (*Abies grandis*)
15. Needles not 2-ranked as in above but with additional row of needles overlying stem or with needles clustered toward upper side of branches; cones purple..... 16
16. Needles 2-ranked but also with additional row of needles growing along upper side of branch; stomata on under side only (occasionally also on upper side near tip); cones 3-6 inches long and barrel-shaped; the most widespread of true firs in Mount Rainier National Park..... Pacific silver fir (*Abies amabilis*)
16. Needles often clustered near top of twig and with stomata on both surfaces; cones 2-4 inches long, cylindrical, and often depressed at top; a common tree of alpine meadows and timber line..... Alpine fir (*Abies lasiocarpa*)
17. Branchlets much flattened with a graceful spreading, fern-like appearance; cones oblong; bark reddish-brown to gray-brown, fibrous and shreddy; a large tree typical of low elevations in the park..... Western red cedar (*Thuja plicata*)
17. Branchlets flattened but drooping to give tree a decided wilted appearance; cones round, $\frac{1}{4}$ - $\frac{1}{2}$ inch in diameter; bark ash-gray and flaky in texture; a tree of intermediate forest zone, also found up to timber line.....
Alaska yellow cedar (*Chamaecyparis nootkatensis*)
18. Leaves evergreen, alternate on branches, thick and leathery in texture, oval to oblong in outline, dark glossy green above and lighter green below; flowers white and urn-shaped, in drooping clusters; fruit red and berry-like; bark reddish-brown, scaling off in thin sections; not found in park but common in Puget Sound basin and at low elevations along roads approaching park from west.....
Madrona (*Arbutus menziesii*)
18. Leaves deciduous, dropping from tree in fall..... 19
19. Leaves opposite on branches..... 20
19. Leaves alternate on branches..... 22
20. Leaves simple..... 21
20. Leaves odd-pinnately compound, 5-14 inches long with 5-7 leaflets; flowers in compact clusters, appearing at about time leaves unfold; fruit in compact clusters, winged, 1-2 inches long; not found in Mount Rainier National Park but commonly observed at low elevations along approach roads from Puget Sound.....
Oregon ash (*Fraxinus oregona*)

21. Leaves deeply 5-lobed, large; flowers yellow, in fragrant, pendent clusters, appearing at about time leaves unfold; fruit winged and in pairs.....
Big-leaf maple (*Acer macrophyllum*)
21. Leaves not lobed, ovate in outline (4-5 inches long and 1½-3 inches wide), and changing to bright crimson in fall; large showy white blossoms conspicuous in spring; fruit in conspicuous, bright red clusters in fall; common at low elevations in Puget Sound basin, found in park only in Ohanapecosh area.....
Pacific dogwood (*Cornus nuttallii*)
22. Leaves lobed, 4-6 inches long and 2-4 inches wide, somewhat leathery in texture; fruit an acorn; not found in Mount Rainier National Park but common on dry, gravelly soils south of Tacoma; a few trees noted near Ohanapecosh entrance.....
Oregon white oak (*Quercus garryana*)
22. Leaves not lobed..... 23
23. Flowers in catkins..... 24
23. Flowers not in catkins..... 27
24. Fruit cone-like (green before maturity, black afterward), ½-¾ inch long; staminate flowers conspicuous in spring as pendent, tassel-like clusters 5-6 inches long; leaves coarsely doubly toothed and ovate in outline, 3-5 inches long; dark green above and rusty brown beneath; bark ash-gray; most common deciduous trees in park.....
Red alder (*Alnus rubra*)
24. Fruit not cone-like; leaves not coarsely doubly toothed..... 25
25. Buds covered by a single scale; leaves usually several times longer than broad and with short petiole.....**Willow (*Salix spp.*)**
25. Buds covered by several overlapping scales; leaves about as long as broad and with long petioles or stems..... 26
26. Leaves broadly ovate, tapering to point, 5-6 inches long, dark green above and silvery to rusty brown beneath, margin finely toothed, petioles 1-3 inches long; buds conical, gummy and fragrant; bark smooth and yellow-gray on young trees, dark gray and deeply furrowed on old trees; largest deciduous tree in the park.....
Northern black cottonwood (*Populus trichocarpa hastata*)
26. Leaves nearly round with small point at apex, 1½-3 inches in diameter, with long, laterally flattened petiole; leaves flutter in slightest breeze and turn bright golden yellow in fall; buds conical but not gummy; bark smooth, greenish-white to cream colored, often marked with black protuberances; not found in the park but seen along Highway 410 east of boundary at Chinook Pass.....
Quaking aspen (*Populus tremuloides*)
27. Bark marked with conspicuous horizontal lenticels as in cultivated cherry; fruit red and cherry-like, about ¼ inch in diameter, bitter; leaves narrow, 1-3 inches long, margins finely toothed and with short petioles; occasionally found in park at low elevations in moist soils.....**Bitter cherry (*Prunus emarginata mollis*)**
27. Bark not marked with lenticels; fruit oblong, yellow and apple-like; leaves widest below middle and tapering to a point, margins toothed, sometimes 3-lobed, pubescent beneath; occasionally found in park at low elevations in moist soils.....
Wild crab apple (*Malus diversifolia*)

BACK COVER: Wind-blown mountain hemlock on Skyline trail. (*Rainier National Park
Co. photo*)

