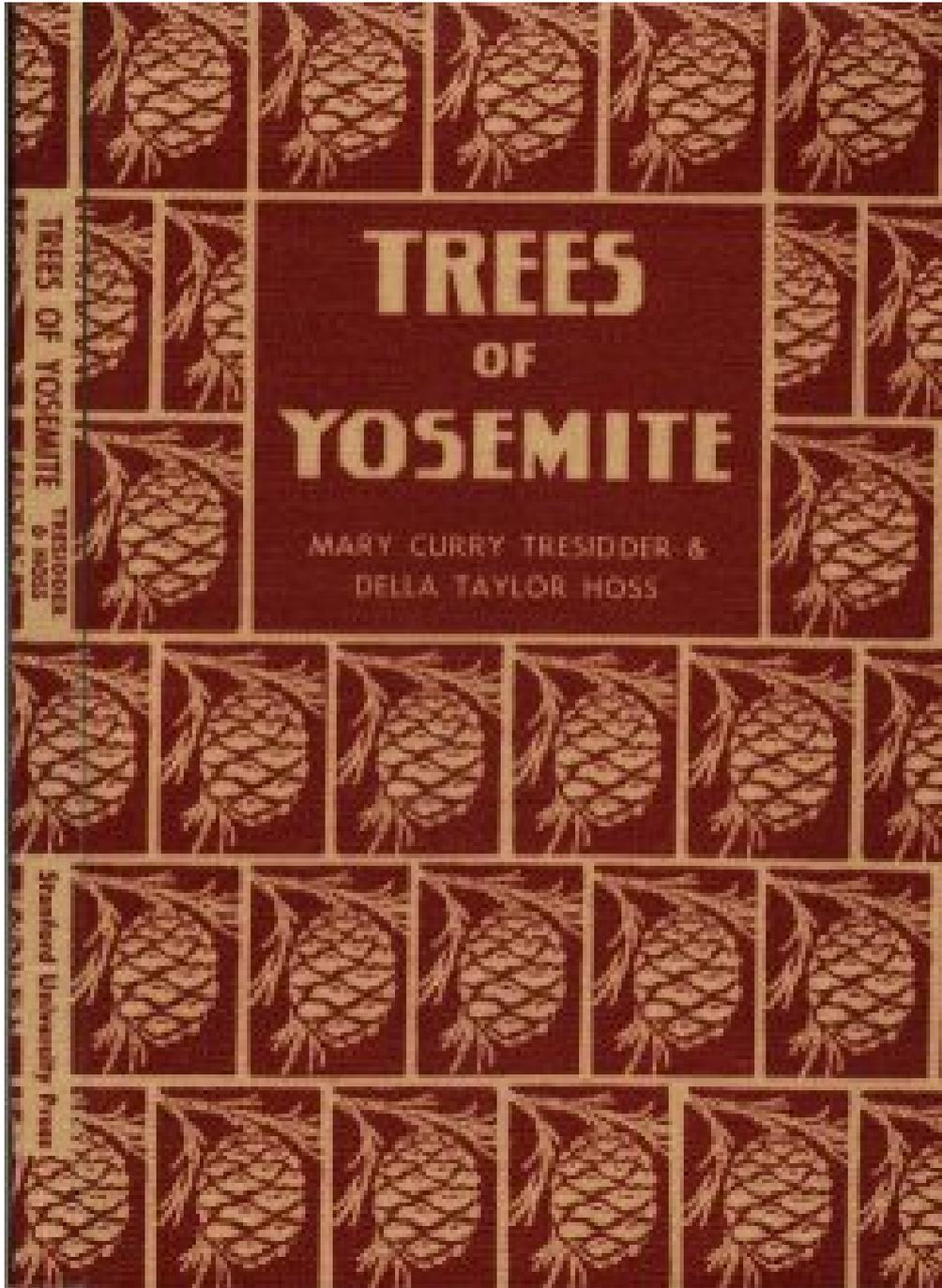


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*Trees of Yosemite* (1932, 1948) by Mary Curry Tresidder



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## About the Author



*Mary Curry Tresidder*  
(Ansel Adams)

Mary Louise Curry was born November 29, 1893 in Ogden, Utah. She was the daughter of “Mother” Jennie Curry and David Curry, founders of Camp Curry in Yosemite Valley, and grew up in Yosemite Valley. She graduated from Yale in 1919.

Mary met her future husband, Donald B. Tresidder, while he was a med student working summers in Yosemite. He was briefly fired for taking her up the back side of Half Dome. They married June 17, 1920. Donald earned his M. D. and became president of Stanford University and the Yosemite Park and Curry Company, the private concessionaire for Yosemite National Park. After Mary’s husband died, Mary was elected president of Yosemite Park and Curry Company. Mary Tresidder was an intensely shy woman. She had a deep interest in botany and would frequently post notes about the latest flower blooms at the High Sierra Camps in summer. Mary Curry Tresidder died of a heart attack October 29, 1970 in her Ahwahnee Hotel suite, Yosemite Valley, California.

For more information on Mary Curry, the Curry Family, Camp Curry, and Yosemite Park and Curry Company, see *Yosemite’s Innkeepers* by Shirley Sargent (1975, 2000).

## About the Illustrator



*Mary Tresidder with Della Hoss  
and one of her linoleum prints.*

Born Della Taylor June 3, 1900 in Harvey, Illinois. She grew up in Los Angeles. Her brother Frank J. Taylor (1894-1972) wrote "Oh, Ranger!" with Horace M. Albright, among some two dozen other books. Della Taylor graduated from Stanford University in 1923 and later studied at the California School of Fine Arts and National School of Fine and Applied Arts. She was an artist, working on prints, paintings, and illustrations. Little Della Taylor married Hermon Hoss, a tall man and attorney for Yosemite Park and Curry Company. They had a son Peter. She illustrated *Trees of Yosemite* with beautifully thick Art Deco-style linoleum block prints of trees and leaves. Della says of her good friend: "My first impression was that all the trees in Yosemite were pines. . . . Mary in her scholarly way and out of her deep love for nature, taught me differently." She began by sketches and later linoleum block prints. (Shirley Sargent *Yosemite Innkeepers*). Della Taylor Hoss died February 19, 1997, Palo Alto, California.

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## Bibliographical Information

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—Dan Anderson, [www.yosemite.ca.us](http://www.yosemite.ca.us)

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Sierra Juniper Tree

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## THE TREES OF YOSEMITE

+++++++ A  
Popular Account by

Mary Curry Tresidder  
With 34 Linoleum  
Block Prints by  
Della Taylor Hoss  
STANFORD UNIVERSITY PRESS  
Stanford, California

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TO  
D.B.T.  
AND  
H.H.H.

---

## PREFACE

This book began with the attempt of the artist to transfer to paper the distinctive patterns of a few of the pine cones strewn in profusion about the Valley floor; others were added because it seemed a pity to pass them by; and it took definite form at last as a record of what she saw and a guide to the trees commonly encountered in the Yosemite National Park. Working on it has enriched days in the Valley and upon the mountains for both the artist and the author; it is our hope that it may enable our readers to know the trees as friends.

We desire to acknowledge our obligation to the authors of the books we have listed in our bibliography; to give our thanks to Colonel C. G. Thomson, Superintendent of the Yosemite National Park, and to Mr. C. A. Harwell, Park Naturalist, for ready access to the necessary resources and materials; and to express our appreciation of the aid of Mr. and Mrs. Charles W. Michael of Yosemite, who read the book in manuscript, and to whom we are indebted for many observations, as well as for a keener vision of the trail-side.

Mary Curry Tresidder  
Della Taylor Hoss

20 November 1941

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## PREFACE TO SECOND EDITION

After fifteen years this book is being reissued. The nomenclature has been changed in some cases, so as to conform more closely to current usage. The Golden-Cup Oak has therefore become the Canyon Live Oak, and the Mountain Pine, that dweller in high places, is given its official title of Western White Pine or Silver Pine, while the Western Yellow Pine is now the Ponderosa Pine. Both names are given in the index in such instances, with cross-references.

Alterations other than these are few, except that I have fallen more than ever in love with the Red Fir, and its chapter has been slightly expanded. Finding myself importuned by friends about the problem, I have also gone into more detail about check points for distinguishing such trees as the Red Fir, the White Fir, and the Douglas Fir.

During the last five years I have been living at some distance from Yosemite. Sometimes I wonder whether one may see the trees with a fresher and more perceptive eye when he is not so constantly among them. On a recent winter visit to the mountains I was almost startled at the different nuances of color and shadow among the Red Firs of the forest near Badger Pass, for instance, and the Sugar Pine and Ponderosa Pine seemed more distinctive in their anatomical structure than I remembered, conscious though I had been of their contrasting silhouettes.

Perhaps we merely forget these things between whiles, but I do believe that the returning wanderer observes with more emotion and with more poignant appreciation, just as he thrills at breathing "an ampler ether, a diviner air," on climbing away from the city smog, out of the dusty, chaparral-covered foothill country, into the clean fragrance of the Yellow Pine Belt.

MARY C. TRESIDDER

15 January 1948

## ADDENDUM

Too late for inclusion in its proper place, yet too exciting to be passed over, comes the news that an expedition sponsored by the Save-the-Redwoods League, and headed by Dr. Ralph Chaney of the University of California, has confirmed the truth of reports from Chinese botanists that another species of Sequoia, previously known only in fossil form in widely scattered parts of the world, has been found growing in rice paddies in the interior of China. Specimens and seedlings of the "dawn-redwood" have been brought back here for study and experiment.

M. C. T.

March 1948

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## **THE TREES OF YOSEMITE**

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### **THE TREES OF YOSEMITE**

#### INTRODUCTION

##### Tree Study in the Yosemite

Yosemite National Park is an excellent laboratory for the study of trees, inasmuch as it preserves for us a cross section from the foothills to the crest of the Sierra Nevada, with wide differences of elevation and exposure. The influence of varying conditions of soil and climate

is ever before the observer; in the Yosemite Valley itself these varying conditions are peculiarly concentrated in a small area by the high granite walls along the north and south, which give a wide range of temperature.

Then, too, the forests of the Pacific slope, with their magnificent stands of pine and fir and redwood, are more restricted in kinds of trees than those of the Eastern states, and the beginner can therefore attack the subject with less confusion.

The displays at the Yosemite Museum may be made most helpful with their specimens of bark and needles, illustrations showing the work of such enemies as insects and fungi, and a very interesting collection of charts and exhibits which portray the life zones. In the grounds of the Ahwahnee Hotel a number of trees from the higher mountains have been planted, in addition to those already at hand. To draw a hard and fast line between trees and shrubs is often difficult. For the purposes of this book we have taken as the boundary a height of twenty-five feet in the habitual appearance of the plant in our region. We have omitted several species which do attain this minimum height at times but not frequently enough to be familiar as trees. Some of the willows may be cited under this head, and the cherries, with such shrubs as the manzanita and certain kinds of *Ceanothus*, or wild lilac.

## The Classification of Trees

Botanists make use of various sets of characteristics to trace relationships among plants; the most fundamental one for that purpose seems to be the method of reproduction. The chart entitled "Trees of Yosemite Classified by Families" gives the broad divisions of that part of the plant world with which we are dealing here, placing the trees in families.

Under the family, in turn, is the genus, which is subdivided into species; and it is from the latter two classifications that our plants take their botanical names for scientific use.

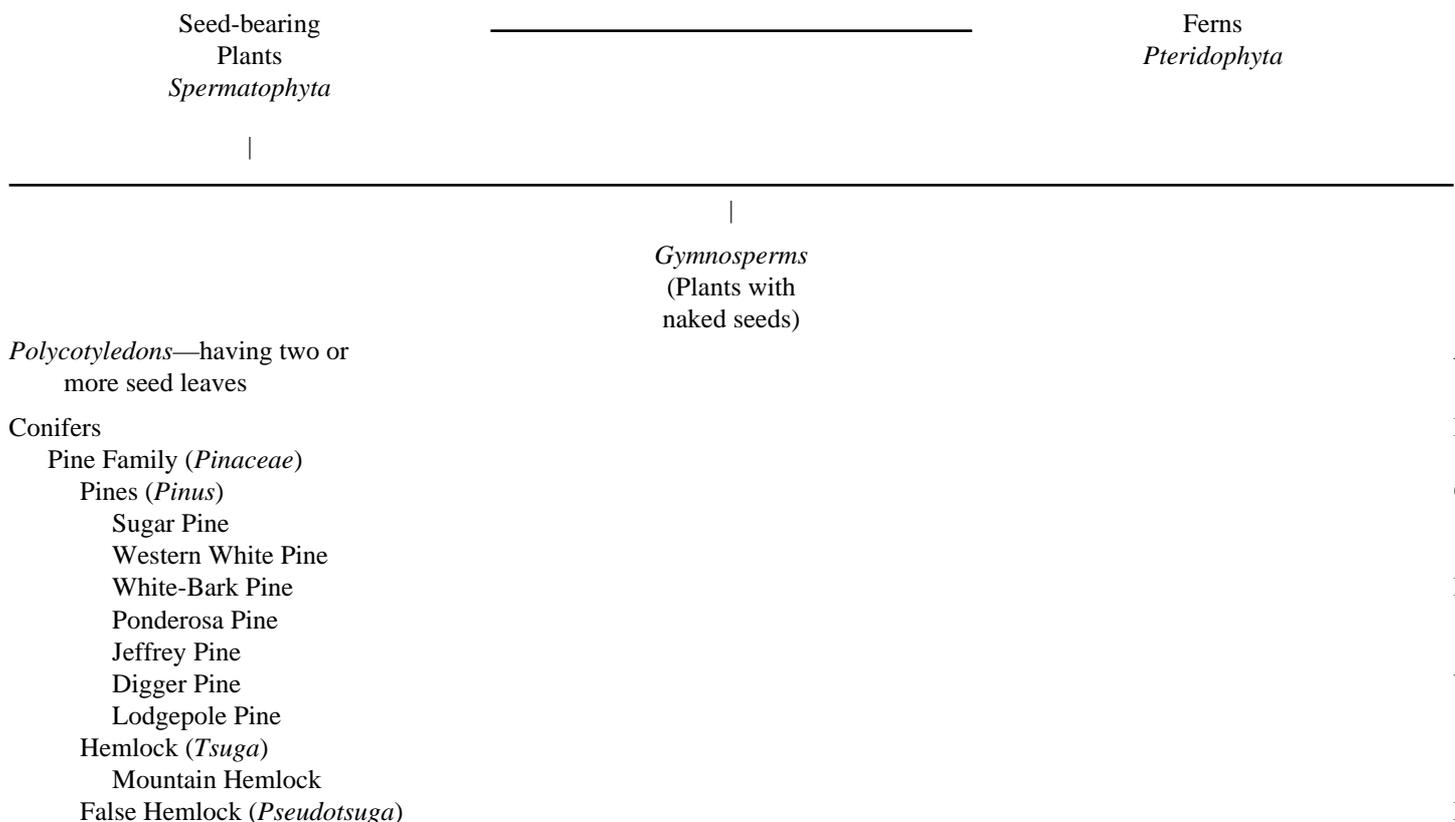
These names are necessary for accuracy, as, with the carelessness of popular usage, the same tree may go under different names in different places; the Canyon Live Oak, for instance, *Quercus chrysolepis*, has a dozen different names in as many places. On the other hand, the same name may be applied to an entirely different tree, on the basis of some superficial resemblance; thus our tamarack, a pine, is of a different genus from the tamarack of the Eastern states, which is a larch, a deciduous tree, though a cone-bearer. Douglas Fir is one of the most confusing of these cases, since it possesses attributes of three genera—the fir, the spruce, and the hemlock—while its lumber goes under the trade name of "Oregon Pine."

To avoid these pitfalls, the botanist employs a scientific terminology which gives a tree a standard name throughout the world. Thus the botanical name of the Ponderosa Pine (Western Yellow Pine), *Pinus ponderosa* Dougl., is made up as follows: first, the genus, or kind, which is *Pinus*, pine, often indicated merely by the initial; then the species of that kind, *ponderosa*; the third part is the name of the botanist who first assigned it to its proper place in the hierarchy of plants and published his findings. This name is often abbreviated. The species name is sometimes descriptive of characteristics or habitat, as with *P. albicaulis*, White-Bark Pine; sometimes it, too, is derived from the name of a person, as with *P. lambertiana*, the Sugar Pine, named by David Douglas in honor of a friend.

Occasionally there is a further segregation beyond the species; the latter may have two or more varieties. This is indicated by the abbreviation "var." after the species name, followed by the name of the botanist who described it as a variation. Usually it is a form differing as a result of climatic conditions, but it sometimes requires study to determine whether it is a variety or a different species. This is the case with the Jeffrey Pine, considered by some botanists a variety of Yellow Pine, by others as an independent species.

### CHART ONE

#### Trees of Yosemite Classified by Families



- Douglas Fir
- Firs (*Abies*)
- White Fir
- Red Fir
- Redwood Family (*Taxodiaceae*)
- Giant Sequoia (*Sequoia gigantea*)
- Cypress Family (*Cupressaceae*)
- Incense Cedar
- Sierra Juniper
- Yew Family (*Taxaceae*)
- California Nutmeg

## Introduction

### Life Zones

Plant and animal life varies with varying conditions of temperature, humidity, and rainfall. Through a mountain area such as this, we have a range of altitude which gives us several well-defined belts of conditions for growth, and groups of associated forms of life in those belts. These are known as life zones. To say that a plant or a bird belongs in a certain life zone is to describe in a general way the factors it requires, the company it keeps. Conversely, seeing a certain plant or animal known to keep strictly to its own preserves serves to identify the zone through which one is passing. The chart on page 9 shows the distribution of trees through the life zones of our region. The altitudes given are those of the Yosemite latitude; farther north, the boundaries are lower; farther south, they are pushed upward.

These boundaries of altitude are only an approximation, of course, not a hard and fast line. Exposure makes a great difference in the climatic conditions; a wide variety of plant life is encountered in the Yosemite Valley, where along the south wall conditions are those of the true Transition Zone, while the north will, absorbing and reflecting the heat, accommodates that side of the Valley to the warmth-loving trees and plants of drier regions.

Thus in the Yosemite Valley proper—between Mirror Lake and the Cascades—we find indigenous specimens of all the trees commonly encountered in our region except the Digger Pine from the Sonoran Zone, the *Sequoia gigantea* from its isolated stands at the upper edge of the Transition Zone, the Western White Pine from the Canadian Zone, and the Mountain Hemlock and White-Bark Pine from the Hudsonian Zone. The Mountain Hemlock and the *Sequoia gigantea* have been planted here and are thriving.

A motor trip from El Portal through Yosemite and over the Tioga Road gives an idea of the sequence and significance of these life zones, and an acquaintance with all the trees generally encountered in our region. At El Portal the traveler is just leaving the foothills—the Upper Sonoran Zone, with its Digger Pine and Blue Oak and its chaparral belt—and entering the Transition Zone, in which the Yosemite Valley lies. Here the Ponderosa Pine predominates, with the White Fir, the Incense Cedar, and the California Black Oak as its most constant companions. Douglas Fir and Sugar Pine also enter the picture, the latter at its best in the upper portion of the zone.

As we turn up the Big Oak Flat Road, on the warm northern side of the Valley, the talus slope is covered with *Quercus chrysolepis*, or Canyon Live Oak, almost to the exclusion of other trees except the California Laurel, with its aromatic leaf. Near Gentry's the road turns west, then north, away from the full glare of the sun, and in little ravines along the watercourses are Douglas Fir and Ponderosa Pine again, with Incense Cedar and White Fir appearing here and there. Across Lily Creek the road climbs abruptly; noble Sugar Pines make the road a Hall of Columns, and Tamarack (or Lodgepole) Pines enter into the picture more and more, as Tamarack Flat witnesses.

We reach the Canadian Zone, with its Red Fir and Jeffrey Pine, then drop down to Crane Flat and pass through the Tuolumne Grove of Big Trees, few in number but glorious. At Carl Inn the Tioga Road turns north and east through a similar forest, on the border between the Transition Zone and the Canadian Zone. Aspens at Aspen Valley, Sierra Junipers along the rocky bluffs above us as we climb over the ridge and drop into Yosemite Creek Basin, a magnificent forest of Red Fir and Western White Pine as we reach Porcupine Flat—these are what cause the Canadian Zone to thrill the heart of the lover of trees, with its great clear shafts glowing with life, its play of sun and shadow through the foliage upon the thick carpet of needles, its occasional meadow of delicate flowers for contrast with these dark giants.

Near Snow Flat, the Mountain Hemlock puts in an appearance; along Tenaya Lake, Lodgepole Pine and Juniper are still present, but Hemlock occupies the moist and shadowed places. Lodgepole Pine leads through Tuolumne Meadows, with Western White Pine as runner-up, particularly on the slopes rising from the meadows, while Junipers cling to the ledges and granite domes of the region. As the road winds up toward Tioga Pass the Hemlock recurs, and at last comes our sturdy, weather-beaten pioneer of timber line, the White-Bark Pine, above whose territory only dwarf shrubs and the hardest Alpine plants venture.

## CHART TWO

### Yosemite Trees Classified by Life Zones

Upper Sonoran Zone	Transition Zone	Canadian Zone	Hudsonian Zone	Alpine Zone
800–3,000 feet (Chaparral Belt)	3,000–6,000 feet	6,000–8,000 feet	8,000–10,500 feet	10,500—
El Portal,	Floor of Valley,	Glacier Point,	Tuolumne	Higher Passes

3,000 feet	4,000 feet	7,214 feet	Meadows 8,549 feet	and Peaks
 ∨ Yellow Willow California Nutmeg — California Black Oak Digger Pine	 ∨ Scouter Willow  Canyon Live Oak	 ∨  — Quaking Aspen	 ∨	 ∨  Dwarf Shrubs only
— Ponderosa Pine —	Incense Cedar White Fir — — Lodgepole Pine — Douglas Fir Nuttall Dogwood	Jeffrey Pine		
	Big-Leaf Maple — California Laurel — White Alder	Red Fir —		
	Black Cottonwood — Sierra Juniper — Sugar Pine Giant Sequoia	Western White Pine —		
		Mountain Hemlock White-Bark Pine		

## Introduction

### Identification of the Trees

Identifying the trees means checking up on this detail and that, narrowing down, eliminating—until, gradually, the eye automatically recognizes the salient characteristics, even at a considerable distance.

In her *Handbook of the Trees of California*, which is, unfortunately, out of print, Miss Eastwood gives a triple means of identification: a key to the trees according to the leaves, one according to the fruits, and one in accordance with the analytical classification into families. For the beginner, the leaf is often the readiest means of identification, as even when the leaves have fallen they may usually be found near by. Of course, due caution must be exercised in such a case.

To turn to method, then: keep the zone in the back of your mind, for that is helpful in limiting the possibilities. If the leaves are linear, either lance-shaped or awl-like, the tree belongs to our first group, the Gymnosperms, which are conifers in the main. If it has broad leaves, it belongs to the Angiosperms.

A chart using the leaf as the key is given for each of these groups. Narrow the problem down by its use; then look up the probable solutions, with the pictures as a guide and a check. You must go through the characteristics until you have the species well before you: the leaf, the bark, the size and appearance of the trunk, the cone (if that is available either on the tree or on the ground), and the situation as regards sun and shadow, moisture and dryness, the kind of soil. The process will sharpen your observation, making you aware of countless details you have never noticed. On the other hand, your mind at length will come to grasp the important things about a tree, and the actual steps in the procedure will be taken without conscious deliberation. The very silhouette of a tree is enough for an expert, especially of a tree with such a distinctive outline as the Sugar Pine or the Sierra Juniper.

The difficulty is that the tree does not often conform exactly to type. A typical Ponderosa Pine, for example, may readily be distinguished from a typical Jeffrey; but few are “typical,” and unless the cones are available (the easiest way of identifying the species, in this case) the identification may be hard. To call the foliage age of one blue-green and that of the other yellow-green is likely to be of little avail unless they are side by side, and not always then. One may have a pointed top for a Jeffrey, the other a flattened or rounded top for a Ponderosa Pine. And so it goes; it is essential to check up by every possible means.

## THE GYMNOSPERMS

### THE CONIFERS

Our first division is made up of evergreens with narrow leaves, either linear, lanceolate, or awl-shaped. These are borne in a sheath in the case of the pines, and singly on the branch, either with a small filament of stem (the petiole) or attached directly, in the other trees of the pine family and in the California Nutmeg. In the cedar, juniper, and sequoia, which have awl-shaped leaves, they clothe the branchlet closely or overlap along it.

All these trees are cone-bearers except the California Nutmeg, which belongs to the Taxaceae, or yew-like trees, and bears a drupe, or fleshy berry. Our juniper also has a berry, but this latter is classified as a cone in its origin.

The cones of these trees are made up of woody scales, overlapping, except in the case of the cedar, and with two or more seeds under each of these scales. In most of the conifers the seed has a thin wing.

The California Nutmeg bears its staminate and its ovulate flowers on different trees. Our conifers usually bear the two kinds of flowers on different branches of the same tree. The staminate flowers produce a yellowish pollen, carried by the wind to the ovulate flowers, which are small, scaly catkins or conelike bodies, and develop into a woody cone bearing the fruit or seed.

### CHART THREE

#### Summary of Distinguishing\* Characteristics of Yosemite Gymnosperms†

FOLIAGE	TREE	BARK	CONE	COMMENT	ZONE
<i>Needles in sheath</i>	<i>Pines</i>	<i>Matures autumn</i>	<i>second</i>		
One; 1 1/2-2 inches; pale yellow-green	Single-Leaf Pine Piñon	Thin, brown	2 1/2-3 inches	Found only in Pate Valley in Yosemite National Park; common along desert east of Sierra Nevada Range	Transition in National Park; common along desert east of Sierra Nevada Range
Two; 1 1/2-3 inches; yellow-green	Lodgepole Pine Tamarack Pine	Thin, grayish-brown; scaly	1-1 3/4 inches	Many dead branches usually. Not true Tamarack	Canadian
Three; 8-18 inches; gray-green	Digger Pine	Dark gray, roughened	6-10 inches	At 15-30 feet, trunk often splits into branches with vertical thrust	Upper Sonoran
7-11 inches; yellow-green	Ponderosa or Yellow Pine	Tawny, with large plates of irregular scales, deep furrows between them	2 1/2-5 1/2 inches; ovate or oval, tapering	Most common pine on Valley floor; sometimes known as Yellow Pine Belt. Slender spire	Transition Zone
7-11 inches; blue-green	Jeffrey Pine	Darker, ridges closer than Yellow Pine	4-11 inches; beehive shape	Crown more flattened than Yellow Pine, of which it is probably a variation	Canadian
3-5 inches	Knobcone Pine	Gray, thin	3-6 inches; stays on tree	Two trees at El Portal. Cones usually opened by forest fire to scatter seeds	Upper Sonoran
<i>Needles in sheath</i>	<i>White Pines</i>	<i>Matures autumn</i>	<i>second</i>		
Five; 2-4 inches; blue-green	Sugar Pine	Brown, tinged with red; fissured up and down the tree	12-20 inches; longest of any of the pines	Distinctive silhouette with one or two large branches flung wide. Sugar from wounds in bark	Transition
1-1 1/2 inches; yellow-green	White-Bark Pine	Darkish-gray in old trees, ashen to silver in young	1-4 inches; ovoid shape; purplish tinge	Often a group of upright branching from a short main trunk to form rounded crown; at timber line often prostrate, matted	Hudsonian
<i>Single shorter needles attached to branch direct or with leaf-stem</i>	<i>Matures first autumn</i>				

1/2-1 inch; blue-green  
all around twig;  
declined leaf-stem

1/2-1 1/2 inches; dark  
green, short leaf-stem;  
needles either around  
twig or somewhat  
flattened; needle flat,  
comparatively blunt

1-2 1/2 inches; White Fir  
yellow-green; flat;  
short, twisted petiole;  
channel above, midrib  
below, two whitish  
bands along side

Needle sessile on  
branch; 3/4-1 1/2  
inches; blue-green;  
four-sided rather than  
flat

Dark reddish-brown; 1 1/2-3 1/2 inches  
rough ridges with long; pendulous  
mottled scales  
top slender, drooping;  
grows in moist, shaded  
situations

Thick, deep, dull 1 3/4-3 1/2 inches;  
furrows, brown bracts with trident  
outside; red, then thrust over scales;  
white inside pendent  
Foliage plumy; Transition  
drooping effect of  
branches; massive tree

Dark gray with ashen 2-5 1/2 inches; erect  
tinge on old trees; on branches of crown,  
rough, soft, fissured; scales fall,  
palish inside remains on tree  
Foliage in fan-like Transition thrusting  
sprays; twisted petiole into Canadian  
axis gives flat effect  
on lower branches;  
needles shorter, curve  
upward from both  
sides on higher  
branches. Note lower  
branches to compare  
needles with Red Fir

Reddish-brown; rough 4-8 inches; erect on  
branches of crown, layers of fan-like  
scales, fall, axis sprays, somewhat  
remains on tree more regular than  
White Fir; shorter  
needles, more strongly  
curved than White Fir,  
especially on lower  
branches

---

*Leaves linear, narrow, Matures first autumn  
bristle-tipped*

---

Rigid, on twisted California Nutmeg  
petiole; leaves making  
flat spray; two  
long grooves in  
them; dark green,  
shiny above;  
yellowish-green  
below

Bark finely checked; 1 1/2-2 1/2  
ashen to brown inches; fruit a  
drupe, olive-like; to Cascades; attractive  
one-seeded; green to  
purplish color; flesh  
resinous height; belongs to yew  
family; leaves pungent  
when bruised

---

*Leaves short,  
scale-like or  
awl-shaped; pointed*

---

Leaves blue-green, Giant Sequoia  
awl-shaped, closely  
overlapping along  
stem, tips free

Reddish bark, often 1-2 1/2 inches; ovoid;  
1-2 feet thick in old ripe second autumn  
trees; fibrous  
Largest trees in world, Transition (upper)  
rounded crown; none  
on Valley floor except  
where planted

Leaves yellow-green, Incense Cedar  
scale-like, arranged in  
pairs adherent to twig;  
each pair at right  
angles to preceding,  
tip turning out slightly  
in pointed effect; flat  
sprays

Reddish-brown bark, 3/4-1 inch long;  
stringy; not so thick or three  
lustrous as Big Tree scales; urn-shaped  
while green; later give lyre effect,  
like upper part of young trees in  
fleur-de-lis open places form  
symmetrical pyramids  
almost from ground up

Short, blue-green, Sierra Juniper  
scale-like leaves clasp  
stem in whorls of  
threes, clothing stem  
tightly; sometimes  
points turn out,  
especially on lower  
part of tree

Pale brown; easily Fruit a small,  
shredded blue-black drupe  
or berry, usually gnarled and  
two-seeded weather-beaten, but  
usually well into Hudsonian  
usually well into Hudsonian  
symmetrical tree of  
forty or fifty feet

\* It must be borne in mind that there are always many variations from the types; the descriptions express averages and apply as tendencies, not as hard and fast rules. In particular, colorings are relative rather than absolute.

† Ours all evergreens, practically all conifers; all narrow leaves, either linear, awl- or scale-shaped

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## Pine Family

**Pine Family** The pine family has more representatives in the Yosemite region than has any of the other families, in number of species and in actual number of trees. Botanically it includes not only pines but also firs, hemlock, spruce, and *Pseudotsuga*. Except when the pine family is specifically mentioned, however, "pine" will be used of the genus, not the family.

Pines have linear leaves, or needles, and bear them in a sheath upon the branch, with from one to five needles in a cluster, the number varying with the species. New clusters form on the young twigs, which push outward each year. The needles may remain on the tree for a time varying with the species from two to six years.\*

The woody cones mature the second season. With some pines the cone falls within a few weeks after the ripened seeds have been shed, while with others the cone remains on the tree indefinitely. In the case of a few pines, such as the Knobcone, the seed is so tightly held that it is usually released only by the intense heat of a forest fire.

Sudworth classes the pines merely as white and yellow; Jepson divides the second group into yellow, nut, and closed-cone pines.

Three of our trees belong in the first group, all of which are characterized by bearing five needles in a sheath. The Sugar Pine occurs mainly in the Transition Zone, the Western White Pine in the Canadian, and the White-Bark Pine in the Hudsonian Zone.

Three of our trees are Yellow Pines, in Jepson's classification: the Ponderosa Pine and the Jeffrey Pine, both of which have three needles in a sheath, and the Lodgepole Pine, which has two comparatively short needles in a bundle. The Digger Pine is a nut pine, and its needles are three in a sheath.

In addition to the seven pines ordinarily seen in the Park, a limited number of members of two other species may possibly be encountered. The Piñon, *P. monophylla* Torr., or Single-Leaf Pine, which is common on the eastern slope of the Sierra Nevada, has a few representatives of its species in the Park, above the Tuolumne River not far from Hetch Hetchy. The other possible species is the Knobcone Pine, *P. attenuata* Lemm., mentioned above as belonging to the closed-cone type. Lone individuals have been found in scattered places in the Park; just below El Portal, a little outside the Park boundary, two of these trees may be seen to the north of the highway.

\* Sudworth, *Forest Trees of the Pacific Slope*, page 19.

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## Sugar Pine

*Pinus lambertiana* Dougl.



### *Sugar Pine Tree*

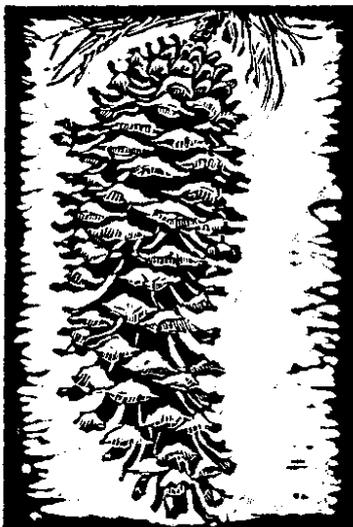
The Sugar Pine is the only White Pine found in the neighborhood of the Yosemite Valley and on the rim itself. The Western White Pine, its neighbor in this category, comes into the picture at the upper edge of the Canadian Zone.

The "sugar" from which the Sugar Pine takes its common name is a syrupy sap exuding from wounds made in the tree, not the sugary pitch with which the cones are smeared. Its scientific name was given it by a botanist of the early nineteenth century, David Douglas. Jepson tells the story of how Douglas journeyed in search of this tree from the Columbia to the Umpqua River after seeing some of

the seeds in an Indian's wallet. He named it for a friend, Aylmer Bourke Lambert, "a founder of the Linnean Society of London and the author of a sumptuous work on pines."

Many think this the noblest tree of our mountain forests. Its characteristic silhouette makes it the easiest of pines to pick out along a distant sky line—a tall shaft, clear for a hundred feet or more, its arms flung wide, with long cones pendent from them in season.

There are many young Sugar Pines on the floor of



#### *Sugar Pine Cone*

About 1/3 Natural Size

Yosemite, but only a few mature trees, notably one in Camp Curry, near the talus slope, and one on the north bank of the Merced between the Kenneyville Bridge and the Ahwahnee grounds. Near Hazel Green on the old Coulterville Road and Crocker's Station on the Big Oak Flat are magnificent stands of Sugar Pine, and there are many splendid individuals along the Wawona Road from Inspiration Point to Alder Creek. The generosity of John D. Rockefeller, Jr., has recently saved from cutting one of the largest and finest in these stands, near the Tuolumne Grove of Big Trees, along the Big Oak Flat Road.

In young trees there are branches from the ground; as they grow older these lower ones are shaded out. The mature tree reaches a height of one hundred and tilts to one hundred and seventy-five feet and a diameter of five to eight feet.

Young Sugar Pines have a silvery-gray bark that turns darker as they reach a diameter of half a foot to more. As the tree grows older, the bark thickens, and in mature trees it becomes serrated in texture and reddish in color. In the higher forests, such as those on the slopes below Half Dome, the bark in certain lights assumes the tinge of purple that marks many of the trees of that altitude.

The Sugar Pine bears its needles in clusters of five, two to four inches in length. Its cones are from twelve to twenty inches long; occasionally one still longer is recorded. In diameter they are from two and a half to three and a half inches at the largest part. The cones are formed one summer, mature and scatter their seeds the second autumn, and may hang on the tree through the following summer. The seeds are bitter, but are much appreciated by the Douglas squirrels, which often send cones flying to earth while still green.

In distinguishing the Sugar Pine and Ponderosa Pine, remember that the needle of the Sugar Pine is shorter while its cone is much longer; the needles of the Sugar Pine are borne in clusters of five, of the other in threes; the bark of the Sugar Pine is closely ridged, while the other is cut into great plates or scales. (The Jeffrey, to be sure, is more closely ridged and more roughened than the ordinary Ponderosa Pine.) The Sugar Pine, its branches at right angles to the trunk makes a broad if irregular crown, while the Ponderosa Pine is more tapering and obelisk-like in its outline. The finest growth of the Sugar Pine is at 5,500 to 7,000 feet elevation, where the Ponderosa Pine is giving way to the Jeffrey. The lover of trees, says John Muir, will never forget his first meeting with a Sugar Pine.

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#### Western White Pine

*Pinus monticola* Don.



*Western White Pine Cones*  
Slightly Less than 1/2 Natural Size

This tree, which is locally known as Mountain Pine or Little Sugar Pine rather than by its more formal titles, Silver Pine and Western White Pine, is a near relative of the Sugar Pine, which it resembles in many particulars. It grows on mountainsides from 7,800 to 9,500 feet in altitude, marching with Lodgepole Pine and Red Fir; in its upper range, it touches shoulders with Mountain Hemlock and, occasionally, with White Bark Pine, while the Sierra Juniper is a neighbor of the rocks. It is one of the few trees of the region not to be found at all on the floor of the Yosemite Valley, but it may be seen along the Tioga Road near Lake Tenaya and again between Tuolumne Meadows and Tioga Pass. The ridge running northward from Mount Watkins has some splendid specimens, as has the Mount Conness Trail. On the Isberg Pass Trail, the hillside above the McClure Fork is clothed with a magnificent forest of Red Fir and Western White Pine.

In open country such as the shores of Lake Washburn, it is a tall and stately guardian of the shining waters, a tree of eighty to one hundred feet in height and from two to four feet in diameter of the trunk. In more closely forested regions it does not attain such height, but is a tree of some fifty or sixty feet, its dense branches giving it a pyramidal effect, which is usually broken by one or two long, horizontal limbs.

As it is one of our three White Pines, the needles are five in a bundle; they are bluish-green in color, and rather shorter than those of the Sugar Pine. Its cones, though similar, are on a smaller scale, and rather more open when ripe. They ripen at the end of the second summer, and remain on the tree only a short time after they have opened and shed their seeds.

The bark varies greatly in color: in the young tree it is gray, becoming roughened and taking on a purplish tinge in dense forest; on open slopes it turns to cinnamon. In mature trees the trunk is checked in small, flat blocks, not deeply fissured. This gives it a peculiar texture, a bark pattern which at once differentiates it from all other trees of the district.

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## White-Bark Pine

*Pinus albicaulis* Engelm.



*White-Bark Pine Cones*  
Slightly Less Than Natural Size

The range of the White-Bark Pine in our region is from 8,000 to 10,500 feet, but it is as the tree of timber line that it holds most interest. At that point, which varies according to exposure and soil, this pine lies in dense mats, flattened by the long season of heavy snows. In slightly lower altitudes, such as near Boothe and Fletcher lakes, it sends its branches upward, making the tree seem a clump of whitish-gray trunks with a rounded crown of yellowish-green needles, very fresh-looking and stiff. In protected slopes it reaches a height of thirty or forty feet, and at times a large single trunk of unusual size takes on a coloring and appearance not unlike that of the Tamarack, which often occurs with it. Ordinarily, however, a group of slender stems with rather bushy branches forms the unit. The bark is thin, with whitish scales.

It is a White Pine, with needles five in a cluster. They vary from one and a half to two and a half in length, and remain on the tree for from five eight years.

The rather large, stout cones have scales thickened at the tip into a prickly umbo, and are from one and a half to three and a half inches in length. The chocolate color of the cones is very striking; they shine as if they had been newly varnished, and often have a purple

sheen. The Clark crows are particularly fond of their large, sweetish nuts. The cones mature in August or September of their second year, opening slowly to shed the seeds. The wings of the seeds remain attached to the scales. At Tioga Pass, and, indeed, in all our high mountain passes, this is the tree that most impresses an observer, accentuating the bleakness of the subalpine landscape. I remember a point on the Donohue Pass Trail where the desolate black peak of Mount Lyell rises above the glacier beyond a clump of these dead and ghostly trees scoured white by wind and snow.

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## Ponderosa Pine

*Pinus ponderosa* Dougl.



*Ponderosa Pine Cones*  
Slightly Less Than 1/2 Natural Size



*Ponderosa Pine Tree*

The Ponderosa (or Western Yellow) Pine is the commonest conifer on the floor of the Yosemite Valley. Dense stands of young trees with their blackish, roughened trunks border the meadows; in more open places, the splendid clear shafts of the mature pines stand boldly forth along the river or on the gradual slopes below the talus, for example, near the foot of the Four-Mile Trail to Glacier Point. The thick bark of these older trees is tawny, with deep fissures dividing the surface into plates made up of small, irregularly shaped scales which provide an endless supply of Noah's Ark animals for children at play.

The needles are yellowish-green, three in a bundle, varying from five to eleven inches in length. The cones mature in August of the second year and vary from two and a half to five and a half inches in length. When the cone falls, some of the scales are usually left on the branch.

The Ponderosa Pine, under favorable conditions, attains a height of one hundred and twenty-five to one hundred and seventy-five feet; its diameter is often four to six feet and sometimes as much as ten or twelve feet. Jepson says that when Douglas described it on the Spokane River he named it *ponderosa* because of its great size.

Unlike most pines, this tree has a very wide distribution —dry ridges, moist valley bottoms, gravelly slopes. According to Jepson, it is “subject to greater Variations of temperature and precipitation than any other North American tree.” It is associated with California Black Oak and Incense Cedar at its lower ranges, and with White Fir and Sugar Pine at its upper limits.

The giant Ponderosa Pine near the foot of Sentinel Rock is an unusually fine specimen. It dominates the forest about it, dwarfing by comparison what would ordinarily be considered a goodly member of the same family. Mr. Charles Michaels estimates, from comparison with Ponderosa Pines of known age, that this must be in the neighborhood of five hundred years old, and that for its first three hundred years it probably stood alone except for a companion oak; the neighboring Ponderosa Pine he places at not above one hundred and fifty years. This giant pine is twenty-five feet in circumference—approximately a fourth of the height of the tree—at six feet above the ground, and its first branch is nearly two feet in diameter. The spread of the great limbs is one hundred and three feet —most unusual for a Ponderosa Pine. Strangely enough, like the Big Tree, or Giant Sequoia, this huge tree bears very small cones for a Ponderosa Pine; the are near the minimum of size. Some small Red Firs and a young Sugar Pine are also to be found in the circle about this tree.

Another interesting Ponderosa Pine is the tree in a cleft on the sheer face of El Capitan. Although in comparison with that great granite wall it looks insignificant a thousand feet or so up the cliff, it is in reality about eighty feet high.

The Ponderosa Pines are often the blue jay’s cupboards, well stored with acorns against the possibility of famine. Indeed, it is the blue jay’s own tree, for the bird uses the twigs and the long needles in making its loosely built nests.

In late April or early May, on the floor of the Valley, the lower branches of these pines may be thickly studded with the clusters of pollen-bearing catkins (the staminate flowers). They are like vivid rosettes, varying in color from Persian rose to purple.

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## Jeffrey Pine

*Pinus ponderosa* var. *Jeffreyi* Vasey



### *Jeffrey Pine Cones*

Slightly Less Than 1/2 Natural Size

Whether the Jeffrey is a separate species or is a variety of *P. ponderosa*, which it resembles closely “in habits and soil and climatic requirements,”\* is a moot point among students of trees; we assume the latter.

At its best it is a massive tree, its bole clear for perhaps a third of the trunk, then shaded by a few large horizontal limbs, and topped by smaller branches curving upward into a rounded; even a flattened, crown, which contrasts with the sharper, more irregular tip of the Ponderosa Pine. Transition forms of the two trees make it difficult to write down a hard and fast description. The foliage of the Jeffrey seems to be blue-green as against a yellowish-green, and that of the Jeffrey seems more dense than that of the Ponderosa Pine. Both have needles in bundles of threes, but, according to Sudworth, who considers it a different species, the needles of the Jeffrey remain on the tree for from five to eight years, and those of the Ponderosa for about three years. A technical feature of difference is that a certain pine beetle is found only on the Jeffrey and not on the other type. The cone of the Jeffrey provides the easiest means of differentiation, when that is available. On the tree, Jeffrey Pine cones have almost from the beginning a strongly purplish cast, in contrast to the greenish hue of the cone of the Ponderosa Pine. The Jeffrey cone, too, is much larger and more rounded than that of the Ponderosa; it ranges from four to eleven inches in length, and its shape is much like that of a beehive. The bark of the Jeffrey is darker and more roughened, its plates of scales are smaller, and, at its higher ranges especially, it has a richer color than does the other. Compare them side by side if possible, as in Sentinel Meadow.

There are a number of Jeffrey Pines on the floor of Valley, particularly along the Merced River, near the wide pool in Camp Six and between the river and Yosemite Lodge, but the Ponderosa Pine prevails. In Little Yosemite, on the other hand, the Jeffrey is the predominating member of the family, and its fine, open stands lend much of the charm to that valley. The often-photographed wind-swept tree on Sentinel Dome is a Jeffrey Pine. Like the giant Ponderosa Pine, it has suffered much at the hands of its admirers, and may not long survive.

\* Sudworth, *Forest Trees of the Pacific Slope*, page 9.

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## Digger Pine

*Pinus sabiniana* Dougl.



### *Digger Pine Cone*

Slightly Less Than 1/2 Natural Size

The Digger Pine is the characteristic pine of the foothills—the Upper Sonoran Zone. With its gray, rather scanty foliage, it is depressing rather than inviting; on the brown and dusty hills of summer. The cone is its most attractive feature.

It takes its common name from the local appellation for the Indian tribes of the region—“Digger,” because much of their food consisted of roots and bulbs. The nuts of the Digger Pine were another of their main sources of food supply. It is also known as “Gray Pine” or “Blue Pine.” It will be noted from the scientific name that this is another of the trees which David Douglas described and classified; he named it for a friend.\*

The Digger Pine occurs frequently up to the El Portal region, though around Mariposa, for example, it gives way to the Ponderosa Pine. At just about the Park boundary, the line of demarcation is rather sharply drawn; this tree is, therefore, a borderline tree of the Yosemite National Park rather than an established denizen of that area.

It reaches a height of from forty to seventy-five feet, and a diameter varying from one to four feet. Occasionally the main trunk is the axis from roots to crown, but the more typical shape of the tree has the trunk dividing at a height of from fifteen to twenty-five feet into a number of slender branches sent upward in an irregularly rounded form.

The needles, in clusters of three, are from seven to twelve inches in length; their grayish-green color is one of the distinguishing features of the tree.

The cones, which grow on stalks a couple of inches in length, are from six to ten inches long and five to seven inches through. They are heavy, compact, and strongly built, with the triangular tips of the firm scales developed into hooks. They remain on the tree for a long time after the seeds fall—from one to six or seven years—and leave the base of the cone attached to the tree, with a few of the basal scales.

The grayish hue of the foliage, the vertical clusters of branches, and the large cones with their hooked scale-tips are ready guides in distinguishing this tree from the Ponderosa Pine. It differs from all our other pines in its airy, open crown.

\* Jepson, *The Trees of California*, page 45: “Digger Pine was discovered by David Douglas, during his travels in California in 1830 and 1831. He named it *Pinus sabiniana* in honor of Joseph Sabine, secretary of the London Horticultural Society, the organization which sent the Scotch explorer to California.

## Lodgepole Pine

*Pinus murrayana* Ore.



*Lodgepole Pine Cones*

## About Natural Size

The Lodgepole Pine is very commonly called the Tamarack on the Pacific Coast; the true Tamarack of the East is a larch, however, not a pine. Dr. Jepson proposes the name "Tamrac Pine" for this species. It is sometimes considered a variation—*P. contorta murrayana* Engelm.

This tree dominates much of our forest cover at 6,000 to 9,000 feet, but it is to be found in greater or less abundance both above and below that elevation, caching from the floor of Yosemite Valley to timber line. Young trees of this species are not infrequent along the watercourses of the Valley; above Sentinel Bridge, for example, are a number of them, scattered among the Ponderosa Pines and Douglas Firs and Cottonwoods.

It attains a height of from fifty to one hundred feet ordinarily, has a pyramidal crown, particularly in the younger trees, and develops a trunk diameter of from one to two feet. The bark is thin and grayish-brown, becoming scaly in old trees.

The needles, borne two in a sheath, are an inch and a half to two inches long, and yellowish-green in color. The fruit is a cone one and a half to two and a half inches in length, tapering, pendent, with sharp prickles on the scales. The cones mature in August or September, but often remain on the trees for some time, either remaining closed or shedding the seed at once.

To many people this tree is the least attractive of our pines. It is often a most untidy tree; the dead branches clasping the lower portion of the trunk, the bark stripped and hanging, and the lower limbs drooping mournfully toward the ground combine to give it a most desolate appearance. On account of its moisture-loving tendency it is first to encroach upon a meadow and thus hastens the process of change which is affecting so many of these charming spots. Bridalveil and Peregoy Meadows on the Glacier Point Road are instances of this.

The thinness of the bark and the prevalence of dead branches render it an easy prey to fire and to pests that work through the bark. Along the Tioga Road in the region of Tuolumne Meadows and near Tenaya Lake thousands of dead trees bear witness to the work of two pests. The Yosemite Museum has an exhibit of pictures and specimens showing their methods. The needle is attacked by a needle miner, a moth which lays its eggs in the needle; the foliage is then ravaged by the pupae, and the tree, in a weakened condition, is attacked by the Mountain Pine beetle, which completes the work of destruction by girdling with its galleries the cambium layer, through which the sap flows. The only known remedy lies in cutting out and burning these trees over a wide enough area to serve as a break to the spread of these insects; but the damage, when it first came under observation, had already covered too wide a territory to make such means effective. However, such pests often work in cycles, and at present there seems to have been some sort of natural check.

The one happy feature of this situation lies in the increased growth of such trees as the Mountain Hemlock where destruction of the Lodgepole Pine has opened an area to sun and air. And, indeed, these dead forests of the Tenaya region and Matterhorn Canyon take on a certain majesty at times, by moonlight or under a leaden sky, when they seem the ghosts of ages long gone by.

I must own, too, that when I remember a stand of Lodgepole Pine in the Upper Lyell Basin of the Merced River, I almost retract my cavilings. Tall and well proportioned, the bark a glowing yellow-brown instead of the customary depressing, lifeless gray, they greet the morning sun, as it surmounts those sharp peaks of the Lyell group, with a freshness of color against the blue Sierra sky that is truly delightful.

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[Pine Family]

## Mountain Hemlock

*Tsuga mertensiana* Sarg.



*Mountain Hemlock Cones*  
Slightly Less Than Natural Size



### *Mountain Hemlock Tree*

The Japanese name of the hemlock is *Tsuga*; it is a favorite in Japanese landscape gardening. (The hemlock of Socrates' fatal potion was obtained not from a tree of this family but from an herb related to our wild carrot.) "Graceful" is the adjective which nearly every writer applies to this tree. Tall and slender, with drooping branches and tapering crown, the Mountain Hemlock is one of the trees whose charm is increased by its association with high-mountain memories.

Its range is from 8,000 feet upward, usually in fairly moist places. It is therefore not native on the floor of Yosemite Valley, but a few small trees which have been planted there are thriving. One benefit of the blight which has been so destructive in the forests of Lodgepole Pine is the attendant increase in hemlocks. Seedlings do not thrive in too close a forest, and with the opening of these places to sunlight the young Mountain Hemlocks have seized their opportunity.

Under most favorable conditions, this hemlock may reach a height of one hundred feet; near timber line it, like the Juniper and the White-Bark Pine, may be found gnarled, weather-beaten, flattened down. Normally, however, the resilient hemlock sapling bows beneath the snow during the winter, only to turn upward again when released.

Hemlock bark is rich in tannin. That of the young trees is silvery, but it soon becomes roughened and finally much ridged and furrowed. It tends to be a dark reddish-brown, often with a purple tinge that echoes the purple coloring of the pendulous cones. The latter vary strikingly, however, on different trees. The cones ripen in a single season; they shed their seeds in September or October, and fall during the winter months. They are from half an inch to three inches long.

The needles are bluish-green, blunt-pointed, growing in spirals around the branchlets but appearing thicker on the upper side because of the twisting of their slight stems. They persist for about four seasons.

The Mountain Hemlock is associated with the Lodgepole Pine in flat, moist canyons, as along the Tioga Road between Tenaya Lake and Fairview Dome; with Red Fir and Western White Pine on high slopes of northerly exposure, such as it finds along the Forsyth Pass Trail above Lake Tenaya, or along the southeasterly wall of Matterhorn Canyon; and with White-Bark Pine near the ridges of the Hemlock's upper limits, far up on the Lyell Fork of the Merced, or at Young Lakes below Mount Conness.

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[Pine Family]

### Douglas Fir

*Pseudotsuga taxifolia* Britt.



*Douglas Fir Cone*  
Slightly Less Than Natural Size

The Douglas Fir, or Douglas Spruce, suffers from an embarrassment of riches in nomenclature, reflecting the complexity of its characteristics. It is commonly known by one of the titles above; when made into lumber it goes under the label of Oregon Pine; and its botanical name assigns it to yet another category—"false hemlock, with a yewlike leaf."

It is a stately tree, and a rather somber one withal. Its dark, brownish-gray trunk and its drooping branches with their great plumes of dark green foliage endow it with an air of majesty, and the wind brings "voices sad and prophetic" which become it well. The cool talus slopes of the south wall are its special habitat, though it may be found scattered through the Valley and for a couple of thousand feet above that elevation. One fine tree stands beside Tenaya Bridge; the Ledge Trail to Glacier Point passes some splendid old monarchs of this species; and the slope below Panorama Cliffs is another good place to find them, along the Vernal Falls Trail.

The Douglas Fir varies in height from seventy-five feet to three times that. In diameter the mature tree may be from three to eight feet, often with a clear shaft for one-third its height. The bark of mature trees is several inches thick and is furrowed longitudinally; where the brown of the old bark is bruised, that underneath is a clear reddish-brown. Young trees have a smooth and rather ashen bark, which gradually thickens from the ground upward and becomes a dull brown.

The needles grow around the branch, but the sprays give a drooping effect instead of the flat appearance of the firs; this is really the best way of distinguishing the Douglas Fir, and it is wise to accustom the eye to the general effect of the tree. The flat needle is blunter than that of the White Fir, but is quite similar to it in the median channel above and the rib below with a whitish band on each side underneath. It is from a half inch to an inch and a half in length, yellowish-green in color—perhaps a little darker green than the White Fir, as a rule. The needle has a short leaf-stem.

The cones, which mature in the first autumn, are a distinctive feature of this tree and a great aid to identification. Unlike the fir cones they are pendent and are not confined to the topmost branches. In shape they are oval, coming to a point; they are about one and three-quarters to three inches in length and one and a quarter to one and three-quarters inches in breadth. The scales are thin and rounded, with bracts thrust over them which have a trident-like tip. The ripened cone seems loosely put together.

The Douglas Fir occurs at a much lower altitude than the Mountain Hemlock; hence there is little danger of confusing the two. The Red Fir does occasionally come down to our fir's level, but the foliage of the Red Fir is much more bluish-green, its bark is a richer brown, and its erect, compact cones are quite different. The White Fir is the tree with which the beginner must most often compare the Douglas Fir; the needles of the two are rather similar and the bark not greatly unlike, though that of the White Fir has a more ashen tinge. The two are found through much the same range, although the White Fir climbs higher, under conditions to its liking, than the Douglas Fir.

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[Pine Family]

## The Fir

*Abies*

Firs are tall and stately trees, their fan-like whorls of dense foliage tapering into a spire, where lightning and the mountain storms have not intervened. Our two species of this genus are the White Fir, *Abies concolor*, and the Red Fir, *Abies magnifica*.

The young trees of both species are graceful things, with their silvery bark, and their symmetrical branches tipped with tender green. As they grow older the bark becomes thicker, roughens, and takes on the coloring implied in each name.

The needles are not borne in a sheath, and are shorter than those of the pines. They are spirally arranged around the branch, but usually curve from it in such a way that they appear to grow from opposite sides or to curve out from the top. On the upper branches they are more pointed than on the lower, and usually are more strongly curved. At a little distance it is interesting to note the contrast of the distinct layers of foliage of the firs with the clustering needles of the pines.

The ovulate flowers grow erect on the topmost branches of the firs, and the staminate flowers hang from branches a little farther down in the tree. The cones are always erect, a distinguishing characteristic of the firs, and are always in the crown. (As the illustrations both for the White Fir and for the Red show a cone-bearing branch, the foliage in both instances is the curving needle of the crown.) The cones ripen in one season, maturing in late August or September. When they are ripe, the cone falls to pieces, and scales and seeds are scattered on the wind, the woody axis and base sometimes remaining for several years. Hence one rarely finds a fir cone on the ground except where the squirrels have been at work.

The range of the White Fir in the Yosemite region is from 3,000 to 8,000 feet approximately, and that of the Red Fir from 6,000 to 9,500 feet. In both cases they occur in the upper portion of their range only where the greater climatic severity of a higher zone is tempered by suitable conditions of sun and shade, of soil and drainage, with a rapid tapering off of the number of trees to be encountered as these conditions change.

Thus it is only in the thousand feet or so from 6,000 or 6,200 to 7,200 that there is likely to be much confusion of the two, and the more readily they may be compared side by side, as at that altitude, the easier it is to distinguish them. Once your eye really is impressed with the characteristic color of bark and foliage in each species there seems to be little difficulty—until you have been away from them for a time and try to explain how to tell them apart when you are confronted with only one or the other instead of both!

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[Pine Family]

## White Fir

*Abies concolor* Lind. & Gord.



*White Fir Cone*

Slightly Less Than Natural Size

The common name of the White Fir is derived from the ashen hue that weathers upon the rather dark and heavily fissured bark of the old trees. These old trees have a rugged and defiant air which contrasts strongly with the airy grace of their youth.

The needles are from one to three inches long, a deep yellow-green in color. They are decidedly flat when drawn between the fingers, usually with a slight midrib below flanked by two whitened grooves, and a faint but perceptible channel above. Although they grow from below as well as from both sides of the branch, they appear, by twisting the short leaf-stem, to grow from opposite sides; on the lower branches the needle is straighter and longer, as well as less pointed, than on those above, giving the effect of a very flat spray, while on the higher branches the needles curve upward much more definitely.

The cones are two and a half to five inches in length, oblong, with a somewhat flattened top, quite compact in appearance, with narrow, oblong bracts. They are brown, often with a yellowish-green tinge even when ripe.

The White Fir reaches a goodly size; it may be from seventy-five to one hundred and seventy-five feet in height, or even more. In diameter the trunk is often five or six feet, and sometimes seven or eight feet. The lower quarter or third of the bole in mature trees is usually clear of branches. Their silhouette is more irregular than that of the Red Fir.

As a rule the Red Fir occurs in almost pure stands, forming a rather dense forest broken by swales or hillside meadows or with some low ground cover under the trees, while the White Fir is scattered through a more open type of forest with Ponderosa Pine, Sugar Pine, and Incense Cedar. It is found throughout the Transition Zone and runs well into the Canadian Zone.

On the floor of the Yosemite Valley the White Fir is of frequent occurrence, and there it is often confused with the Douglas Fir. (For a comparison with this tree see the description of the latter.) There are several fine White Firs near Camp Curry, and also around the parking area at Happy Isles.

In the glades of the Tenaya and Merced canyons are some grand old White Firs, along with Incense Cedars. On the northeast shores of Merced Lake several White Firs of unusual size rise from among the aspens. The White Fir likes good soil; given that, and a certain amount of protection from undue exposure, it will venture above its "proper" limits.

Even in such a Red Fir forest as that at Badger Pass, an occasional White Fir may be found, the exception certainly and not the rule.

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[Pine Family]

## Red Fir

*Abies magnifica* Murr.



*Red Fir Cone*

Slightly More Than 1/2 Natural Size



### *Red Fir Tree*

The Red Fir takes its common name from the bark of the mature tree, which is almost of a chocolate color, with a decided reddish tinge in the sunshine. Its Latin name is descriptive of the impression it makes upon the beholder. The rich coloring of the bark, the architectural effect of the shaft, and the heavy sprays of foliage make it truly one of the most magnificent of all our trees.

Its blue-green needles range from three-quarters of an inch to an inch in length, growing all around the branch, but seeming to curve from opposite sides, after the manner of the firs. The needles are sessile; that is, they are attached directly to the twig without a leaf-stem. They are curved, often in a sickle shape, especially so upon the upper branches, and are slightly thickened, so that they are four-sided instead of flat. The cones are from four to eight inches in length, slightly larger than those of the White Fir, but similar in shape; like them, they break up on the tree, leaving the woody axis. When ripe they are brown with a purplish bloom.

The Red Fir is a dweller upon the mountainsides of the Canadian Zone, where it reaches a height of one hundred and seventy-five feet, with a massive, column-like trunk two to five feet in diameter. In a dense forest, the shaft is clear of branches for fifty or seventy-five feet, and the crown is gradually rounded off; most of the lower branches are horizontal or slightly inclined, with their fan-like layers of needles; but as they become shorter, forming this conical crown, they tend to turn upward.

On a sunshiny March day they are especially striking, with their heavy sprays laden with snow, icicles hanging from them, while under the branches the reddish-purple of the staminate flowers stands out against the glistening white.

There are a few young Red Firs on the floor of the Valley; several are grouped around the giant Ponderosa Pine, and there are others on the Lost Arrow Trail, near the Yosemite Creek footbridge. They are rather scrubby specimens, but below Gin Flat, on the Big Oak Flat Road, is a stand of the fresh young saplings, beautiful as the morning. Bordering the Glacier Point Road just above Mono Meadows is a forest of splendid mature trees, readily accessible; on the ridge which runs from Mount Watkins to the Tioga Road at Snow Flat is another.

A brief review of differences between the Red Fir and the White Fir may be of service. The bark gives a primary distinction but it is one that applies only to mature trees. In both species it is then rough and deeply furrowed, but in the Red Fir it has a dark red or even purplish cast and the surface is more narrowly broken by rounded ridges, divided irregularly by diagonal fissures, while in the White Fir the color is ashen to dark gray, with brown in the clefts and shadows. In cross section the inner wood of the former is red, that of the latter pale, and more subject to decay. Red Fir bark is good bonfire wood; it is the wood which is burned down to glowing coals nightly for the firefall from Glacier Point.

Young trees of both kinds have a whitish or silvery bark, the Red Fir particularly so. When they are under close comparison, young branchlets of the White Fir seem more yellowish-green and are smooth and bald, whereas those of the Red Fir are often minutely hairy with a rather rusty effect.

The needles of the Red Fir are shorter, on the average; the difference in length is perhaps more pronounced on the lower branches. In color they are darker and definitely more bluish-green. By a twist in the short leaf-stem or petiole the White Fir needles appear to grow straight out on both sides of the twig, while the needle of the Red Fir is sessile; that is, it is directly attached to the twig on a foot that is thickened ever so slightly, contracted—again, ever so slightly—above, and the needle itself tends to curve upward. The needle of the White Fir is flat, with a midrib below, while that of the Red Fir, though smaller, is sufficiently thickened to seem four-sided.

When both are ripe the cones of the Red Fir are larger than those of the White Fir; their brown has a purplish cast rare in the White Fir, usually a brown tinged with olive or chrome.

As the Red Fir mingles with the White along its lower borders, so it does with the Mountain Hemlock at the upper edge of the Red Fir's territory. On the Forsyth Pass Trail between Lake Tenaya and Little Yosemite, for example, the slope toward Tenaya Lake has an abundance of Mountain Hemlock. It is a northerly exposure where the snow lies long, at an altitude ranging from 8,200 to 10,000 feet. Across the ridge, where the exposure is to the south and the sun, the Red Fir is the dominant tree, with some admixture of Western White Pine.

The bark of the Red Fir is much more deeply furrowed than that of the Mountain Hemlock, although the coloring is not dissimilar—a little more red in the fir, perhaps. The trunk of the hemlock is somewhat smaller, and while the Red Fir branches carry the great flat sprays of foliage so often noted, those of the Mountain Hemlock are plummy and drooping, even to the leader at its narrow spire of a top. Both have bluish-green needles, but those of the former are sessile; those of the latter grow all around the branch on short leaf-stems and are much blunter.

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[Redwood Family]

## Giant Sequoia

*Sequoia gigantea* Dec.



*Giant Sequoia or Big Tree Cone*  
Slightly Less Than Natural Size



*Grizzly Giant (Big Tree or Giant Sequoia)*

Topping the list of its conifers with the monarch of them all, Yosemite has within its boundaries three groves of the Giant Sequoia, trees that were seedlings when Alexander sighed for more worlds to conquer, had become mere saplings when Christ was born, and had attained the grandeur of their prime long before Columbus set eyes upon this continent.

Aside from the mantle of the centuries, the Giant Sequoia has a claim to reverence by virtue of its beauty, its dignity, its majesty. The pines and firs about it represent an even older family of trees; but the Giant Sequoia dominates and subdues them into a background for itself, a scale from which its greatness may be appreciated. It is not merely an ordinary tree raised to the *n*th power, but is the apotheosis of a tree.

Although there are earlier claims to the honor, the accepted discoverer of the Giant Sequoia was A. T. Dowd, a miner, who was led by the trail of a wounded bear into the Calaveras Grove in the spring of 1852. The story made its way into the newspapers, but it was not until the next year that the unknown giants were given an official description and a name. An Englishman named William Lobb, seeing some material in the possession of Dr. Albert Kellogg, became interested. He made a hasty trip to the Calaveras Grove, and took home with him some specimens and seedlings. He gave these to a botanist, one John Lindley, who published a description of the tree as a species representing a new genus, which he called "*Wellingtonia*," adding the species name *gigantea*. The following year (1854) a French botanist, J. Decaisne, recognized it as a species of *Sequoia*, the genus established for the Coast Redwood about five years

earlier, and named it "*Sequoia gigantea*." Meanwhile Lindley's name for the tree had stirred up a fury of popular resentment in this country. By some it was classed as a *Taxodium*, the family of the Bald Cypress, with *washingtonium* as the specific name, and when it was referred to the genus *Sequoia*, *Sequoia washingtonia* was urged as right and proper; Sudworth adopts this latter naming. However, *Sequoia gigantea* is now generally recognized.

To go back a little farther, the Coast Redwood was likewise referred to the genus *Taxodium* at first. Menzies found this tree in 1794; the Lambert for whom Douglas named the Sugar Pine described it as *Taxodium sempervirens* in 1823, and in 1847 one Stephen Endlicher, a German botanist, placed it in a new genus, making it *Sequoia sempervirens*. The word "Sequoia" is generally supposed to have been derived from the name of Sequoyah, a Cherokee Indian who transcribed the language of his people in phonetic symbols. In their book, *Big Trees*,\* Colonel White and Judge Fry list seventy-one groves of *Sequoia gigantea*, scattered through the Sierra Nevada from a point near Tahoe to Deer Creek, south of the Kern and Kaweah rivers. In the northerly section of the state the groves are, for the most part, smaller and farther apart; toward the south they are in a more continuous belt, interrupted only here and there. They are all in the upper part of the Transition Zone; great rivers and mighty canyons divide them; they are found nowhere else in the world today. Why they should occur in these groups, without an occasional tree interspersed between groves, is one of the problems connected with the Giant Sequoia.

They, with the Coast Redwood, are representatives of a genus once widespread in North America, Europe, and Asia, as fossil remains show, and they, like the Coast Redwood, are not only alive but vigorous. Their seedlings thrive where they have access to exposed soil, plenty of moisture and sunlight, and adequate protection withal. Reproduction is going on at a much higher rate in the southern groves than in the northern, for reasons unknown.

In the Yosemite National Park are three groves. The Mariposa Grove, by far the largest and best known of the three, is a few miles south and east of Wawona; its trees are distributed in two groves, with a neutral band between which contains no Big Trees at all. There are approximately two hundred trees over ten feet in diameter at the base in the two groves.\* This grove was made known to the world by Galen Clark in 1857; he was later appointed Guardian of the Grove and of the Yosemite Valley, under the State Board of Commissioners. The grove may have been traversed earlier by prospectors; one R. Hogg, a hunter, claimed to have seen some of its trees in 1855. Galen Clark, at any rate, recognized their importance and made them known.

The Tuolumne Grove, on the Big Oak Flat Road, comprises about twenty-five large trees, and the Merced Grove, which has only about twenty such trees, is yet a most charming group by reason of its setting in a mountain hollow, through which flows a delightful stream with its banks thick with azaleas. The tallest of our *Sequoia gigantea* is in the Merced Grove, near the cabin; the second is in the Tuolumne Grove. According to Francis P. Farquhar, members of the Walker expedition who crossed the Sierra Nevada in 1833 may have passed through either the Merced or the Tuolumne Grove, as they reported seeing "trees of the Redwood species incredibly large."†

Speculation about the age of these trees ran riot earlier, and such trees as the Grizzly Giant were estimated to be five to eight thousand years old; today the consensus is more conservative, something over three thousand years. This is based on a count of the rings in many fallen or felled trees, with an estimate of the average increase in growth. Thus Professor Jepson allowed twenty years to an inch, in a careful survey, but with a caution against accepting this without the confirmation of the count of the rings. At the door of the Yosemite Museum is a cross section of a Giant Sequoia that dates from A.D. 925, with events in history marked at corresponding points on this tree's diameter.

Turning to the size, we find further arguments, for when a Sequoia is measured around the base, projecting roots, as well as the root swelling near the ground, make it hard to establish a standard measurement. Then, too, some advance the claims of a board-foot measurement in determining the real size of the tree, and not merely its girth.

The measurements of several of the largest trees in the Mariposa Grove are included on the opposite page, giving the size both at the base and at a point ten feet above the ground.

The Grizzly Giant, largest of these trees, has several competitors for the title of the largest tree in the world; of these, the General Sherman Tree, in the Sequoia National Park, is best known. The General Sherman's diameter at the base is 32 feet, 6 inches, and at 16 feet above the base is 24 feet. Its height is 267 feet, 6 inches.

The Wawona Tree, through which the road passes, shares fame with the Grizzly Giant. The tunnel, 26 feet long, was cut through this tree in June 1878, enlarging the burnt-out area which already existed in the trunk.

Name of Tree	Girth at Base  (Feet)	Diameter at Base  (Feet)	Diameter at Ten Feet above Ground  (Feet)	Height   (Feet)
Grizzly Giant	94.2	30.0	20.7	200
faithful Couple	95.8	30.6	19.7	244
Columbia	88.1	28.0	17.8	290
Lafayette	96.1	30.6	17.9	267
General Sheridan	78.0	24.8	13.4	258
St. Louis	78.6	25.0	16.1	277
Washington	93.5	29.7	15.7	238
Wawona	86.4	27.5	19.5	231
Mark Twain	55.7	17.7	13.0	274
Stable	92.0	29.5	17.8	266
Virginia	89.3	28.4	18.4	186
Clothespin	69.6	22.2	14.9	293
California	78.1	22.8	15.1	234

In shape the young Sequoia is a symmetrical cone, with its somewhat scaly-surfaced bark giving a grayish or purplish tinge to the trunk. As it reaches a diameter of about a foot, the bark thickens into the reddish-brown for which it is famous. The bark of a large tree is often

a foot in thickness, sometimes more. It has very little resin in it, unlike the bark of most conifers, and this thick bark seems to serve as an asbestos covering for the cambium layer through which the sap flows. Hence comes a large measure of the apparent invulnerability of the Giant Sequoias; while they may be burned here and there, the flames do not spread and the wound is healed, as its edges become grown over, within a short space of time. In bark and wood, and even in the cones, there is a high percentage of tannin, which seems to serve as an additional protection against the attacks of ordinary enemies of the trees. As the tree ages, the lower branches are shaded out and a few of those remaining take on greater size. The trunk tapers only slightly, and the first great branches are proportioned to it. On the Grizzly Giant the first important limb, over a hundred feet above the ground, is six feet in diameter. The top is like an inverted bowl, a leafy dome.

The wood of the mature tree is rose-red, gradually turning dull after being exposed to the air. It is much more brittle than that of the Coast Redwood; on the fall of a Giant Sequoia, the trunk may be broken into many pieces in transverse fractures, while the Redwood splits longitudinally.

The leaves are awl-shaped and clothe the branchlet closely, overlapping along it. On young trees the tips often turn outward slightly. The sprays are not so flat as those of the cedar. In color the dense foliage is a bluish-green.

Staminate and ovulate flowers are borne on different branches of the same tree; both are small, rather scaly bodies. The cones are compactly formed of thick, woody scales, and are egg-shaped. They mature at the close of the second summer, open just enough to shed their seeds, which they do gradually, and often remain on the tree for some time longer. They are one to two and a half inches long. Five to seven narrow, winged seeds are borne under each scale; "millions are ripened annually by a single tree," says John Muir, "and in a fruitful year the product of one of the northern groves would be enough to plant all the mountain ranges of the world."

Judge Fry and Colonel White tell of an experiment with cones and seeds in the Giant Forest. They studied a dozen cones upon the tree, and found that they released their seeds, a few each year. The last of the twelve fell at the end of fourteen years; it still had seven seeds within its scales, and five of them were still capable of growth when planted.

There are no native specimens of the Giant Sequoia on the floor of the Yosemite Valley, but a number have been planted. There are two in the Old Village, one dating from the 'nineties and the other from the beginning of this century. On the Ahwahnee grounds, near the campfire, is one which was planted in the early 'nineties and is now about seventy-five feet in height, with its top still conical. Several small trees along the west side of the parking area were set out in 1927. These are all too young to show the characteristic bark of the mature tree, but there is a beautiful piece of bark among the exhibits at the Yosemite Museum, in addition to the cross section at the door.

My own most vivid memory of the Giant Sequoia goes back to a camping trip. We came into the Mariposa Grove by some little-used trail that brought us unexpectedly upon the Grizzly Giant. The great tree stood in full sunshine upon the hillside, unquestioned king of all the trees around it, and we seemed to have found again

*the morning of the world,  
When earth was nigher heaven than now.*

From the first golden shafts of sunlight to the ruddy glow of sunset—one must go all through the day with these trees to reach a realization of them. And by moonlight they take on an added height and beauty that makes them even more the creatures of the Golden Age.

\* Stanford University Press, Stanford, California, 1930.

\* Report of Alfred Bellen to the Superintendent of Yosemite National Park, October 1930.

† Quoted in Fry and White, *Big Trees*, page 8.

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[Cypress Family]

Incense Cedar

*Libocedrus decurrens* Torr.



*Incense Cedar Tree*



*Incense Cedar Cones*

The Incense Cedar belongs to the cypress family; it is not akin to the cedar of Lebanon, nor is it a redwood, although the rich cinnamon coloring of mature trees often leads the visitor to the floor of Yosemite Valley to insist that he has been seeing many redwoods. This latter name is properly applied to the Sequoia, and particularly to the *Sequoia sempervirens*, or Coast Redwood, which is not found in the Yosemite region.

The young Incense Cedar is a strikingly symmetrical tree when it grows in open places. There are several such trees near Yosemite Lodge, and also along the edge of the meadow near the entrance to the Ahwahnee. Pyramidal in form, with branches almost reaching the ground, they taper to a point as if they had been regularly clipped. In young trees the bark is a purplish-red, with a silvery sheen on the loosened scales; in older cedars the bark thickens and becomes deeply furrowed, taking on a reddish-brown hue that glows in the sunlight.

They reach the goodly age of three to six or seven hundred years. Old trees in forest glades may be from three to six feet in diameter, the shaft being free of branches for thirty or forty feet and attaining a height of seventy to ninety feet, with one or two massive limbs thrust out in an irregular outline.

The range of the Incense Cedar is from 2,000 to 7,000 feet. One glorious stand is in the Lost Valley at the upper end of Little Yosemite, where it mingles with Sugar Pine and an occasional Red Fir.

Its yellowish-green foliage is composed of flat sprays with a series of flat, scale-like leaves, one overlapping the next in such a way as to seem jointed. The sprays occur in pairs. Ovulate and staminate flowers grow on different twigs of the same branch, appearing in late autumn or early winter. The latter shower the tree with gold at a time when they vie with the crystal blossoms of the snow on barer boughs.

The small, pendent cone is urn-shaped while it is green. As it matures, the wings roll back from the central partition, freeing the ripened seeds. There are usually two of these winged seeds on each side. They drift down in great numbers during the month of September, especially in a high wind, and make a red-brown carpet around the cedars. The cone usually clings to the tree for several months.

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[Cypress Family]

Sierra Juniper

*Juniperus occidentalis* Hook.



*Sierra Juniper Branch*  
Slightly Less Than Natural Size



### **Sierra Juniper Tree**

At a casual glance the Sierra Juniper is often confused with the cedar; indeed, one of its common names, misnomer though it be, is Red Cedar. It is a tree of rocky places; it clings to wind-swept ridges, and takes a precarious stand in crevices on Yosemite's many granite domes.

The juniper is long-lived, in spite of its battle for existence; its trunk is often two or three feet through, although the tree may be only eight or ten feet in height. It is sometimes prostrate, as in the secret depths of Tenaya Canyon and in the Merced Canyon above Little Yosemite, where it grows fiat along the shelves of the gorge. Sometimes it is crooked, with several forks. When, occasionally, it does have a favorable situation, with abundant soil, it flourishes and may attain a height of sixty feet and a diameter of three to five feet with a systematic growth of branches and dense foliage that makes it seem a different tree entirely, except for the layer of reddish-brown bark, easily torn off in long shreds. One notable stand of this type is to be found on the Isberg Pass Trail, between the McClure Fork and the Lyell Fork of the Merced River.

The scale-like leaves, pitted on the back, more bluish-green than those of the cedar, make an overlapping armor along the twigs and small branchlets. They grow in whorls of three, pressed close to the branch, without the jointed effect that characterizes the leaf of the cedar. The foliage of the upper branches sometimes differs slightly from that of the lower in turning back slightly at the tip only. The blue-black fruit, usually known as a berry, is morphologically a cone. It has a whitish bloom. Its flesh is pulpy, and it is aromatic because of the resin cells it contains. The berry contains two hard seeds, occasionally three. Male (pollen-bearing) and females (fruiting) flowers occur on separate trees, whereas in the Incense Cedar they grow on different twigs of the same branch.

Junipers may be noted near Clark Point and at the top of Nevada Falls, on the slopes north of Tenaya Lake along the Tioga Road, and throughout the Canadian Zone in the Park, reaching well into the Hudsonian Zone at times. There are a few strays on the floor of the Valley, notably one in Camp 16 which illustrates the dimorphic foliage in different parts of the tree, and another near Camp Curry, west of the garage. There are fine specimens, "four-square to all the winds that blow," on the great dome-like barrier which the old Merced Lake Trail traverses above Lost Valley; there they lend striking contrast to a fairy pool fringed with aspens and jeweled with pond lilies.

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[Yew Family]

California Nutmeg

*Torreya californica* Torr.



### *California Nutmeg Drupes*

About 2/3 Natural Size

The California Nutmeg takes its common name from its fruit, which resembles a large olive and contains a seed having the appearance of the nutmeg of commerce. The true nutmeg is not even related to this tree, however, as ours is one of the *Taxaceae*, or yew-like trees. The casual observer often mistakes it for a fir when the tree is not displaying its peculiar fruit.

The Nutmeg grows from twenty to seventy-five feet in height, its branches tending to make it cone-like in form, as it usually grows in fairly open places. The trunk, with its finely ridged grayish bark, with a weathered appearance on old trees, is from one to two feet in diameter. The dark green leaves are stiff, bristle-like, and pointed, growing along the branchlet in opposite rows.

Unlike the conifers, male and female flowers grow on different trees. The pollen is wind-blown. The fruit matures the first autumn.

These trees are found in scattered groups in the Coast Range and in a few places in the lower Sierra Nevada. In the Yosemite region they grow only near the junction of Cascade Creek and the Merced River and down the canyon as far as Arch Rock. Several clumps of them are scattered among the rocks between the highway and Cascade Falls, and a number of single specimens may be seen here and there along the Merced River and beside the old Coulterville Grade.

On account of the disagreeable odor which results from bruising the foliage and even the wood, the tree is sometimes known as "stinking yew" or "stinking cedar." The Indians used this wood and that of the Incense Cedar for their bows.

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## The Broad-Leaved Trees

### THE ANGIOSPERMS

#### THE BROAD-LEAVED TREES

In the Yosemite National Park we have nine species of trees, representing six genera, belonging to the broad-leaved type: White Alder, California Black Oak, Canyon Live Oak, Yellow Willow, Black Cottonwood, Quaking Aspen, Nuttall Dogwood, Big-Leaf Maple, and California Laurel.

Almost everyone knows a few of these trees; the Black Oak, the Willow, and the Maple are familiar in a vague way, at least, whereas the tendency is to call all the others evergreens and let it go at that.

The broad-leaved trees have certain characteristics which set them apart. They have two seed-leaves, and are therefore known as dicotyledonous. The leaves, as the division name implies, are broad instead of linear; moreover, they usually have a network of veins. The tree tends to divide into branches not far above the ground instead of sending up a main trunk as the axis; this characteristic is typical and not constant, however. The growth of the wood in the stems is by annual concentric layers beneath the bark, in which these trees resemble our first group, but they differ in lacking the resinous pockets which are more or less common among the Gymnosperms, and particularly



### Leaves of the Broad-Leaved Trees

noteworthy in the firs. Many of the broad-leaved trees reproduce or regenerate by crown-sprouting from the roots, which is rare among the conifers, although it is a characteristic of the Coast Redwood.

All the broad-leaved trees of our region happen to be deciduous except the Canyon Live Oak and the California Laurel. The White Alder loses its leaves in September or October, while they are still green. The others of this group give the Yosemite Valley and the higher mountainsides their gorgeous autumn coloring, along with such shrubs as the Azalea, the Creek Dogwood, and, in the upper Canadian or lower Hudsonian zones, the Mountain Ash.

These trees are all to be found in the Transition Zone, and of them all only the Quaking Aspen goes much beyond the border of the Canadian Zone; it ventures even into the Hudsonian belt at times. There are Black Cottonwoods and Black Oaks through the Little Yosemite, and occasionally one sees them even higher, where sun and exposure are unusually favorable. The Huckleberry Oak, a shrub rather than a full-grown tree, in appearance very similar to the Canyon Live Oak, is common in the Canadian Zone around the rim of the Yosemite Valley and in similar places on the Tuolumne watershed. For the most part, however, it is only through the Transition Zone that we need compare the broad-leaved trees.

Most of this type are water lovers. The alder is nearly always found overhanging the banks of a limpid stream. The cottonwood likes the meadows and the quiet stretches of the river; the aspen, too, likes water, but it may often be found on talus slopes beneath a granite cliff, where water trickles beneath the rocks or drains through porous soil. So, too, with the maple; its favorite haunts are near the foot of some waterfall, or at such places as the old spring near Happy Isles and along the talus slopes on the shaded south side of the Valley. The California Black Oak is another denizen of the meadows, but it will take root among the rocks when it finds a pocket of good soil. The Canyon Live Oak likes the sunny slopes of the northern wall; laurel grows with it there, but develops more notably in moist, cool places.

Among these trees the shapes of the leaves are so distinctive that there is little difficulty in classifying them, once an opportunity for close examination is given. The margin of the leaf may be entire, or may be toothed, or deeply notched or lobed. Some trees have their leaves definitely opposite or alternate on the branch; the maple and the dogwood belong in the first category, the trees of the laurel, willow, birch, and oak families in the second. When the flowers are available, the type of bloom helps identify the tree—the flowers in catkins, like the alder, or in a head, like the dogwood. Then there are the fruits—the flyaway, cottonheld seeds of the cottonwood, the winged samaras of the maple, the familiar acorn of the oak, the olive-like fruit of the laurel.

### CHART FOUR Broad-Leaved Trees\*

TREE	LEAVES	ARRANGEMENT OF FLOWERS	FRUIT
1. White Alder	Toothed; alternate	In catkins; both kinds on same tree	Small, woody cone
2. California Black Oak (Kellogg Oak)	Deeply parted lobes, bristle-tipped points; alternate	Similar to Canyon Live Oak	Acorn in tawny cup
3. Canyon Live Oak	Entire or toothed; alternate	Pollen-bearing in catkins; fruiting	Acorn in cup covered with golden minute, scaly bodies; both on same tree
4. Yellow Willow	Entire; other willows toothed; alternate	often In catkins; staminate and pistillate	Fruit a pod; seeds with tuft of hair on different trees; fertilized by insects for wind distribution
5. Black Cottonwood	Finely toothed; alternate	Similar to willow	Similar to willow; seed pods in cottony spray

6. Quaking Aspen	Faintly toothed; alternate	Similar to willow	Similar to willow; tiny brown seeds
7. Nuttall Dogwood	Entire; wavy margins; opposite	Flowers perfect; clustered	Head of bright red drupes surrounded by large white bracts
8. Big-Leaf Maple	Palmately lobed; opposite	In pendent clusters; perfect and imperfect flowers often mixed	Seeds in winged samaras
9. California Laurel	Entire; aromatic; alternate	In umbel, or loose cluster	Olive-like drupe

\* These all occur in the Transition Zone, but Quaking Aspen is found more commonly in the Canadian Zone, and often in the Hudsonian. California Black Oak and Black Cottonwood may nut well up into the Canadian Zone.

[Birch Family]

## White Alder

*Alnus rhombifolia* Nutt.



### *White Alder Branch*

About 1/2 Natural Size

The alder belongs to the birch family. The field name of "White Alder" was suggested by Sudworth in the absence of any other, on account of the pale, rather whitish-green foliage. The species name *rhombifolia* refers to the shape of the leaf.

The tree has a rather straight, gray trunk one to three feet in diameter, and may range from thirty to seventy feet in height, with a decidedly rounded crown of rustling, leafy branches.

The leaves are oblong-ovate and are minutely hairy. The veins run straight from the central vein of the leaf to the margin, which is toothed correspondingly. The leaves are shed in autumn, but they do not change color particularly before they fall.

Staminate and pistillate flower-clusters are borne on different parts of the same branch; the former, opening in midwinter, are pendent, terminating a branchlet; the latter are lower down on the twig, and develop into small, erect cones, half an inch to an inch in length, whose scales open in late autumn or early spring. These tiny cones fall entire.

White Alder occurs along streams in the canyons of the Sierra Nevada in the Transition Zone, as in the lower part of Illilouette Canyon and along the Merced River near Happy Isles, where its drooping lower branches cast a dappled shade upon the waters.

In the winter months the pine siskins find the White Alder one of their main sources of food supply. A Rock of them will perch in the branches of a single tree and shake the cones until the seeds fall. In spring the drooping clusters of catkins are besieged by black-headed and evening grosbeaks, and by little groups of purple finches.

## Oak Family

*Fagaceae*

The oak family is divided into two main groups which may easily be distinguished by the coloring of the bark: White Oaks and Black Oaks. In general the White Oaks produce their acorns in one season and the Black Oaks in two, but it happens that our local White Oak, the Canyon Live Oak, is an exception to this rule, and both our oaks therefore take two seasons for ripening their acorns.

Two oak trees are commonly found in the Yosemite Valley proper and elsewhere in the Park through the Transition Zone. One is a White Oak, the Maul or Canyon Live Oak; it belongs to the live oaks. The other, which is deciduous, is the California Black Oak or Kellogg Oak. There is a third oak, commonly a shrub, which with manzanita and chinquapin covers the dry, sunny slopes at the rim of the Yosemite Valley and in similar places throughout the Park. This is the Huckleberry Oak, *Quercus vaccinifolia* Engelm., which is quite similar to the Canyon Live Oak, except that its thin acorn-cups lack the golden fuzz and its leaves are more often entire than toothed. It is sometimes classified as a subspecies of the other, but since it is a shrub rather than a tree this brief mention must suffice. Another oak is often seen through the foothills, with the Digger Pine, but it seems not to reach the Park; this is the Blue Oak, *Q. douglasii* H. & A., a deciduous species, one of the White Oaks; it is readily distinguished by the bluish-green color of its foliage.

The leaves of the oaks have a great variety of sizes and shapes in the different species, but in all they grow singly on the branch. The trees themselves usually have a sturdy bole sending off a number of powerful branches into a wide crown of rather dense foliage. Oaks sprout freely around the cut-off stump; they have a long, strong tap-root, insuring their vitality.

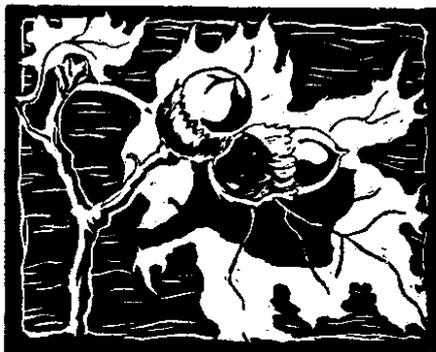
The staminate flowers of the oaks hang down in a loose catkin from the lower part of the young shoot, while the pistillate flowers, which develop into acorns, are borne above on the new twig. As the acorn requires two seasons to mature, by the time it is ripe the new growth has pushed beyond it.

Squirrels, blue jays, and woodpeckers vie for the acorns in laying away their winter stores. The oaks were the orchards of the Indians, for whom acorns were the staff of life; after leaching them to remove the bitter element, they pounded them to a flour in their mortar rocks, and then cooked them as a gruel or made them into loaves in their cooking baskets, heating the water by means of hot stones. The mortar rocks are usually found under or near a group of oaks; they often have several dozen holes of varying depths worn in one rock.

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## California Black Oak

*Quercus kelloggii* Newb.



*California Black Oak Acorns*  
Slightly Less Than Natural Size



*California Black Oak Tree*

The California Black Oak, also called the Kellogg Oak, is deciduous. In the meadows of Yosemite it brings russet and gold to the long Indian summer. It is one of the associates of the Ponderosa Pine throughout the Transition Zone, and its ball of shiny green foliage affords a strong contrast to the darker green of the other's tall, narrow spire. A bitter struggle for existence goes on between the two, with the Ponderosa Pine usually the victor. Stoneman Meadow affords an example of this, as does El Capitan Meadow, where the thickets of azalea beneath the Black Oaks are having their territory invaded by the Ponderosa Pine.

The trunk of the Black Oak is a weathered deep gray, often black, with a hard bark roughened and checkered along the lower portion. It usually divides, at a height of from fifteen to twenty-five feet, into several large branches, which are again subdivided and produce a rather open but rounded crown, fifty to seventy-five feet above the ground. The younger branches are smooth, and the new twigs are reddish in color.

The mistletoe is a persistent enemy of this oak; great clumps of it often hang upon the branches of old trees and sap their vitality.

When the young leaves emerge from the winter buds, they are soft and velvety, tinged with red, shimmering in the sunlight. This stage soon passes, and the leaves become a yellowish-green, smooth above, paler and sometimes slightly downy underneath. They have a strong central vein and are deeply lobed, usually with three or four points on each side, each lobe more or less toothed at the tip. They are decidedly variable in size and shape, ranging from four to eight or ten inches in length and from two to five inches in width.

Its acorns, with their deep cups, are chestnut-colored when ripe; they mature the second season, in September or October.

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## Canyon Live Oak

*Quercus chrysolepis* Liebm.



*Canyon Live Oak Acorns*  
Slightly Less Than Natural Size

The tree commonly known as Golden-Cup Oak in the Yosemite region goes by many other names in different localities. Maul Oak is one of the most generally employed, as the hardness of the wood makes it valuable for mauls and other uses of carpentry; Hickory Oak is similarly derived; Canyon Live Oak and White Live Oak are still other descriptive names often applied to it.

It is a white oak and a live oak, as some of the names above imply; the leaves persist for several years. The shape of the tree varies considerably with the environment; sometimes it is merely a shrub; sometimes it has a short, thick trunk sending out long branches into a round, full crown; sometimes the trunk is clear for fifteen feet or more before it sends up the branches that support its canopy. In the Yosemite the very short trunk dividing into several main limbs is perhaps the most common form, and at times a very striking one.

The leaves, too, are extremely variable; the leaves are small, oblong to ovate in shape. On a single tree, some leaves will resemble the holly, with its sharply notched margins, while others have a perfectly smooth margin. Young leaves have a ruddy tinge, almost copper, when they first emerge from the winter buds; they later assume a bright yellowish-green color above, with a golden down on the duller side beneath. As they age they become a darker green and lose their down, becoming grayish beneath but still very shiny on the upper side of the leaf.

The trees blossom in late winter; the acorns seem to develop very little the first summer, but ripen at the end of the second season to a pale chestnut. They have very short stems, being set in cups coated with a yellow fuzz, sometimes almost a deep mustard color. The cups are very striking when they are first scattered freely on the ground—lovely dishes for a playhouse.

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## Nuttall Dogwood

*Cornus nuttallii* Aud.



*Nuttall Dogwood Flowers*  
About 1/2 Natural Size

The dogwood derives its botanical name from the hardness of the wood (Latin, *cornu*, horn), which, however, is little used commercially. It is known as the Nuttall, Western, Mountain, or Pacific Dogwood, and also as the Cornel. It differs in certain respects from the Flowering Dogwood of the Eastern states.

The origin of the name “dogwood” seems to be shrouded in the mists of antiquity, although it is one of the names people most often ask about—and protest against. One writer says, “It is questionable whether the name Dogwood was meant to convey contempt for the tree as worthless for timber, or whether it referred to the value of its astringent bark as a cure for the mange in dogs.”\*

The bark is smooth and grayish as a rule; only in comparatively old trees is it broken and scaly. The mature dogwood attains a height of twenty-five to sixty feet, with a rather irregular crown, and a bole from six to eighteen or twenty inches in diameter. Young shoots often spring from the roots, making a leafy clump.

The leaves are entire, rather ovate in shape, three to five inches long, on a short leaf-stem. They are usually opposite, as are the twigs themselves.

In the spring, usually in May, with the unfolding leaves, the flower-clusters of the dogwood make a sunshine in the shady places where it loves to grow. The large, white, petal-like scales or bracts which surround the head of the small flowers are usually taken for the flower itself. The number of the bracts varies—four, five, or six; one of the heads may measure six inches across, from tip to tip of the bracts.

Again in the autumn the dogwood stands out among its neighbors by reason of the brilliant coloring of its deciduous foliage and also of the fruit—a compact head of small scarlet berries, or drupes, each containing a stone with one or two seeds.

It is not found in the higher mountains, but grows in profusion on the floor of the Yosemite Valley and for two thousand feet above it. The dogwood makes the region of Bridalveil Falls a fairyland in spring; the Wawona Road between Inspiration Point and Chinquapin and the Big Oak Flat Road near the Tuolumne Grove of Big Trees are among the places rendered more lovely by its presence.

The Creek Dogwood, or Red-Stemmed Dogwood, is a shrub which grows along streams and in marshy places; its flowers are much less showy, and its smaller and more pointed leaves turn a rich, dark red, almost a mahogany color, in the fall.

\* H. X. Kaiser, *Our Native Trees and how to Identify Them*, page 174.

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## Willow Family

*Salicaceae*

The willow family is represented in the Yosemite National Park by trees of two genera.

The first of these is the genus *Salix*, the willow proper. It has a number of species in the Park, but most of them are shrubs rather than trees. The willows may easily be distinguished as such, but to identify the species, which run through many variations, is often a matter for microscopic study. We have therefore described the genus, with brief reference to the species commonly found in our region.

The other branch of the family is the poplar, genus *Populus*, to which the Black Cottonwood and the Quaking Aspen belong. Scientists tell us that the poplar is a tree of very ancient origin; from fossil remains they say that in the days of the Cretaceous period in Greenland, perhaps fifty millions of years ago, the poplar was the only one of the deciduous trees to grow among the darker evergreens. There are indications that they were to be found in this country and in Europe during the Miocene portion of the Tertiary era, twenty million years or so ago.

The trees of the willow family are deciduous; they have alternate simple leaves, with a leaf-stem at whose base is a pair of stipules—small, scale-like or leaf-like appendages—which often fall away long before the leaf. They have their flowers in long, narrow spikes, or catkins, with the staminate and pistillate flowers occurring on different plants. The fruit is a capsule containing many seeds, each with a tuft of hairs at the base, an aid to wide distribution by the wind. The fruit usually matures in the spring.

The bark is very bitter, particularly so in the genus *Salix*. Trees of the willow family are of rapid growth; they sprout freely both from the root-crown and from cut-off stumps, and grow readily from cuttings.

*Salix* has rather narrow leaves, with a short leaf-stem; the winter buds are covered by a single scale; the catkins are usually erect, and appear with or before the leaves. The leaf-scars on the willow have three small dots. *Populus* has a broader leaf and a longer stem; the buds are covered by several scales; the catkins in our species are pendulous, and appear before the leaves. They grow into larger trees than the other genus; this is particularly true of the cottonwood.

The sand-bars at the upper end of Mirror Lake give an excellent demonstration of the willows' effect in consolidating the banks of streams and the margins of lakes. As the current of the stream is slowed down on entering the lake, the silt it carries is dropped. The willows soon take hold in the soil thus brought to their threshold, and the delta becomes larger year by year.

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## The Willows

*Salix*



*Yellow Willow Branches*  
About 1/3 Natural Size

For a long time it was a question among botanists whether many of the species of willows were to be regarded as trees or as shrubs, on account of their frequent habit of sending up several trunks from one main root-stock. A few species do not exhibit this characteristic, and have therefore been readily admitted to the company of the trees.

Hall, in his *Yosemite Flora*, lists two of the local species as trees: the Yellow or Sword-Leaf Willow, *Salix lasiandra* Benth., and the Black Willow, *S. nigra* Marsh. (Incidentally, several different species seem to be known as "Black Willow" in different places.) The latter, he says, occurs below but probably not within the Park boundary.

The Yellow or Sword-Leaf Willow is more definitely a tree than the other willows of our area, ranging from twenty to thirty-five feet in height and from twelve to twenty inches in diameter, with a darkish-brown bark, roughly seamed. It has a lance-shaped leaf, often tapering to a slender point; it is from three to seven inches long and from half an inch to an inch and a quarter wide, with the margin entire. In color it is a yellowish-green, shiny above and a paler green underneath. This willow may be distinguished by the tiny, wart-like glands at the upper end of the leaf-stem. The catkins are one and a quarter to two and a half inches in length. It occurs from sea level through the Transition Zone.

The Scouler Willow, *S. scouleriana* Barr., occurs from the Transition through the Canadian and even into the Hudsonian Zone, and is sometimes shrubby, sometimes arborescent in form. Even as a tree it has a smooth bark, unlike the Yellow Willow. Its leaf is shaped like an inverted egg, wider toward the rounded tip; it is one to two inches long and half an inch to an inch and a quarter wide. In color it is yellow-green, shiny above and somewhat smooth or minutely hairy beneath, with yellow veins. Its catkins in blossom are fluffier and more lovely than those of any of our other willows. Twigs of the last season's growth are reddish-brown. This willow assumes an independent air; it is rarely found in groups. Unlike most of its kin, it does not seek the banks of streams but grows along the mountainsides above them, at such places as the Emerald Pool or beside small springs, such as the one near the head of Nevada Falls. It is often found among the aspens.

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[Willow Family]

## Black Cottonwood

*Populus trichocarpa* T. & G.



*Black Cottonwood Branch*  
About 1/2 Natural Size

The Black Cottonwood is one of the trees frequently encountered along the banks of the Merced River and on the edge of the meadows throughout the floor of Yosemite Valley. It is found well into the next zone also, where it finds favorable conditions, but it does not go so high as the aspen.

It grows quite tall, ranging from a rather symmetrical tree of forty feet in height, with clustering branches angling upward around the main stem, to a height of a hundred feet or more, with a rather cylindrical outline of branches and foliage. The trunk may be from one to three feet in diameter, with a smooth, whitish bark, until the tree is fairly old, when it gradually darkens and is furrowed into long, narrow plates. It is one of the broad-leaved trees which carries the main trunk through the tree.

The leaves are smooth, and are a deep, shiny green above; below they are dull in finish, whitish in color, and are quite heavily veined. In shape they are from ovate to lanceolate, varying in length from two or three inches to almost a foot. They are often heart-shaped at the base, and usually taper to a more or less acute point. They turn a deep yellow in autumn.

Staminate and pistillate flowers are usually borne on different trees and fertilization is by means of insects. The seeds are enmeshed in a cottony substance which is easily blown upon the wind and gives them a wide distribution.

Along with others of the willow family, the cottonwoods have been invaded by the oyster-shell scale and are dying off rapidly. They are also subject to a dry rot, so that old trees readily topple over in a high wind.

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[Willow Family]

## Quaking Aspen

*Populus tremuloides* Mich.



*Quaking Aspen Leaves*  
About 1/2 Natural Size



*Young Quaking Aspen Trees*

The aspen is the most widely distributed of our North American trees and one of the most delightful. At our latitude it does not descend the mountains much below 4,500 feet, though one stray grove is to be found on the Valley floor (4,000 feet), on the south side of the Merced River near Cathedral Spires.

It is a slender, graceful tree, twenty-five to seventy-five feet in height and from eight to eighteen inches in diameter. The trunk is silvery in tone, varying from greenish-white in young trees to a blackish-gray in old trees. Bears often leave the marks of their claws plainly in the parchment bark of the aspen—whether as a measuring post of their own height or in challenge to an invader is matter of surmise.

The leaves are alternate on the branches, and leave a scar-like knob when they fall. They are yellowish-green above, paler beneath, round-ovate in shape, and finely toothed along the margin. They are smaller than the leaves of the cottonwood, and do not taper gradually to a point. The petiole, or leaf-stem, is flattened in such a way that the leaf quivers at the least breath of air.

In autumn they are among the chief glories of our mountains. At such altitudes as that of Little Yosemite, the aspen leaves turn pure gold in the sunlight; higher, they burn with an orange and scarlet flame, making a pattern of Oriental splendor on many a slope.

Aspens are an indication of underground water; they thrive near lakes and where rocky hillsides verge on swampy river bottoms. The new trail to Merced Lake gives access to a most beautiful grove; another stands beneath tremendous White Firs on the shores of the lake itself. Pleasant Valley, north of the Tuolumne River, boasts perhaps the greatest wealth of them, fringing its lily ponds and dropping down its long slopes. Tall, blue larkspurs, monkshood, columbines, and ferns throng their light shade. At Aspen Valley or Porcupine Flat on the Tioga Road, along the little stream that runs toward Chinquapin from the summit of the Bridalveil Creek ridge on the Glacier Point Road, in the tangled thickets of Glen Aulin, there are countless places where they may be found, and always they are a joy to the eye.

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## Big-Leaf Maple

*Acer macrophyllum* Pursh.



*Big-Leaf Maple Branch*  
About 1/2 Natural Size

This maple is known as the Broad-Leaf or Big-Leaf Maple, Oregon Maple, or Water Maple—this last from its preference for moisture-filled ground.

It is a beautiful tree. The trunk of the sapling is smooth, pale, gray-green; as it grows older, the bark becomes scaly and somewhat ridged and turns to a darker gray, sometimes tinged with reddish-brown, but it is always a comparatively thin layer. The shaft is from one to two and a half feet in diameter at the base, tapering off quite rapidly, often with several shoots forming one broad, rounded crown, when the tree grows in a fairly open place, but with a narrower top when in the thick forest.

The leaves, as the name implies, are large—six to fourteen inches wide. They are cut into five lobes by deep indentation, with a rather wavy margin. In color they are yellowish-green, shiny above, pale and dull beneath, with stems six to ten inches in length. In autumn the leaves turn a clear yellow, sometimes tinged faintly with russet, before they fall.

In late spring the pale yellow flowers hang in great drooping clusters, before the leaves unfold. They become tawny as they ripen. They depend on insects for their fertilization, and for the distribution of their fruit on wind, flood waters, or animals. The flowers are not often perfectly bi-sexual. Sometimes they occur on separate trees, sometimes on the same. The fruit is a pair of one-winged seeds, or samaras.

Fine specimens of this maple are scattered throughout the floor of the Yosemite Valley, and are easily distinguished by their leaves and flower-clusters. The talus slope below Glacier Point, particularly in the neighborhood of the old spring west of Happy Isles, along the banks of the Merced at frequent intervals, and along Tenaya Creek are a few of their local habitations.

The Dwarf Maple (*Acer glabrum* Torr.) occurs on trails above the Valley, such as near Clark's Point and on the Four-Mile Trail, but it is a shrub rather than a tree.

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## California Laurel

*Umbellularia californica* Nutt.



*California Laurel Branch*  
About 4/5 Natural Size

The California Laurel goes by several names. In our region it is called Laurel or Bay indiscriminately; in northern California it is known as Pepperwood; in the dense forests along the coast of Oregon it is called Myrtle. It is one of our finest hardwoods.

The California Laurel varies greatly in size and shape and character, adjusting itself to conditions. In the Yosemite we do not have the large individual specimens sometimes encountered elsewhere, but we usually find a tree with a short trunk sending up several slender vertical branches to form a dense crown, thirty to sixty feet in height. The trunk in old trees is reddish-brown; young stems are smooth and grayish-brown in color.

It may readily be distinguished by the aromatic odor of the leaves or bark when crushed. The dark green leaves, shiny above, are alternate along the stem on a short petiole. In shape they are oblong to lanceolate, three to five inches long, with the margin smooth. The flowers are greenish, in an umbel or cluster; hence the name "Umbellularia." The olive-like fruit has one seed and is yellowish-green in color. It matures about October.

The California Laurel ranges from the hot and rocky talus slopes of the northern wall, where it has the Canyon Live Oak for its companion, to the cool shade at Happy Isles, or at the foot of Bridalveil Falls, where it mingles with Dogwood, Maple, and Douglas Fir.

The tree is an evergreen. In April or early May, its dense foliage and its loose clusters of bloom, profuse though inconspicuous individually, stand out boldly against the Nuttall Dogwood and the Big-Leaf Maple, whose leaf-buds are just beginning to unfold.

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The student of our trees will find three books on the subject particularly valuable: Hall's *Yosemite Flora*, Jepson's *Trees of California*, and Sudworth's *Forest Trees of the Pacific Slope*.

The *Yosemite Flora* is the handbook of plants commonly in use for this region. As its material is limited to the Yosemite National Park, it is particularly helpful here. Its descriptions are brief and to the point, and it contains a very useful introduction to plant study in general and to the Yosemite flora in particular, with an explanation of many of the technical terms used in botanical works.

The *Trees of California*, is naturally more detailed in its study of trees. The articles on the genus *Sequoia*, the general information on forest conditions in California, and the stories of many of the common and specific names of our trees are most illuminating. If possible, the student of trees should also look into Jepson's *Silva of California*, the monumental work on the subject, with its splendid illustrations. In our day, no book on California trees can appear without an acknowledgment of indebtedness to Professor Jepson, which is given herewith.

Sudworth's *Forest Trees of the Pacific Slope* includes a still wider range of forest life. A government publication, it is a thorough study of the lives and habits of our trees, going into their variations under different climatic conditions, their range and occurrence, uses, and so forth, with a wealth of material.

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## GLOSSARY

*Angiosperm*. A plant whose seeds have a covering of some sort, such as a pod.

*Cambium*. The layer just beneath the bark in a tree, through which the moisture flows upward and the sap flows downward.

*Catkin*. A scaly spike of flowers, such as that of the willow or birch.

*Dicotyledon*. A plant having two seed-leaves only.

*Dimorphic*. Having two types of foliage.

*Gymnosperm*. A plant with its seeds naked, as with the pines, where the seeds are attached at the base of the scales in the cone.

*Lanceolate*. Broadest at base, narrowing down to a point, like a lance.

*Monocotyledon*. A plant having only one seed-leaf.

*Obovate*. Shaped like an inverted egg.

*Ovate*. Egg-like in shape.

*Ovule*. The body in the ovary which at length becomes the seed.

*Ovulate*. Seed-bearing.

*Petiole*. Leaf-stem.

*Pistil*. The seed-bearing organ of a plant.

*Pistillate*. Bearing pistils only.

*Polycotyledon*. A plant having two or more seed-leaves.

*Sessile*. Without a stalk or leaf-stem.

*Stipule*. An appendage at the base of a leaf-stem; in many instances it falls before the leaf.

*Stamen*. The pollen-bearing organ of a plant.

*Staminate*. Bearing stamens only.

*Umbo*. A knob or spike at the outer tip of a scale, as in the cone of the White-Bark Pine.

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