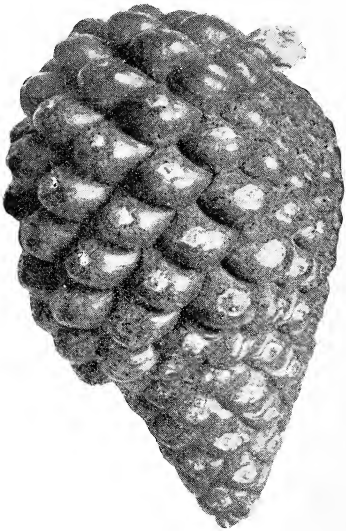
How to Tell the Trees



How to Tell the Trees

AND

Forest Endowment of Pacific Slope

BY

JOHN GILL LEMMON

Author of "West-American Cone-bearers;" "Oaks of Pacific Slope," Etc.

ALSO

Some Elements of Forestry with Suggestions

BY

MRS. LEMMON

First Series

THE CONE-BEARERS

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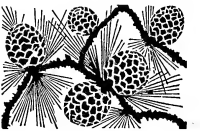
OAKLAND, CALIFORNIA

1902

DEDICATION

To Mrs. Ellanor H. Stetson
My comrade husband's friend and mine of many years
this booklet, for all tree-lovers,
is affectionately dedicated
by
Mrs. John Gill Lemmon



PREFACE.

"Some Hints upon Forestry," issued for the California Federation of Women's Clubs, in 1900, contained the following suggested topics for study and discussion:—

1. Forest trees, their names, appearance, habits, manner of growth, uses, etc.

2. Distribution, where found and reasons why so located, nature of soils, exposure, etc.

3. Enemies of trees, animate and inanimate, including man, their worst enemy.

4. Effects of forests upon climate, conservation of moisture, preventing both floods and drought.

5. Reforestation, its value both economical and esthetic, supplying man with needed materials for his development, and preventing his deterioration.

6. Necessary attention and education, then legislation and practical application, etc.

In harmony with these brief hints, I invited one with whom I have studied the trees in their homes for over twenty years to elaborate the first of the above hints. The result is this booklet—"How to Tell the Trees"—with "Matchless Forest Endowment" for introduction; the final pages are devoted to a brief presentation of forestry, as in part embodied in "Some Hints."

It is to be hoped that this profusely-illustrated little packet of leaves will be welcomed by all tree lovers, and prove helpful in their becoming better acquainted with man's best friend on earth, the bounteous forest.

MRS. JOHN GILL LEMMON.
5985 Telegraph Ave., Oakland, Cal.,
June, 1902.

CHIPS.

The quivering forest groans,
And tosses her arms on high,
And struggles, and writhes, and moans,
Like a soul in agony;
Till her high, imperial crown,
In cowering pain and fear,
At the pitiless presence near
Bends blindly and wretchedly down.

—*Mrs. A. D. T. Whitney.*

Thou art weighed and wanting, O nation;
The writing is seen on the wall!
With the scepter and crown of the forest
The kingdoms of men will fall.

—*Lilian H. Shuey.*

He plants the forest's heritage,
The harvest of the coming age,
The joy that unborn eyes shall see,—
These things he plants who plants a tree.

—*The Century.*

MATCHLESS
FOREST ENDOWMENT
OF PACIFIC SLOPE
Particularly California

MOTHER NATURE is wonderfully lavish with her favors towards some countries, and as strangely niggardly to others.

No more striking proof of this fact is found than that of the distribution of the forests over the land-surface of the earth. It is but little understood that the most wonderful and valuable forest known is that of Northwest America.

This forest possesses more kinds or species of resinous-wooded, needle-leaved, cone-bearing trees than any equal area in the world, and these trees are either the largest in dimensions, or they bear the largest fruits, called cones, that the earth has produced.

This matchless combination of superlative qualities has been bestowed by circumstances and forces so wonderful as to give the phenomenon the character of a distinct gift or local endowment.

Passing by the non-resinous, broad-leaved trees, of which there is a liberal allowance, the resinous-wooded, cone-bearing trees of the Pacific Slope

number 14 genera or families, comprising 70 species or kinds of trees—13 of the genera with 40 species being in California.

Of these species 27 are pines, 2 are larches, 5 are spruces, 2 are hemlock spruces, 2 are false hemlock spruces, 10 are firs, 2 are redwoods, 2 are American cedars, 7 are cypresses, 9 are junipers, and 2 are yews.

ENORMOUS SIZE OF TREES AND CONES.

Three of our pines—the great Sugar, the Yellow, and the Jeffrey Pine—all of them being very valuable trees, are also the largest trees of the family, often attaining a height of 220 feet, with a diameter of 10–12 feet—no pines of foreign countries attain one-half of these dimensions.

Five of our pines bear longer or heavier cones, with larger seeds than any found elsewhere, the cones of the very valuable Sugar Pine being 15–20 inches long, while those of the Coulter Pine often weigh 8–10 pounds, the Gray Pine 3–4 pounds, the Torrey Pine 2 pounds, and the Jeffrey Pine ½–2 pounds, while the largest cones outside of California scarcely exceed 6 inches and the heaviest rarely weigh 1 pound.

Two of our spruces attain enormous dimensions —the very beautiful and valuable Douglas Spruce of the Sierra and northward becomes 300–450 feet high, with a trunk 8–12 feet thick. The great Tideland Spruce of the north coast is but little less in dimensions, while the cone of the Big-cone Hemlock Spruce of the San Bernardino Mountains is 5–7 inches long and 3–4 inches thick when ripe

and expanded—these dimensions far excelling any foreign spruce.

Five of our firs, the Red-bark, the White-bark, and the Shasta firs of California, and the Grand and Noble firs of the region northward, become two or three times as large as any eastern or foreign fir, being often 200–300 feet high, 12–18 feet in diameter, with cones 6–8 inches long.

Our two world-renowned redwoods—the Coast Redwood and the Sierra Big Tree, rising to the height of 300–320 feet and enlarging, while yet young, to a diameter of 20–35 feet and growing for 3,000–5,000 years—are not approached in grand proportions and regal majesty elsewhere. And the cones of one of our redwoods—the Sierra Big Tree—though small as compared with our pine cones, are yet, doubtless, the monsters of their race, the largest being the size of a hen's egg, while the largest cone found in connection with fossil remains of the twenty-five extinct species do not exceed the size of a nutmeg.

So with the 2–3 inch cones of our Alpine Hemlock Spruce, the 1-inch cone of Incense Cedar, the 1½-inch cone of the Monterey Cypress, the ⅜-inch berry of the California Juniper, and the California False Nutmeg, all the largest cones of their respective families.

WHY THIS FAVORITISM?

This prodigality in number and size extends to other vegetable growths. Our oaks are numerous and often large, with the largest acorns and cups known. One of our maples bears leaves 6–10

inches across, while the little popgun elder of the East is supplanted here by a species 12–20 inches in diameter.

Most of the trees mentioned are indigenous to California and three-fourths of them are found only in that state. Why this great prodigality of Nature in behalf of the Pacific Slope, and especially of little California?

The solution of this problem involves a brief discussion of certain controlling factors.

At the outset we may observe that an impassable climatic barrier is set up at present, by Nature, preventing migration north and south. The Torrid Zone, in which no resinous trees can grow except on high peaks, separates the world's forests into unequal and very different floras.

The Southern Hemisphere is the home of the Araucaria, the Eucalyptus and the Acacia, while in the Northern Hemisphere are found—in addition to the hosts of broad-leaved, non-resinous trees, such as oak, ash, hickory, etc.—all of the large families of pine, larch, cedar, spruce, and fir, with the redwood, cypress, and juniper; the distribution of these trees across the two continents, however, is very unequal.

DISPARITY OF AREAS AND DISTRIBUTION.

The northern part of the eastern continent—Eurasia—is approximately 9,000 miles across. North America is but 3,000. We would naturally expect, for instance, three times as many pines in Eurasia as in America. Just the reverse is the case. Of the 80 species of known pines only 20

are indigenous to Eurasia while 60 are flourishing in America.

Again, the Pacific Slope region, from the Rocky Mountains to the Pacific shore, is about 1,000 miles, one-third of the distance across, yet it has 40 out of the 60 American species, 15 being in Mexico and 25 in the western United States, with 20 of these in California, a narrow strip of coast only 800 miles long by 150 wide, yet containing as many pines as all Eurasia!

Now if the distribution was equal, Eurasia having 60 pines and North America 20, the Pacific Slope, being one-third of America, would be entitled to but 6⅔ species, and little California, which embraces about one-tenth of the Pacific Slope, would have little more than half a chance to get one species!

This excessive prodigality of Nature in favor of the Pacific Slope and especially the California part of it, is due to a combination of factors, chief of which are the contours of continents, the trend of principal mountain ranges, the behavior of certain oceanic and atmospheric currents, the alternate elevation and depression of continental areas, together with the ability of all these factors to modify the effects of certain crucial climatic periods, called—

THE ICE AGE AND THE THERMAL AGE.

The phenomenon of hot and cold periods in the earth's history compelling the migration, the change of location of the entire organic world—the kingdoms of the animals and plants—is a

much discussed and controverted topic. Seven theories have been presented from time to time, accounting for these important epochs, chief of which is the very interesting—

ASTRONOMICAL THEORY.

This theory, first presented by Mr. Croll, and endorsed by Professor Geikie and many other English geologists, "attributes the Glacial Age to the combined influence of precession of equinoxes and secular changes in the eccentricity of the earth's orbit," whereby the seasons, summer and winter, would have a disparity of nearly five weeks instead of one week, as at present: this disparity, it is claimed, would produce Glacial and Thermal Ages alternately, every 21,000 years.

However, Professor Le Conte, America's most renowned geologist, controverts this theory, in part, quoting from many authorities, showing that but one Glacial Age can be proven. Referring to the researches of Professor Wallace and others he asserts that the phenomenon is the result of several agencies—astronomical, geological, and geographical—producing a severe Glacial Age of great length, with two cumulative periods of greatest severity and a Sub-Thermal period between; the Age commencing about 240,000 years ago, continuing 160,000 years, and ending 80,000 years ago.

GREAT DESTRUCTION BY COLD.

During this Glacial Age the plants were driven slowly, generation after generation, a few feet at a time, down across the North Temperate Zone, by

a world-wide sheet of ice, to be as slowly driven back by waves of tropic heat.

In this double migration, owing to the configuration of continents and mountain ranges, most of the plants were destroyed, only a few vestiges of the post-glacial families being extant, to-day, gathered here and there upon the plains or stranded upon the mountains.

The means and manner of this destruction are most interesting. The continents of both the old and new world are greatly expanded at the north, while the southern portions are attenuated to narrow peninsulas.

These configurations give to the North Temperate Zone its greatly dominant character, having most of the existing families, while the peninsulas are sparsely furnished.

The Eurasian mountain ranges are mostly transverse, like the Alps, Himalayas, and Thian-Chan Mountains, forming barriers to the progress of plants; while North-American ranges are nearly longitudinal, permitting the plants to escape southward during a Glacial Age, and return during a Thermal one.

There is much evidence found as fossils in the rock strata, that an abundant flora of monster trees once occupied the Arctic regions, similar on the two continents, owing to connections then existing or to nearness of extremities.

MANNER OF THIS DESTRUCTION.

The formation of an ice-cap at the pole and of snow and ice deposits on the summits of mountains lower down in latitude, drove the plants down

from the northern plains, and down from the mountainsides to form vast hordes of fugitives hastening to southern plains.

This hegira continuing as the sheet of ice grew and plowed its glacier beds slowly down to median latitudes of Europe and Asia, the entire members of many families were overtaken on the northern side of the mountain ranges and frozen out; others, passing between the ends of the ranges, reached the shores of the Mediterranean Sea and the Indian Ocean, and were then and there destroyed, a few only escaping by the narrow, devious Isthmus of Suez into Africa, while others huddled upon the three peninsulas of Arabia, Hindustan, and Malacca.

On the Western Continent a great portion of the plants in their flight came down unobstructed, to the Gulf of Mexico, to be caught and frozen there, a few eastern families escaped on the peninsula of Florida, while the greater part of the western plants ran down along the plateau of Mexico into Central America, and perhaps finally crossed on the Isthmus of Darien into South America.

GREATER DESTRUCTION BY HEAT.

Following the Glacial came a Thermal Age, with contrary effects, yet with more destructive results. The ice melts on the southern verge of the ponderous ice cover, allowing the plants to return, timidly seeking the newly-emptied glacier beds. Soon after, the flood-water sinking into the mountainsides, the brown earth, becoming vivified, invites the grasses and flowers to new-made homes, while

sunny parterres beckon to the spying trees, promising centuries of occupation—if they can stand the climate.

The rising heat rolling in waves from the south, nearer and nearer, urges on the lagging columns, adding the necessity of avoiding death to the attraction of better homes.

But the universal return of plants from the south, was prosecuted under vastly different, more destructive conditions than those of the northern flight. The plants on the return trip were attracted northward along the cool plains, and also, some of them upward on the mountainsides, for it is the same thing in effect, to ascend a mountain for cooler weather as to journey northward.

Now the first elevations beside a valley are usually low ones, foot-hills, outlying ridges or higher spurs. The plants that ascended these elevations, as the heat came on and proved too severe for their constitutions, were shriveled and burned then and there—the last battle ground and altar-places where were immolated the greater part of the vegetable creation of the period.

THE LONE SURVIVORS.

Here and there straggling members of a family reaching a locality on the plain or part way up a mountain when the present equilibrium of seasons was established, found themselves suited to the environment—and it is the descendants of those plants that are the inhabitants of our plains and mountains to-day.

These terminals of broken lines of development,

--these remnants of a past multitudinous vegetation,—ever since they were allowed to exist and perpetuate their kind, have been obliged to wage war upon neighbors from generation to generation, in order to gain or retain a foothold, resorting to changes of ground, of character, or weapons, in order to win in the incessant battle of life.

PROOFS OF DOUBLE MIGRATION.

That the plants have made the double journey described is plainly proved by the characters of alpine plants on high peaks of the North Temperate Zone. They are found to be identical with Arctic plants. Now they could not have passed from northern regions directly to these summits during the southern flight, for the reason that both Arctic regions and these mountain tops were being slowly covered simultaneously, with snow, soon becoming permanent ice. Manifestly cold-loving plants—our Alpine plants—could ascend mountains only when fleeing from torrid heat, and exactly that condition was experienced on the return journey; so here on all the peaks of the North Temperate Zone are stranded Arctic species of plants, with less northern families established on the slopes of the mountains.

GREAT FOREST OF THE NORTHWEST.

It has been stated that Europe and Asia were deprived of their quota of plants by the many long transverse ranges of mountains preventing the passing of plants north or south, except through the wide gaps between ranges; while North Amer-

ica was favored by having nearly longitudinal ranges, permitting the free passage of plants to and fro along unobstructed plateaus.

The two long American watersheds—the Rocky Mountains and the Alleghanies—deliminate three plateaus, Atlantic Slope, Mississippi Valley, and Pacific Slope. We have seen that the distribution of plants was not equal—the Pacific Slope having the lion's share, and largest growths. This is due principally to four potential agencies.

1.—CONDUCTED NORTHWEST BY HIGH PLATEAUS.

The Rocky Mountains, lying near the western side of the continent, extend southeasterly, upon the eastern side of the high plateau of Mexico, to Central America. The plants returning from the south at the beginning of the Thermal Age, 80,000 years ago, were divided at the outset in southern Mexico, and a large part barred out of the Mississippi Valley by the Cordilleries, that killed off unfortunate individuals or families which ascended their foot-hills and spurs—as described—while other families or other members of the same families were attracted to pursue the broad, free, and, at the time, cool and inviting pathway along the high plateau of Mexico and Arizona, diminished at every league by the many-spurred Rocky Mountains; the survivors escaping to pass into the valleys and along the sides of the mountain ranges, some of them particularly directed northwestward again by the favoring coast plateau, decimated the while, by the high, similarly inclined

and destructive Sierra Nevada, to reach final destination in California and the region northward.

2.—DISTRIBUTED BY WARM JAPAN CURRENT.

A very important agency helping on the capture and directing the distribution of the trees all along the western coast from California to Alaska, is the presence in the north Pacific Ocean of the warm *Kuro-Siwa*, or Japan current, primarily a hot tropical current striking the islands along the southern coast of China and deflected northward to be more deflected by the Japan islands and hurled northeastward across the Pacific Ocean, there striking the southern side of the long chain of Aleutian Islands, which turn a part of the current down along the coast of America, delayed and accumulated during its long sweep by the many islands and capes on the way, while its heat rises into the atmosphere, carrying with it enormous quantities of water.

3.—NOURISHED BY MOIST LANDWARD BREEZES.

Another factor closely connected with the preceding is found in the cool, broad, overruning Pacific breezes that prevail most of the year on the northwest coast. Mingling with the heated and moisture-filled air over the Japan current, the volume presses inland, the moisture condensing and falling most copiously upon the nearest cool elevations—giving sustenance and stimulus to the richest and most remarkable forest on the face of the globe.

4.—DEVELOPED BY SEMI-TROPIC HEAT.

The fourth factor necessary, it is found, for the production of largest growths, is a high degree of heat, of which the Puget Sound region lacks sufficient for some plants, although many of her trees, such as the Noble, Grand, and Amabilis firs, and the very valuable Gigantic Cedar, or Shingle tree, became monsters, and the Douglas Spruce, one of the most valuable timber trees on the earth, becomes in Oregon and Washington the tallest trees known, 450 to probably 480 feet high!

This necessary heat is found under the semi-tropic sun in the latitude of California. This heat added to the enclosed condition of the state—the high Sierra on one side, the lower Coast Range on the other admitting the ocean breezes through its passes, and with low interlocking ranges at each end—furnishes just the right conditions, it seems, for strongest allurement to enter and for highest development afterward, for here only, in this *cul-de-sac* of California, are found the largest cone-bearing trees on earth, of some nine different genera; and here only are found the largest and heaviest cones of sixteen different species!

Is it not passing strange that out of the twenty pines of Europe and Asia, and the twelve pines of the eastern states, not one should develop cones as large as either one of five pines in California?

TRIBUTE TO CALIFORNIA CLIMATE.

The great truth is forced upon the attention that it is California that was set apart from all the world, when, as the geologists tell us, the Pacific

Slope was raised from the ocean bed, in recent geologic times, by a mighty *geotherm* or earth heat-wave, with the Sierra and Cascade Range as its axis of elevation; followed in a later age by another uplift with the Coast Range as its axis; while the long, narrow valley between the ranges was cross-fenced by low mountains into several magnificent parks, principal of which are the valley of California, the smaller Willamette valley, and the extensive Puget Sound region.

Of these, California was assigned first place in the pathway of the southern fugitives, inviting to enter and urging to tarry and form a natural, unexampled *arboretum* within her mountain walls, supremely aided thereto by a semi-tropic sun dispensing beneficent heat—the whole array of factors mentioned conferring to produce the most generous and forcing climate on the face of the earth—as magnificently evidenced by this Matchless Forest Endowment!

A PROPHECY.

There is a collateral thought, pregnant with great promise, clearly deducible from this forest phenomenon. Because the physical conditions producing largest and best forms in one of the two organic kingdoms—the vegetable—prevail now upon the earth in one sequestered region, we may believe that the other kingdom—the animal—and especially the human family, is equally susceptible to the world-excelling stimulus, and we may logically expect that this favored clime—with the contiguous country it shall dominate—is the com-

ing empire of the earth, with a people and government preëminent in moral as well as intellectual and architectural ~~splendor~~. development.

The poets, those inspired persons of all ages, have given us hints of the future great Republic of Arts and Letters that shall arise on these shores, as foreshadowed by Joaquin Miller:—

"Dared I but say a prophecy,
As sang the holy men of old,
Of rock-built cities yet to be
Along these shining shores of gold,
Crowding athirst into the sea,
What wondrous marvels might be told!

"Enough, to know that empire here
Shall burn her loftiest, brightest star;
Here art and eloquence shall reign,
As o'er the wolf-reared realm of old;
Here learn'd and famous from afar
To pay their noble court, shall come,
And shall not seek nor see in vain,
But look on all with wonder dumb."

John Gill Lemmon.

How to Tell the Trees

No. 1. THE CONE-BEARING FAMILY

CONIFERÆ

By J. G. Lemmon

Common trees throughout the earth are recognized by certain prominent characters—mostly, those of leaf and fruit. We know the oak at sight, by its usually large leaves, and especially by its peculiar fruit—the acorn. We know the poplar by its heart-shaped leaf and cotton-bearing seeds, the maple with its large-toothed leaves and double-winged seeds, the ash with its pinnate leaves and single-oared seeds.

We Californians have learned to tell at a glance, the wonderful Madroña by its magnolia-like leaves, its red berries, and particularly, its naked, red limbs. The clean, white-barked Sycamore with its great palmate leaves and its hanging strings of button-balls, is at once detected, and the spicy-leaved California Laurel with its large bright-green berries.

All these and many more large-leaved, usually low-land trees are well known; but they do not compose the mass of our forests; they do not cover our coast ranges nor our lofty Sierra Nevada. They do but little of the work of sponging the moisture out of the overrunning ocean winds and distilling it in rain or showering it in snow upon the moun-

tains; and they do less in holding the greater part of it in the canyons of the Sierra for the summer needs of the plains below.

No; it is an entirely different class of trees that, mainly, discharge these important functions for the benefit of smaller plants, and, incidentally, for the sustenance of mankind. That class is the resinous-wooded, narrow-leaved, usually evergreen trees bearing a peculiar scaly fruit, called from its usual shape the cone, giving to the great class the appropriate name of *CONIFERÆ*,—Cone-bearers.

SPIRALES

NORTHERN PITCH TREES

It is the most resinous of these trees, the spiral-coned Northern Pitch Trees, that form most of the great forests of the North Temperate Zone. This is the region where man originated and where the most populous nations assembled, and, particularly, the most important of these are in Europe and North America, the homes of the dominant nations of the earth; and, farther, the largest number of species in ratio to the breadth of the country occupied, and the largest forms of these trees, with largest cones and seeds, are found only in California.

What an inspiring inference can be drawn from this array of extraordinary facts! What a guaranty—barring accidents—for an unexcelled people hundreds of years hence!

It may be well in this connection to state that the superlative terms "largest," "tallest," "heaviest," "most valuable," etc., are inevitable expressions when one is describing and comparing California trees. This is owing to the fact that our flora is not identical with any other. Our trees are, in a sense, a spe-

Photo by J. G. Lemmon.

BIG TREE, OR GIANT SEQUOIA.

Sequoia Washingtoniana. Sudworth.

cial creation of enlarged specimens, the result of exceptionably favorable conditions of soil and climate; consequently, they are in many instances simply unexcelled.

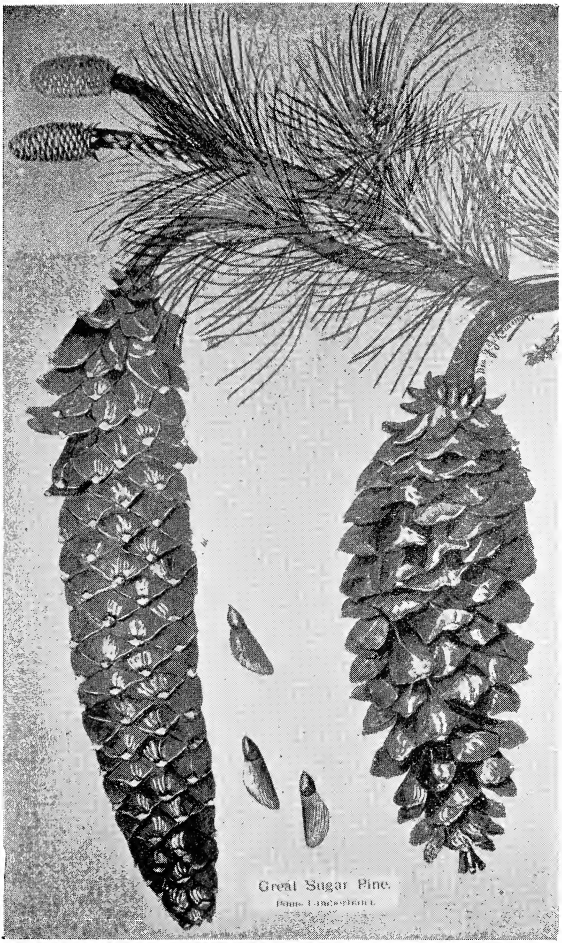
If we Californians would enter upon the exalted stage prepared for us by Mother Nature, we will profit by avoiding the errors of older nations, by the study of our own matchless forests, insistence upon their preservation, and consequent inheritance of their benign influence upon our own advancement.

Preparatory to the serious study of forestry, and in accordance with the outline of topics presented in "Some Hints upon Forestry," let us in this paper take up the first topic there suggested, learn how to distinguish the many kinds of trees, call them by name, and get acquainted with them in their homes.

REDWOODS—*SEQUOIA*

Of course, the first tree that comes into the mind of a Californian, native or adopted, is the Redwood (*Sequoia*), the chief of all trees in size and majesty; one species (*S. sempervirens*) dominating the coast forests, with its wealth of valuable lumber trees; the other, the Big Tree (*S. Washingtoniana*), ennobling the Sierra forests with its mammoth columnar trunk and its immense crown of perfect verdure, not a limb awry or dead, nor a tree dying until prostrated by its own overweight or a severe storm.

So well known at home and abroad are these mammoth trees that this mere brief mention of them in the order of their importance suffices. It is pertinent in passing to call attention to the newly-discovered fact that, of the fifty or more extinct species of a prodigious forest known to have extended well over northern regions, of which our two Sequoias



From a painting by Mrs. J. G. Lemmon.

SUGAR PINE.

Pinus Lambertiana. Douglas.

are the conspicuous living representatives, our Sierra Giant bears much larger cones than any found in fossil remains. Without doubt it is the largest vegetable creation that ever towered above the surface of the earth.

The tall, spire-shaped Coast Redwood need never be confounded with the Cedar and Cypress of the region, for they have only little pointed scales for leaves, while the Redwood has distinct, linear leaves, one-half to an inch long, and arranged in two ranks along the branchlet. The broad-crowned Sierra Giant, or Washington Tree, having small, scale-like leaves, is sometimes mistaken for the Incense Cedar of the region, but the comparatively large, oval cone, one and one-half to two and one-half inches long, distinguishes the Big Tree unmistakably.

FASCICULARES

THE PINE FAMILY—*PINUS*

Next to the Redwoods in interest is the numerous family of pines comprising the most part of our forests. The genus called botanically *Pinus* comprises about eighty species all told, distributed over the North Temperate Zone on both hemispheres, but, to the surprise of most persons, quite unequally.

Of the 80 species, only 20 are found in Eurasia, a vast region over 9,000 miles across, while three times as many species, 60, are in North America, only one-third as wide (3,000 miles). Of these 60 American species, 25 are on the Pacific Slope north of Mexico, and 20 of these are in California; that is, the little, narrow state of California has within its borders as many species of pine as there are in all the broad expanse of the Old World.

And the same conditions prevail practically, in regard to most of the other forest trees;

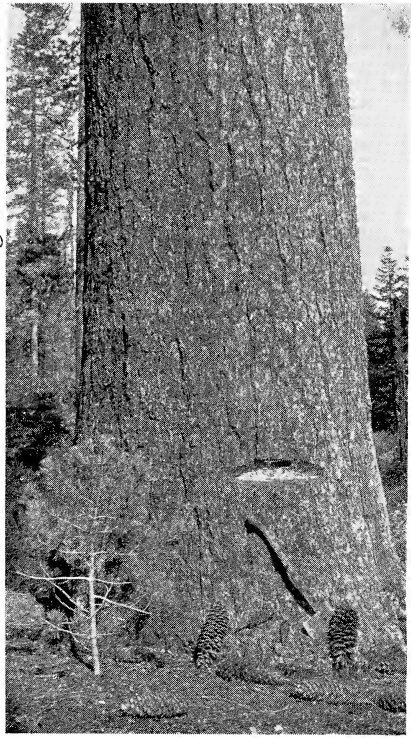


Photo by J. G. Lemmon.

SUGAR PINE TRUNK.

Pinus Lambertiana. Douglas.

there is a paucity of species and individuals generally in the Old World, while there is variety and profusion in the New.

These twenty species of California pines include about three-fourths of the forest trees in the state; that is, they constitute the much larger part of the great forests covering our several mountain ranges.

Now, would it not be gratifying and encouraging as well, if one with little attention could be enabled to tell any pine tree at a glance? That pleasure and power may be in the possession of the reader by making one simple little discovery. Look closely at the twigs or pick up a few leaves beneath a forest tree and examine them. If they are fastened together in little bundles of two, three, or five, you may be sure that *you have at hand a pine tree.* Moreover, most of the leaves (all of them when young) are close-wrapped at the base with long, thin, overlapping scales. This leaf-sheath is the infallible sign of a pine, as it covers the case of the Single-leaf Pine, which is born a twin, but the microscope reveals that its brother is overcrowded in the sheath and perishes.

Other important characters are: Usually long, slender leaves (called needles), of equal size from end to end: the fruit (called a cone) is composed of flat, overlapping scales, arranged in spirals from base to apex, the scales enlarged at the end or exposed portion, which usually bears a prickle or a stouter spine or hook, each developed scale bearing above it two usually winged seeds.

It is necessary to segregate this mass of thousands of miles of forest wealth, and perhaps it will be as well in this brief paper to depart from the strict botanical groupings presented in "Manual of West-American Cone-bearers," since the species composing them are

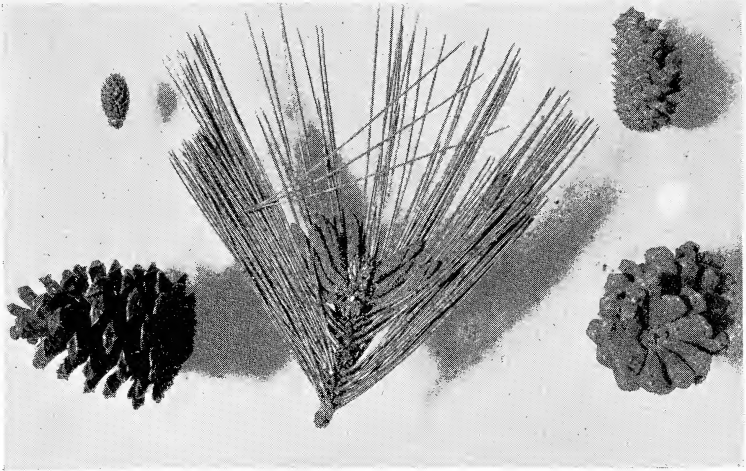


Photo by J. G. Lemmon.

WESTERN YELLOW PINE.

Pinus ponderosa. Douglas.

often scattered well over the regions; so we will present them somewhat as we find them, associated in given regions of the mountain slopes or in lines along the seashore.

But while we may profitably ignore botanical groupings, we should not neglect the botanical names, for they are the only ones that are in universal use by educated persons of all nations: and they are not difficult to pronounce if one considers that in Latin every letter has its proper sound, none are silent, and every vowel is in a separate syllable.

In the use of English names the most appropriate have been selected,—those agreed upon by the largest number of dendrologists.

FOUR LARGE LUMBER PINES

What Californian does not know the Sugar Pine (*P. Lambertiana*) at a glance? Seen from the car window while threading the canyons of the Sierra, or as noted from the Yosemite stage, its massive trunk, finely checked in bark and limbless for 100 to 200 feet, its large upper limbs outreaching and suspending aloft, the large, long, russet cones, the tree is one of the most interesting known. It adds greatly to the impression to reflect that the Sugar Pine is by far the largest pine, with largest fruit, in all the world.

Trees are not rare measuring 250 to 300 feet high, with a diameter of 10 to 12 feet, the cones 15 to 20 inches long. The lumber is very valuable, white, soft, and easily manufactured. Sugar Pine is next in value to the celebrated White Pine of the great forests that but recently covered the region of the Great Lakes. The sad reflection comes that the same shrewd business men who have destroyed those great forests are now seeking Sugar Pine claims, to repeat here the dis-

Photo by J. G. Lemmon.

JEFFREY, OR BLACK PINE TREE.

Pinus Jeffreyi. Murray.

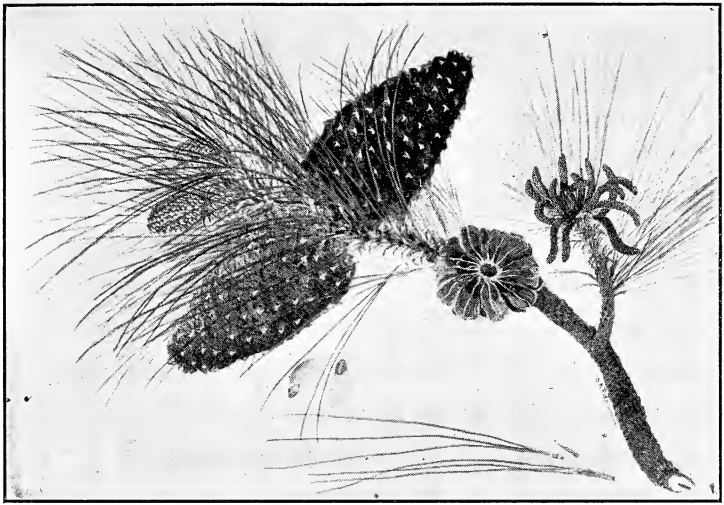
astrous conditions affecting the sources of the Mississippi River.

Above the belt of Sugar Pine, often mingling with its upper edge, resides his big brother, the Silver Pine (*P. monticola*), with its white bark (on young trees gleaming like beaten silver), the same kind of large, outreaching limbs; but the cones are smaller, not one-fourth the size. Like the Sugar Pine and the eastern White Pine, it belongs to an important group, with special characters of white, soft lumber, smooth, unarmed cones, and short, slender leaves always in fives.

Ranging below the Sugar Pine belt of the Sierra, and outspanning it north and south, as also extending eastward to the Rocky Mountains, are massed the great forests of Yellow Pine (*P. ponderosa*), trees varying considerably in color of bark and size of cones, but usually with yellowish bark, and the cones ovate, three to four inches long, with small, deltoid prickles, the leaves in threes. A marked peculiarity of this tree is common to the group to which it belongs,—the Broken-cone Pines. Soon after maturity the cones break away from the stem by an irregular fracture through the base of the cone, and fall away, leaving a rosette of small, undeveloped scales upon the branch.

The Yellow Pine is next to Sugar Pine in size, often attaining the dimensions of 200 to 300 feet in height by 8 to 10 feet in diameter, with spire-like form and short limbs. The lumber is yellowish, hard, and strong. Closely related to the Pitch Pines of the east and the Long-leaf Pines of the south, it shares with them in reputation for good building lumber.

The male or staminate flowers of the Yellow Pine are quite conspicuous, forming large rosettes of long, curling, brown tassels two or three inches long and one-fourth inch in



From a painting by Mrs. J. G. Lemmon.

JEFFREY, OR BLACK PINE.

Pinus Jeffreyi. Murray.

diameter, ornamenting most of the twigs of bearing trees, never, however, on the same branchlet with the cones, nor are the rosettes exactly terminal, a bud with a few leaves usually being in the center.

All the other pines, especially the White Pine group, have shorter or smaller tassels.

In a few high localities from near Mount Shasta to the southern mountains of the state, and mingling with the Yellow Pine, is the fourth mammoth tree of this genus, the noble Jeffrey Pine (*P. Jeffreyi*), so named in honor of its discoverer, also known as Black Pine, from the prevailing color of its bark. The tree is more rounded in outline than the last, with longer limbs and much larger cones, six to ten inches long, with larger prickles. The leaves and twigs are whitish in color, and when injured they exhale a pleasant, aromatic fragrance.

It is these four pines that are falling before the ax and saw of the lumberman at a fearful rate, the undesired trees and young ones sharing the same fate through carelessness. Forest fires complete the devastation. When this quartette of magnificent trees is stripped from our mountains, but a ruin will remain, and the plains will be doomed.

FOUR COAST PINES

Another interesting group, or rather, line of trees, is the quartette of shore pines stretching from the sand dunes of San Diego to the glacier beds of Alaska, and which have been characterized as "the quartette of fighting, storm-beaten, but successful heroes battling their way down to the foam-flecked sea."

Most of the population of California reside in or near the coast cities, and may readily meet with these pines and make their acquaintance. The curious can not help being

interested in their determined seizure of the ocean-blown sands, century after century, and their individually different implements or armor, with which they have learned to equip themselves for resisting the fury of the ocean gales.

Examination reveals the curious fact that the southernmost of the line, the one in the semi-tropic latitude of San Diego, is the most limited in area of occupation and in the number of trees, and that it has the largest cones, with the largest seeds; the leaves are the largest, the longest, and they have the greatest number in the fascicle; grading down in several respects through species after species, the last one being the little dwarf pine, with minute organs, condensed for the fight along the Arctic shore of Alaska.

First is the Torrey Pine (*P. Torreyana*), named for the eminent botanist Dr. John Torrey; often called the Lone Pine. It is found on the beach near Del Mar, twenty miles north of San Diego, with a few on adjacent islands. It is now reduced to a few hundred trees, crouched and creeping on the sand or struggling for the erect position in the valley back of the bluffs, their tops broadened out and flattened to just the level of the barrier.

The prostrated trees on the shore side are on all-fours, so to speak, and thrusting upward short, sturdy shoots heavily loaded with circles or with solitary cones, which are nearly globular, four to five inches long, and of the hardest and heaviest character, two to three pounds weight, with short points to the broad scales. The seeds, hard as filberts, are about an inch long, the largest pine seeds known. The leaves reach the limit of extension at three points; they are twelve to eighteen inches long, one-tenth of an inch wide, and there are five of these unequaled needles to the fascicle.

What a magnificent tree this must have been in its best estate! The wide space of 400 miles between its present home and that of the next species northward may indicate the ground it has lost and predict the impending doom of this heroic but unfortunate pine.

What California poet will pay a visit to these lone survivors, gaze upon the many deep pits in the hard soil where stood their ancestors, and give to the world a threnody,—"The Passing of the Pine"?

One coast pine at least is well known to many citizens of west-central California, the Monterey Pine (*P. radiata*), much used for ornamenting parks and pleasure grounds of the coast towns, and highly prized for the dense, dark-green leaves clothing its long, spreading limbs, interspersed with light-yellow, curiously-knobbed cones.

With headquarters on Point Pinos, it ranges southward to San Simeon Bay and northward to Pescadero. The leaves, four to six inches long, are in threes; the cones, usually produced in circles about the limbs, are strongly declined, ovate, four to six inches long, and often weighing half a pound; and the scales on the outside near the base are enlarged to hemispherical knobs, often one-half inch high. Usually the cones do not fall at maturity, but are caught in the thick bark of the tree and carried outward through life. Trees near Pacific Grove may be seen retaining all the cones they have borne—a most interesting phenomenon.

The length of time that a pine cone remains upon the tree usually depends upon the length of the cone stem. The cones of the four Nut Pines of the interior arid region are stemless, sitting flat on the branches, and so are pushed off at maturity. The half-inch stems

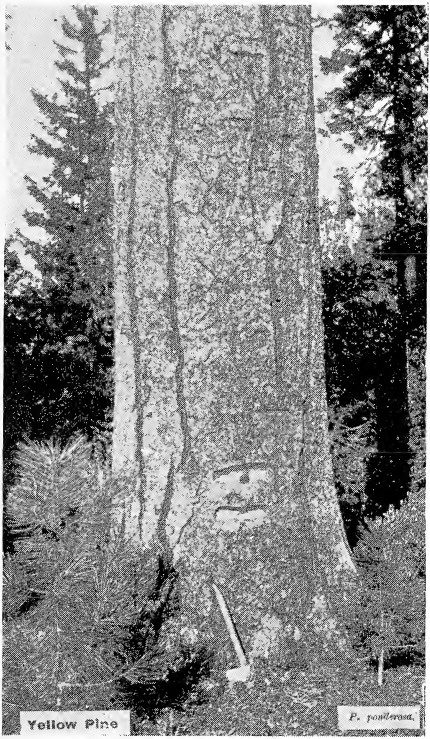


Photo by J. G. Lemmon.

WESTERN YELLOW PINE TRUNK.

Pinus ponderosa. Douglas.

of the Broken-cone Pines allow the cones to remain about two years. The three or four-inch stems of the Heavy Cones are not disturbed for four to six years. The long, slender, soft stems of the Sugar Pine either separate naturally from the branchlet or they are twisted off by the autumn winds next following maturity.

Mingling sparsely with the Monterey Pine, but increasing to sole possession of the shore northward, is the Prickle-cone Pine (*P. muricata*), loving the wet places, from Tamales Point to Cape Mendocino, where it is found of large size, two or three feet in diameter, and with very hard bark, three to five inches thick, the thickest known. The cones in circles are reduced to the size of a hen's egg and are armed with sharp prickles; the leaves are reduced to a pair in each fascicle. This tree, like the last, belongs to the group *Tenaces*, or Persistent-cone Pines, holding their cones through life. As the cones are carried along outward, the piece of stem causes a channel behind it from pith to bark, spoiling the lumber of the whole group, boards made from them being found full of "pinholes."

To make amends, they are beautiful trees, holding in check the ocean winds, and further, they readily yield to cultivation, like the maritime pines of southern Europe, largely used in the reclamation of the southern coast regions.

Near Cape Mendocino commences the long stretch of North Shore Pine (*P. contorta*), the last and smallest of this quartette of sea-loving, fog-nurtured, aggressive, fighting pines. Pressing along the promontories, and taking possession of the sand dunes as soon as thrown up by the sea—despite the blasts of old Boreas—they yield so far as to become close-set, round-shouldered, flat-headed, many-

limbed trees, with dense, stubby, one-inch leaves, reduced to pairs, and wedged in between the dwarfed cones one to two inches long, the latter held tightly, often through the life of the tree.

Thus these brave little pines hold the forts along the bleak northern coast to the forbidding glaciers of Alaska; not alone succeeding by their intrepidity, but, stooping to conquer, they dispense with the garniture enjoyed by their relatives of the interior, and modify remaining organs to the requirements of desperate battle.

Near Mendocino are wind breaks composed of this pine so dense and extensive that strange plants from the interior are encouraged to journey to the coast, there to flourish and flaunt their graces in serene security, while the dairy stock of the vicinity during wintry storms seek the shelter of this living wall of subjugated trees.

TWO HEAVY-CONE PINES

The Gray Pine (*P. Sabiniana*), with its whitish foliage resembling clouds of smoke at a distance, is found in the gulches and on the foot-hills sparsely from the Tehachapi Pass to Redding. It bears very large and heavy cones, three to five pounds; its leaves are in threes and whitened with powder. When young this is one of the prettiest pines; older, the trees are apt to divide near the base, and the leaves—all but those of the season—droop or fall away, giving the limbs a tufted appearance.

A second species of the Heavy-cone group has become celebrated. Who of California, especially southern California, has not seen or heard of the Big-cone Pine (*P. Coulteri*), named for the discoverer? The cones in

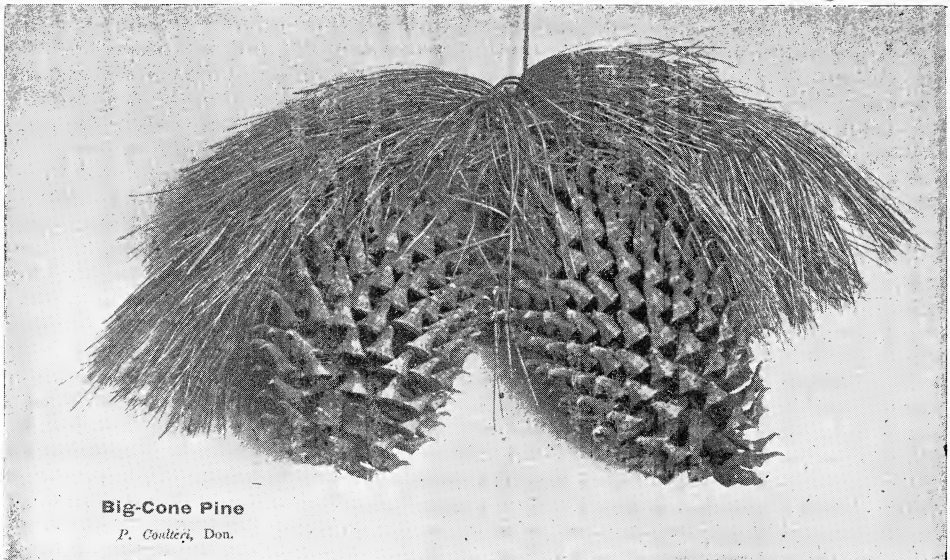


Photo by J. G. Lemmon. BIG-CONE, OR JEFFREY PINE. *Pinus Coulteri.* Don.

quantities are taken to the several world fairs, and are on exhibition in eastern and foreign museums. Grand trees are they, becoming three to five feet in diameter in the San Bernardino Mountains. They extend northward along the Santa Lucia Mountains to San Luis Obispo, where they were first seen in 1830 by Dr. Coulter. An outlying grove of about 1,000 acres of small but beautiful trees ennobles Mount Diablo on the north side, in full view of the village of Clayton.

To be seen at their best, the reader should visit the largest trees, holding out on their long limbs the great cones in pairs or triplets, when opened resembling wicker baskets. They are ten to twelve inches long, and weigh eight to ten pounds, by far the heaviest cones known. The scales terminate in hooks, curving inward, the largest near the base on the outer side being often three to four inches long. The leaves, in threes, are almost unexcelled, fourteen to eighteen inches long.

TWO CURIOUS PINES

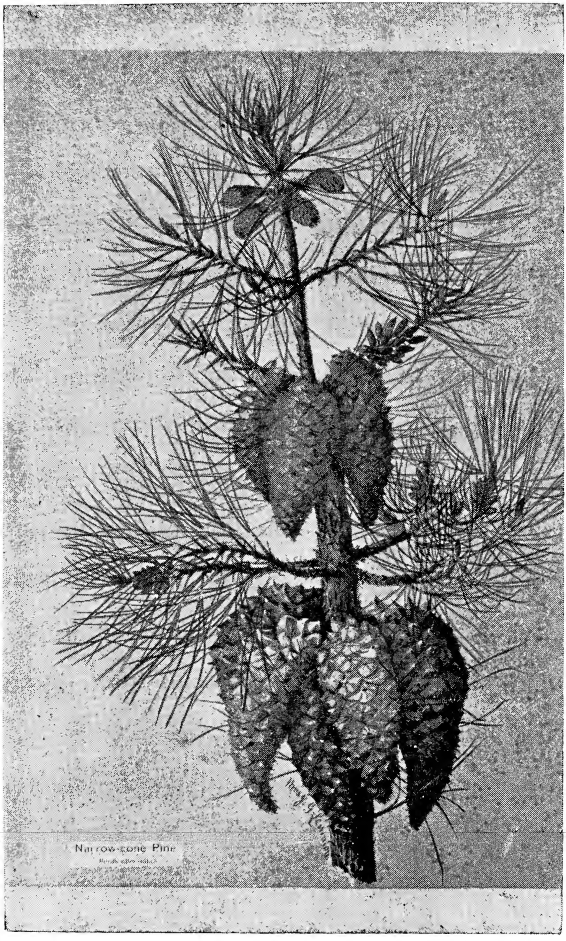
In strong contrast with these big Heavy-cone Pines is the little Knob-cone or Narrow-cone Pine (*P. attenuata*), found in small groves at middle altitudes from the San Bernardino Mountains along the sunny slopes of the Sierra to Shasta, with several noted groves in the Coast Mountains, especially one large body on the summit of Mt. St. Helena, and a smaller on the eastern slope of the Oakland hills, but a few miles from that city.

Usually small trees growing in masses, they become slender and tall, beginning to bear at an early age; the bright little cones, four to six inches long, are produced in circles, one marking each year's growth, and hold fast on trunk and limbs, if the tree is separated

far enough from others to retain its body limbs, through the life of the tree. Owing to the tapering character of the cone (suggesting its botanical name), the cones are not pushed off, but often the wood-layers seize and cover the cones from sight.

It is not strange that this lovely little pine is a favorite in cultivation, a long hillside being planted with them like an orchard in the lower end of the experimental grounds at Berkeley. Managers of experimental grounds elsewhere in the state are growing them by the thousand and distributing as desired, for reforesting the foot-hill region, especially where denuded by hydraulic mining. The Narrow-cone Pine is a member of the *Tenaces* group, along with the Monterey Pine, having persistent cones and leaves in threes, but the cone is narrower, pointed, and the scales on the outer side terminate in conical, curved spurs instead of rounded knobs.

Another contrast is found in the characters of the true Nut Pines of the arid interior regions, the cones small, nearly globular, strongly knobbed, and containing large, wingless, oily, and delicious seeds. There are four species; practically but one of them, the Single-leaf Pine (*P. monophylla*), reaches California on the southeastern flanks of the Sierra and on the desert exposures of the San Bernardino Mountains. In early times the nuts of these trees, called Pinyons, then abundant on the hills of Nevada, formed a large part of the aboriginal food, but later the miners and stock men have nearly exterminated the Indian orchards. The Pine Nuts of commerce are the product of another species in New Mexico.



From a painting by Mrs. J. G. Lemmon.

NARROW, OR KNOB-CONE PINE.

Pinus attenuata. Lemmon.

The widest distributed of the Sub-Alpine Pines is the Murray Pine (*P. Murrayana*), often called Tamarack Pine from its resemblance to the Larch or Tamarack of the east. It is one of the Thimble-cone group, with tiny cones and short leaves in pairs, like the North Shore Pine described, with which some botanists classify it. The bark (from a little distance above the base) is exceedingly thin, flaking off in small scales, leaving but an eighth inch of hard bark remaining. In northern regions, where it is called Lodge-pole Pine, it is usually found tolerating the presence of sister trees, so forming dense groves of tall, slender, white stems, suggesting bamboo. Southward in California they occupy almost exclusively the high plateaus. Beautiful groves enliven the scenery of such glacier lakes as Tahoe, Donner, Independence, and Webber, and similar valleys elsewhere emptied of their lakes. The broad, glaciated plateau eastward of Yosemite, upon which arise the Sierra peaks, is mostly covered with this singular pine, interspersed with little sun-filled intervales, where the unaffrighted deer may be seen nibbling the lush autumn grasses and the chattering red squirrel thinks it no intrusion to share the comforts of your camp—likewise its provisions.

Most trees are greatly modified by environment; those growing in the open often branch freely and retaining all the limbs, this behavior being very different from trees of the same species in a dense forest.

A tree of the Murray Pine rioting alone in the moraine soil above Webber Lake was felled to obtain a log specimen for exhibition at the Centennial Fair. It proved to be 300 years old, 123 feet high, 7 feet in diameter,

and with a mass of 360 live, body limbs, many of them 20 feet long, drooping and sweeping the ground.

Three other sub-Alpine pines, more or less abundant on the mountains of the interior Great Basin, reach the eastern slope of the Sierra sparsely near the southern end. They all have short leaves in fascicles of five each, and pendant, oblong cones three to four inches long.

One is the Limber Pine (*P. flexilis*), with slender branchlets, smooth cones, with large, nearly round, wingless seeds; found at a few stations, notably a few trees in Bloody Canyon of Mono Pass, east of Yosemite Valley; also a few trees were discovered only last season by a forest ranger on the north (desert) slope of Mount San Bernardino.

A second species, the Bristle-cone Pine (*P. aristata*), with black bristles half an inch long terminating the cone scales, is sparsely inhabiting several slopes; and the third species, the Fox-tail Pine (*P. Balfouriana*), with long, plumelike limbs, and softer, nearly smooth cones, forms a few high groves near Mt. Whitney; while, very strangely, a few lonely trees fringe the high forest on Mt. Eddy, near Mt. Shasta, 400 miles from its relatives.

THE BRAVE LITTLE ALPINER

Lastly, above them all, on the verge of the timber line,—the upper fringe of the immense forest robe of King Sierra,—are found the few living specimens of a truly Alpine tree, the White-stem Pine (*P. albicaulis*). Depressed to firm platforms flooring the high, narrow, wind-swept passes, or leaning crippled and stunted against the storm-splintered buttresses (or even standing out defiantly, alone), all with bodies short and thick, their

branches maintaining sturdy, milk-white branchlets, proudly erect, and bearing aloft their condensed fascicles of shortened, thickened leaves, half concealing the abbreviated, hardened cones, they strongly appeal to sensitive souls for sympathy.

It is interesting to note in this connection that of all the forest trees, of whatever class or family, on the face of the earth; of all the cone-bearing trees so bountifully bestowed upon California, it is the pine that is endowed with a constitution sufficiently hardy and with organs sufficiently pliable to meet alike the rigorous requirements of existence upon the bleak, inhospitable shores of Alaska and the similarly storm-beaten, but two-miles higher peaks of the Sierra.

Imprisoned in ice and snow for the greater part of the year, the White-stem Pine only has time to breathe, when, for a few weeks, the midsummer sun melts the snow banks, revealing the icicle-decorated heroes uplifting their white-staffed scepters, bright with royal purple gems, as who should say: "We are the strongest trees on earth, the highest expression of arboreal existence, the crown of the world's forests! Leaving relatives behind eons ago, through ages of strenuous endeavor, and despite the rigid repression of the elements, we have battled for this exalted throne. We alone above the worthy and titled individuals of the celebrated forests below are privileged to stand before kings; the heaven-piercing pinnacles of the High Sierra only, are loftier than we."

OTHER PITCH TREES

The rest of the Pitch Trees of the Cone-bearing family are peculiar and easily recognized. The problem is greatly simplified at the outset by the elimination of two genera not found in California, except in cultivation, —the true Cedar (*Cedrus*) and the true Larch or Tamarack (*Larix*).

The other groups, the Spruces and Firs, are represented in abundance in America, and especially in California, by trees often of great size and value. The leaves of both are solitary and short; the cones with thin, flat, unarmed scales.

FEATHER-CONE SPRUCES

If one should be traveling in the mountains of California, and should come upon trees with long, gracefully declining branches, bearing on the outer margins numerous small brown cones, which when open are about the size of a hen's egg, and decorated with long, flat, three-toothed, feather-like bracts, protruding a half inch from between the scales, he might be sure that he was in the regal presence of a Douglas Spruce (*Pseudotsuga taxifolia*). Forming the greater part of the dense forest about Puget Sound, where they become 350 to 450 feet high—the tallest trees in the world—they spread down along the Rocky Mountains and the ranges of California to Arizona. Douglas Spruce (improperly called by lumber dealers "Oregon Pine" and "Red Fir") constitutes the major part of the output of the scores of great mills in the northwest, now the richest lumber region of the world. No tree is more utilized for all pur-

Photo by J. G. Lemmon.

DOUGLAS SPRUCE.

Pseudotsuga taxifolia. Britton.

poses where strong, durable lumber is desired. For building timbers, sleepers, joists, and flooring it is unexcelled. It is exported to all parts of the world for ship timbers, spars, and masts. The stout vessels used for voyaging amidst the ice floes of the Arctic are built from selected Douglas Spruce lumber taken from the butt logs of these trees.

The thousands of piles used so largely for wharves and ferry slips, for building foundations and railroad bridges, the tall flagstaffs erected at recent world fairs, all come from the Douglas Spruce forest of the north.

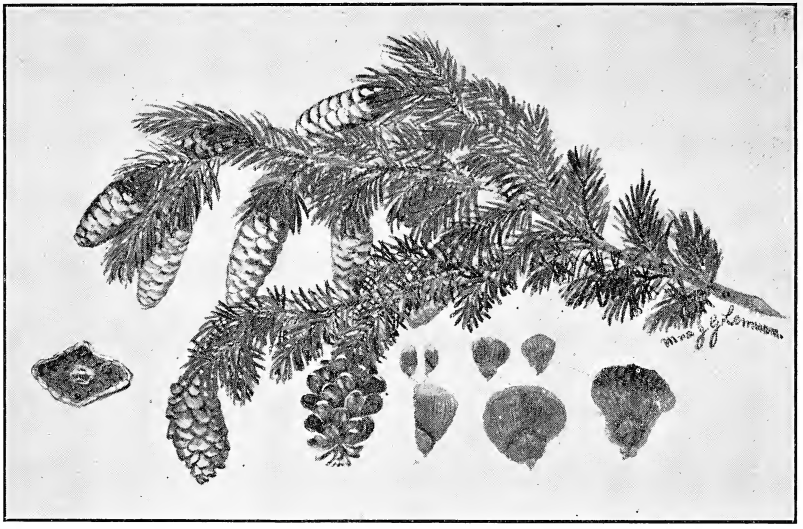
Fine specimens with rounded heads and abundant cones are found on the western end of Mount Tamalpais, near the ocean, and in sight of San Francisco. A very beautiful form, with graceful, weeping branchlets, is found sparsely near Yosemite and northward to near Mt. Shasta.

A second species of this Feather-cone genus of Spruces is the Big-cone Spruce (*Ps. macrocarpa*), growing on the south side of the San Bernardino and connected mountains. The cones, similar in appearance to the Douglas Spruce, are many times larger, six to eight inches long, the largest in the world.

NAKED-CONE SPRUCES

The Naked-cone species of spruce (*Picea*) in California comprise two species also. One, the Tide-land Spruce (*P. Sitchensis*), is abundant northward, and comes down the coast as far as Cape Mendocino. Loving the ocean beach and the interior wet grounds, it often becomes a large tree, remarkable for its beautiful, smooth cones two to three inches long, and for its sharp leaves, wounding the fingers like sewing needles.

The fourth species, the most beautiful of all, would require a special effort to find it, so sequestered and limited is its growth. This



From a painting by Mrs. J. G. Lemmon.

SUB-ALPINE HEMLOCK.

Tsuga Mertensiana. Carriere. (*Ts. Pattoniana.* Engelmann.)

is the newly-discovered Weeping Spruce (*P. Breweriana*), on the western end of the Siskiyou Mountains, in splintered rocks of the summit. Remarkable for its very long, drooping branchlets, two to six feet long, giving the tree the appearance of a weeping willow. This beautiful tree ought to be in cultivation, but efforts to that end thus far have proved unsuccessful.

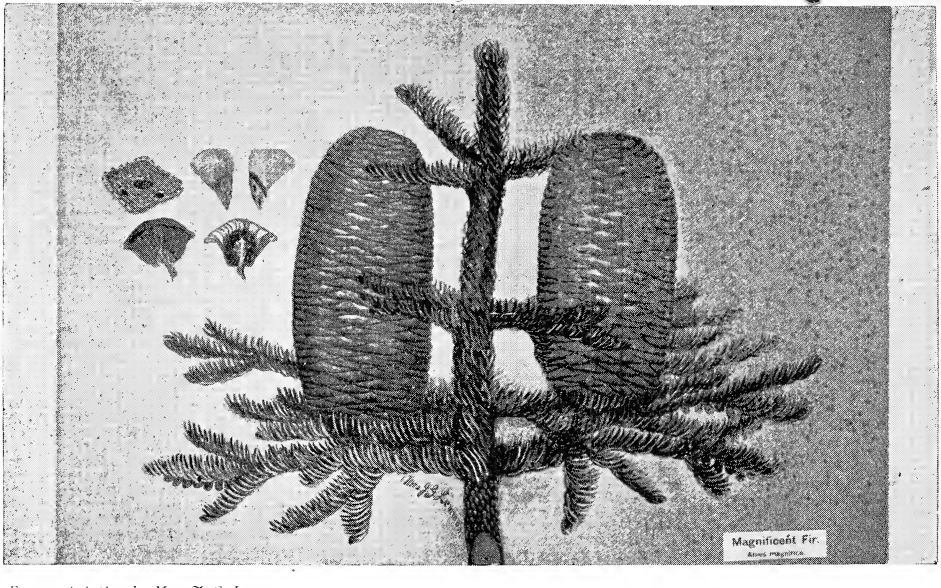
HEMLOCK SPRUCES

Space admits of little more than brief allusions to the lovely Hemlock Spruces (*Tsuga*), one species (*Ts. heterophylla*) in the northern coast counties, with its pea-green, convex sprays of foliage, decorated on the border with brown, ovoid, half-inch cones; the other (*Ts. Mertensiana*), sub-alpine and scattered among the giants from end to end of the Sierra, its exceedingly graceful appearance, with depending branches, clothed with dark-green, tufted foliage, and decorated with large, purple cones one and one-half to two inches long, the largest of the hemlocks. This royal evergreen, sparsely present in every mass of forest in the High Sierra, always claims instant attention and admiration from visitors to the high regions, and not inaptly it is called "Queen of the Sierra."

In concluding this introduction to California spruces the principal points for recognition may be recapitulated, as; spire-like form of tree, with graceful, declining limbs; the cones terminal, dependent, and remaining whole at maturity; leaves solitary and scattered, these characters strongly contrasting with the next group.

THE TRUE FIRS

This, the last family of Pitch Trees to be described, is the most marked in its modes of



From a painting by Mrs. J. G. Lemmon.

MAGNIFICENT, OR RED FIR. *Abies magnifica.* Murray.

growth, and in characters of the cone, of any group in the forests of the Northern Hemisphere, and hence easily detected.

Should the reader, being anywhere in the Northern Hemisphere, see in the forest, even from a distance, a tree perfectly conical in outline, the limbs arising in horizontal circles, the branches often nearly touching each other, forming layers or platforms prim and symmetrical, the broadest layer at the bottom, diminishing in breadth regularly to the top; or should you be able to see only the top of the tree, if you found it bearing cones standing out bold and erect upon the uppermost limbs, you may be sure that you are beholding one of the most interesting of trees, the true Fir (*Abies*). Close examination reveals other characters. The cones at maturity fall to pieces, the scales and seeds sailing away on the wind, leaving the brown axis on the limb to weather away during the next winter. You never find a fir cone on the ground, unless it has been cut off before quite ripe by a squirrel, hence many persons, even lumbermen, are unaware that they bear cones at all. Also, the leaves are peculiar; on young trees and the lower limbs of older ones they are arranged in two ranks, but on the upper, bearing limbs they all turn upward.

The principal points for certain identification of a fir tree are: Prim, regular stratification of the limbs, the cones erect upon the upper limbs, their scales deciduous at maturity, the leaves in two ranks, right and left, along the branchlets of lower limbs.

THE SIX CALIFORNIA FIRS

There are in California six species of fir, four of them becoming large trees. The largest is the magnificent Red Fir (*Abies*

magnifica), often attaining 250 to 300 feet, with a diameter of 8 to 12 feet, by far the largest fir in the world, and the cones, cylindrical and erect, like green parrots perched upon the limbs, are six to eight inches high, the largest fir cones known. Extending from end to end of the Sierra, and mingling with the Giant Sequoia, the Douglas Spruce, and the four kingly pines described, they dominate certain regions of the middle altitudes of the Sierra by sheer force of numbers, giving a fir character to the forest unexcelled for grandeur, enlisting the profound admiration of foreign visitors to the Sierra. The bark of the Red Fir becomes very thick, and, although black outside, it is madder-red within, readily detected when broken, suggesting the name of the tree. The lumber is valued for various purposes.

A closely related species is the Shasta Fir (*A. Shastensis*), large trees clothing the flanks of Mount Shasta and some of the highest peaks on the other end of the Sierra. This tree is particularly distinguished by its higher locality and smaller cones, with broad, feather-like bracts, protruding a half inch or more from between the scales. Soon becoming declined, they nearly conceal the dark green cone with their lighter drapery.

A big brother of these two is the White Fir (*A. Lowiana*), found at lower altitudes, and with small, narrow, naked cones, three to four inches long; bark dark outside, but greenish white within.

A third species is the Lowland Fir (*A. grandis*), a noble tree, abundant in the Puget Sound region, and reaching our coast in the northern counties; cones two and one-half to three inches long; the leaves dark green, and shining above, white lined with minute breathing pores below.

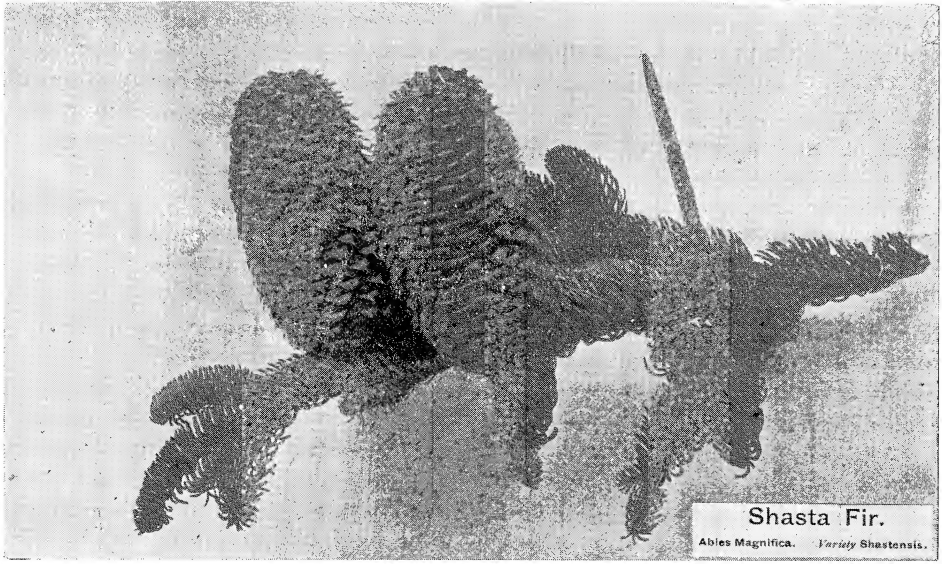


Photo by J. G. Lemmon SHASTA, OR BRACTED RED FIR. *Abies Shastensis.* Lemmon.

In the foot-hills of the southern part of the state are a few trees of the Colorado White Fir (*A. concolor*), with their exceedingly whitened bark, leaves, and cones, otherwise much like the White Fir of California, with which it is classed by some authors.

Last, as well as prettiest, of our firs let us study for a moment the most singular of all our trees, the Needle-cone Fir (*A. venusta*), of the Santa Lucia Mountains, near the south boundary line of Monterey County. It is a tree with its limbs so short that the tree has the appearance of a narrow pinnacle or column, often fifty or more feet high. The cones are oblong, three inches long, the bracts between the scales terminating in strong, sharp needles two inches long, which, curving downward, inclose the cone in a net-like envelope. The leaves, too, are out of the ordinary state, being very long—two inches—and one-eighth inch wide, the largest fir leaves known. Very singularly the locality of this fir was discovered by the earliest explorer of this coast, the indefatigable David Douglas, in 1830; but so deeply secluded are they in the confusing ramifications of the Coast Range, and so steep —almost inaccessible—are the mountain cliffs to which they cling, that few persons have seen these wonderful trees, not above a dozen persons all told, although their home is but a few miles from the populous metropolis of the Pacific Slope, and quite near our two universities, with their thousands of students.

What might have been done at any time all these years was developed last summer, when a botanist of the University of California explored the region thoroughly, and discovered some four new groves, one of them quite extensive, of this exceedingly lovely tree.

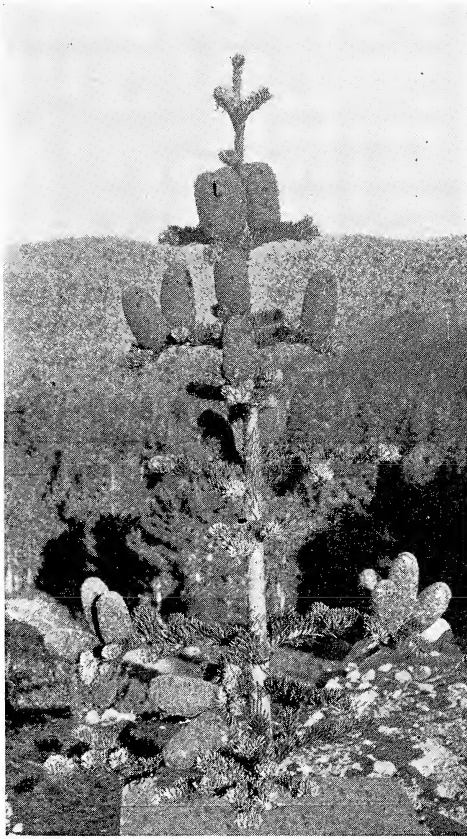


Photo by J. G. Lemmon.

AMABILIS FIR.

Abies Amabilis. Forbes.

CYPRESSES AND THEIR ALLIES

It would require much space to properly point out the characters of the large class of cypress-like trees, with their many genera, all with their leaf and cone structure usually in pairs and opposite, not in spirals and scattered, as in the Pitch Trees described. Their leaves are reduced to mere small scales, triangular and pointed; the cones are small, seldom more than an inch long, the scales in pairs and in alternate series. The timber of all the cypresses is but slightly resinous, and is fragrant, often pungent; includes the two American Cedars, one, the Red Cedar, or Shingle Tree (*Thuya*) of the north, with horizontally flattened, convex sprays of foliage and minute, half-inch, upturned cones, becoming large trees at the north, and extensively manufactured into shingles of the most durable character; the trunks, usually swollen at the base, are apt to be hollow, hence were finely adapted for use by the aborigines in making their canoes.

The other pyramidal, flat-branched, thick-barked tree is the Incense Cedar (*Libocedrus*) of the middle elevations of the Sierra, particularly abundant in and near Yosemite Valley; foliage like the last, but the cones much larger, yellowish, and pendant from the ends of the fan-like, usually horizontal sprays, the two larger concave scales facing each other and holding the four seeds; the timber is very fragrant and quite durable, hence much used for fence posts.

The true Cypress (*Cupressus*) has four species in California, all distinguished by globular and very knobby cones. But two species need be mentioned. One, the Law-

Photo by J. G. Lemmon.

INCENSE, OR POST CEDAR.

Libocedrus decurrens. Torrey.

son Cypress (*C. Lawsoniana*), is one of the prettiest trees known for lawns and parks, and very popular. A small grove is indigenous to the head-waters of the Sacramento River, near Mount Shasta, but the headquarters are around Coos Bay, Oregon, giving it the name of Port Orford Cedar. Its lumber is in great demand for interior finishing, cabinet work, etc. Distinguished by its graceful form, its foliage in flattened, convex sprays, and its numerous little cones the size of a garden pea.

The other noted Cypress (*C. macrocarpa*) is native to Cypress Point, on the Monterey Coast, where the ocean storms flatten and sculpture their dense, dark-green foliage in terraces, or completely prostrate the tree. A favorite tree for making hedge rows or wind-breaks; cones the largest of the genus, often over an inch long, with prominent bosses or knobs.

Descending to the lowest, earliest stage of development, we find the Junipers (*Juniperus*) with only minute scales for leaves, and for fruit a small, closed berry, with only vestiges of the scales, and juicy with turpentine, the well-known Juniper Berry. One species (*J. occidentalis*) growing up in the High Sierra becomes quite a large, round-headed tree of great age. Another (*J. Californica*) is a degraded, unnecessarily sprawling shrub, found on the plains and slopes of southern California.

What a world of arboreal development between this tardy Juniper and the perfected, colossal, royal Sugar Pine, described,—the king of the Pine Tree clan!

Photo by J. G. Lemmon.

MONTEREY CYPRESS.

Cupressus macrocarpa. Hartweg.

CONSPECTUS

PACIFIC SLOPE CONE-BEARERS.

FASCICULARES, Leaves in bundles.

THE PINES, *Pinus*, Tournefort.

WHITE-WOOD PINES.

1. Sugar Pine.	*P. Lambertiana*, Douglas.
2. Silver Pine.	*P. monticola*, Douglas.
3. Mexican Pine.	*P. strobiformis*, Engelm.
4. Rocky Mt. Pine.	*P. flexilis*, James.
5. Alpine Pine.	*P. albicaulis*, Engelm.

PLUME-BRANCHED PINES.

6. Balfour Pine.	*P. Balfouriana*, Murray.
7. Bristle-cone Pine.	*P. aristata*, Engelm.

TRUE NUT PINES.

8. Single-leaf Pine.	*P. Monophylla*, Torr. and Frem.
9. Mexican Pinon.	*P. cembroides*, Zucc.
10. New Mexican Pinon.	*P. edulis*, Engelm.
11. Parry Pine.	*P. quadrifolia*, Parry.

BROKEN-CONE PINES.

12. Western Yellow Pine.	*P. ponderosa*, Lawson.
13. Rocky Mt. Yellow Pine.	Variety *scopulorum*, Engelm.
14. Jeffrey (or Black) Pine.	*P. Jeffreyi* "Ore. Com."
15. Arizona Yellow Pine.	*P. Arizonica*, Engelm.
16. Mayr's Pine.	*P. Mayriana*, Sudworth.
17. Apache Pine.	*P. Apachcca*, Lemmon.

THIMBLE-CONE PINES.

18. North Shore Pine.	*P. contorta*, Loudon.
Pigmy Pine.	Variety *famelica*, Lemmon.
19. Tamarack Pine.	*P. Murrayana*, "Ore. Com."
20. Lodge-pole Pine.	Variety *tenuis*, Lemmon.

HEAVY-CONE PINES.

21. Big-cone Pine.	*P. Coulteri*, Don.
22. Gray-leaf Pine.	*P. Sabiniana*, Dougl.
23. Torrey (or Lone) Pine.	*P. Torreyana*, Parry.

PERSISTENT-CONE PINES.

24. Monterey Pine.	*P. radiata*, Don.
25. Narrow-cone Pine.	*P. attenuata*, Lemmon.
26. Swamp-loving Pine.	*P. muricata*, Don.
27. Chihuahua Pine.	*P. Chihuahuana*, Engelm.

TUFT-LEAVED TREES

TRUE LARCHES, *Larix*, Link.

1. Western Larch.	*L. occidentalis*, Nuttall.
2. Woolly Larch.	*L. Lyallii*, Parlat.

SOLITARES, Single-leaved Trees.

PENDENTES, Pendent fruited Trees.

TRUE SPRUCES, *Picea*, Link.

1. White Spruce.	*P. laxa*, Sargent.
2. Blue Spruce.	*P. pungens*, Engelm.
3. Engelmann Spruce.	*P. Engelmanni*, Engelm.
4. Tide-land Spruce.	*P. Sitchensis*, Carriere.
5. Weeping Spruce.	*P. Breweriana*, Watson.

HEMLOCK SPRUCE, *Tsuga*, Carriere.

1. Western Hemlock. *Ts. heterophylla*, Sargent.
2. Sub-alpine Hemlock. *Ts. Mertensiana*, Carriere.
3 Hooker Hemlock. Variety *Hookeriana*, Lemmon.

FEATHER-CONE SPRUCES, *Pseudotsuga*, Carriere.

1. Douglas Spruce *Ps. taxifoli* , Britton.
Cork-bark Spruce. Variety *suberosa*, Lemmon.
2 Big-cone Spruce. *Ps macrocarpa*, Lemmon.

ERECTES, Upright-fruited Trees.

THE TRUE FIRS, *Abies*, Link.

NORTHERN FIRS, OREGON, WASHINGTON, ETC.

1. Noble Fir. *A. nobilis*, Lindley.
2. Amabilis Fir. *A. amabilis*, Forbes.
3. Lowland Fir. *A. grandis*, Lindley.
4. Alpine Fir. *A. lasiocarpa*, Nuttall.

CALIFORNIA FIRS.

5. California White Fir. *A. Lowiana*, Murray.
6. Magnificent (or Red) Fir. *A. magnifica*, Murray.
7. Shasta Red Fir. *A. Shastensis*, Lemmon.
8. Needle-cone Fir. *A. venusta*, Koch.

EASTERN AND SOUTHERN FIRS.

9. Colorado White Fir. *A. Concolor*, Parry.
10. Arizona Cork Fir. *A. Arizonica*, Merriam.

TAXODIADS, *Sequoia*, Endlicher.

1. Coast Redwood. *S. sempervirens*, Endlicher.
2. Sierra Big Tree. *S. Washingtoniana*, Sudworth

CYPRESSES AND THEIR ALLIES.

ARBORVITÆ, *Thuya*, Linn.

1. Pacific Red Cedar. *T. plicata*, Lambert.

INCENSE CEDAR, *Libocedrus*, Endlicher.

1 Incense or Post Cedar. *L. decurrens*, Nuttall.

FLAT-BRANCHED CYPRESS, *Chamæcyparis*, Spach

1. Alaska Cypress. *Ch. Nutkatensis*, Spach.
2. Lawson Cypress. *Ch Lawsoniana*, Porlat.

TRUE CYPRESS, *Cupressus*, Lindley.

1. Monterey Cypress. *C. macrocarpa*, Hartweg.
2. North Coast Cypress. *C. Goveniana*, Gordon.
3 McNab's Cypress. *C. Macnabiana*, Murray.

SOUTHERN CYPRESSES.

4. Guadaloupe Cypress. *C. Guadaloupensis*, Watson.
5 Arizona Cypress. *C. Arizonica*, Greene.
6 Lemmon Cypress. *C. bonita*, Lemmon.

THE JUNIPERS, *Juniperus*, Linn.

1 Western Juniper. *J. occidentalis*, Hooker.
2. California Juniper. *J. Californica*, Carriere.
3 Great Basin Juniper. *J. Utahensis*, Lemmon.
4 Rocky Mt. Juniper. *J. scopularum*, Sargent.
5 Wyoming Juniper. *J. Knightii*, Aven Nelson.
6 Southern Juniper *J. monosperma*, Sargent.
7 Alligator Juniper. *J pachyphlœa*, Engelm.

TAXADS, THE FIRS

TRUE YEW. *Taxus*, Linn.

1 Pacific Yew *T brevifolia*, Nuttall.

FALSE NUTMEG. *Tumion*, Rafinesque

1 California Nutmeg. *T Californicum*, Greene.

ELEMENTS OF FORESTRY

WITH SUGGESTIONS.

The object of Forestry is not to preserve intact the virgin forests, and thus deprive man of the use of its products, such as wood required for fuel, the making of charcoal, building of vessels, houses, carriages, fences, etc., its use for railroad ties, telegraph poles, mining purposes, bark for tanning, and the manufacture of numberless large and small wares for the use and convenience of man. It designs to teach the best way to glean rich and ample harvests of lumber, or even to remove large areas of forests where the lands are fertile, accessible, and well adapted to agriculture, for clearing of roads, for the laying out of towns and cities.

Its design is to protect and save the bounteous rainfall by maintaining the forests on high mountain slopes, because the rainfall is greatest there—there the rivers take their rise. Remove the forests, and the waters drain off so rapidly that dangerous floods occur, causing avalanches and mountain slides, sweeping everything before them, taking away vast quantities of the real forest floor, leaving an irreparable, barren, rocky waste, a menace to man and beast, causing more frequent, earlier, and heavier frosts, droughts, sudden changes in temperature, severe hail-storms—all working constant injury to the diligent bread-winner on the lower levels. The people of California may take a hint from the interest in forestry in the east. There is seldom a lack of rainfall there, and nature provided it

with an abundance of timber. Settlement has cleared off a great deal of the wood. The consequence is that water runs off so fast as to cause disastrous floods in many localities. Many people will remember the tragedy of Johnstown, Pa., in May, 1889, when thousands of lives were lost by the giving way of the dam from the rush of waters. "The Johnstown Water Company has bought the watershed of the Conemaugh Creek, and propose to replant in forest trees so that it will not pour down devastating floods. The government will furnish the expert work, and perhaps some of the material for reforesting the region."

Again, forestry designs to show that the reckless denuding of forests by contractors and lumbermen, wood choppers and fire-fiends, can by proper and fair means be avoided.

Forestry teaches how to plant and cultivate trees, the suitable trees for reforesting and for ornamental purposes; the particular species of trees adapted to certain kinds of soil and elevation; it points out the enemies to tree growth, both animate and inanimate, and how to get rid of them.

Forestry stimulates patriotism—regard for country and laudable pride that it be adorned in its richest garments for use and beauty.

It is the duty of all patriotic women as well as men to assist in awakening an interest in this saviour of the country if we would not be held responsible for its weakness and decadence.

"Why should woman be interested in the subject of forestry?" has been asked. Why should she not be interested in forestry, since she enjoys the benefits with man and suffers with him in the loss of the trees?

Women can exert the most powerful influence to advance this noble work by becoming well versed in the subject. A preparation

must come through study if women hope to effect anything worthy their effort.

Let us learn something about trees—how they grow; the names of different species as an introduction to becoming better acquainted, especially those that clothe the high mountain slopes, where grand forest trees have room to lift up their protecting branches above the little springs and rivulets—then follow the different families of trees to the lower levels and out upon the plains; learn not only their names, but all possible about them, their habits of growth, how they mature their fruit, their simple needs, etc. A close acquaintance will ripen into a real, not affected, love, and when we become really intelligent tree-lovers, we shall more and more desire their protection, seeking it most earnestly in every possible way, exerting our influence in their behalf with voters, tax-payers, owners of forests, wood-cutters, lumbermen, and lumber merchants,—all, in fact, who have to do with the grand forests in any way.

DESTRUCTION OF FORESTS.

Forests have been unwisely removed or destroyed from several large regions of the old world, notably in Italy, the Spanish Peninsula, France, portions of Germany, and the two Scandinavian Peninsulas. These regions were once clothed with dense forests of large trees.

"If nature is let alone, she will cover any portion of the earth, where vegetable life is possible, with the particular kinds of vegetation best fitted to grow under the existing conditions of soil, heat, light, and moisture," writes an eminent authority. But nature is not allowed to do her normal work unhindered. Many conditions and objects are inimical to the growth of trees, such as parasites and

epiphites (which might be denominated inanimate tramps), insects and animals, but chiefly man himself.

It is a pitiful story, that of the destruction of the forests of Spain. Madrid, its capital, was located on a beautiful plateau in the midst of a magnificent forest, well watered by large and numerous fresh-water lakes. The Spaniard, however, does not love trees, in fact, seems to hate them, seizing every opportunity to destroy them. The consequence is that the Madrid of to-day is a magnificent city, to be sure, but situated on a hot, parched, and barren waste. almost a desert, its lakes long since dried up, the springs, once in adjoining hills, exhausted, the water supply obtained at great cost from their distant Sierras. Other cities of southern Europe, through thoughtless deforestation, are nearly as badly off, owing to lack of shade and water.

The Spanish explorers of the western continent brought with them the bad custom of tree-destruction. The original city of the Montezumas was situated like Madrid in a lovely, picturesque, well-watered forest on the plateau of Anahuac. The Spaniards located their capital, Mexico, on the same site, and began at once the destruction of its surrounding forests, and a second Madrid is the result. (The writer has seen in Arizona the Mexican turn off the trail and ride out several yards to strike his hatchet into a tree or cut down a young sapling wantonly. A Mexican seldom plants a forest tree.)

California is quite like Italy as regards latitude, and is sometimes called New Italy, with its sunny, blue skies and equable climate. The effect from the destruction of Italy's forests should sound the note of alarm. Ignore the subject as we may, the loss of the forests has a retroactive effect upon the people, and

the climatic conditions best suited for the growth of the trees are also best suited for the growth and development of man. It is noteworthy that, in countries where forests have been laid waste without renewal by man or nature, the inhabitants have gradually deteriorated.

RESTORATION OF FORESTS.

Several governments of Europe, taking the alarm, have attempted to check wanton destruction, and have set about reforesting. The expense at the beginning is enormous, but already several distinct forests are so well managed that they are yielding a good government revenue.

America's lesson in economics should be that it is far better to save forests, especially at the headwaters, far up on the mountains, on middle slopes, and lower levels; to judiciously regulate the removal wherever necessary, than for the government at length to set about the task of reforesting. Where our government has, in times past, sold and almost given away thousands of acres of forest lands, it should condemn and repurchase, and what she still holds she should zealously guard as a sacred trust for her future well-being.

In an address by Dr. Gifford Pinchot, he declared that, in order to develop a well-sustained forestry policy, much depends upon the work of educated specialists, and in it the specialists need to be supported by an intelligent public sentiment. Now, this intelligent public sentiment must come first through certain lines of study, already referred to.

Forestry is fast gaining the attention of the people, and none too soon, for the logger, shake-maker, and millmen have long been at work unhindered.

The whole people should be aroused and en-

listed in the cause of forest-saving, of wise, judicious tree cutting, and the establishment of a proper forest policy by the states. First become well informed upon the subject, then help to educate others.

The various Federation clubs might devote an afternoon occasionally to the subject of forestry, taking up for discussion or study some specified topic through a given paper or lecture. The clubs might give assistance to municipal officers in developing taste in regard to planting trees in parks and along streets; they might influence legislators to urge the general government to retake possession of the great forests of the country; they might arrange for holding meetings at the centers of population to be addressed by competent speakers, preferably specialists in forestry; they might recommend the procurement of books upon forestry for close study of the trees, their names, habits, and value.

Teachers might introduce, in nature studies, talks upon trees, and during the children's walks to and from school the receptive mind and quick eyes of the child would discover much about the habit and growth of trees by the wayside.

The observance of Arbor Day should be encouraged by the planting of one tree by each child at specified places, when the locality is favorable or convenient, and cause it to grow. The child keeps watch and guard over the pet tree, waters and nurtures it, and so learns while young more intimately the needs and designs of forestry.

To study and gain a familiar knowledge of the trees of our country is to hold the key to the treasures of field and wood.

Mrs. J. G. Lemmon,
Chairman of the Committee on Forestry
for the California Federation of Women's Clubs.

Books and publications suggested for use in the study of Forestry. By the Forestry Committee of the California Federation of Women's Clubs.

Mrs. J. G. Lemmon, Chairman.

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