THE SEQUOIAS

Many millions of years ago, when the present coal deposits existed in the form of dense, luxuriant vegetation, representatives of the trees we now call "sequoias" were thriving among the tree ferns and palms of that period. As the climatic conditions of the earth changed, the sequoia came to be one of the predominating trees in the Northern Hemisphere. This fact has been definitely determined by the discovery of sequoia fossils in New Jersey, Connecticut, North Dakota, Montana, Arizona, Greenland, France, Germany, Western Europe, Siberia, Alaska, and Australia.

Due to the Ice Age, and other radical changes in the topography and climate of the earth, the sequoias gradually became more and more restricted in their range until, so far as human knowledge was concerned, these trees were non-existent. That is, they were non-existent until 1769, when the Portola expedition of Spanish explorers landed upon the shores of California near Monterey Bay. At that time Father Crespi noted in his diary, under date of October 10, 1769, "as we knew not the names of the trees we gave them that of the color of the wood, Palo Colorado". Thus, for the first time, the name Redwood was applied to these new and wonderful trees.

In 1794, an English botanist collected specimens of the redwood and sent them to England. The tree, however, was not classified until 1823, when the English botanists determined it to be an evergreen species of Taxodium, Bald Cypress, which is a genus of deciduous cone-bearing trees. The tree was consequently called Taxodium sempervirens, Evergreen Bald Cypress - "sempervirens" meaning "ever living".

This name persisted until 1847, when Stephen Endlicher, An Austrian botanist, decided this tree was not a Bald Cypress, but instead an entirely new genus. Endlicher was a linguist as well as a botanist, and through his studies of languages had learned of the remarkable Indian alphabet prepared by the Cherokee Indian, Sequoyah. This botanist apparently thought that the unusual Redman should be honored by having his name applied to the great red tree - both of which were products of the same little known continent. The new tree was, as a result, named Sequoia sempervirens. This classification was accepted by other botanists. The tree also became commonly known as the Redwood.

Because of their proximity to the coast, it was natural that the sempervirens should be the first sequoias discovered. As settlement extended further inland, people came into contact with other large trees that resembled those of the coast but were much larger. The earliest record of these trees was dated 1839, when the Joseph R. Walker exploration party made a journal entry concerning them. In 1852, A. T. Dowd, a hunter, discovered the upper Calaveras Grove while tracking a wounded grizzly bear.

The discovery of this new species of red-barked tree seemed to arouse greater excitement among botanists than had the discovery of the coast species. The English botanists, deciding it was of an unclassified genus, and waxing patriotic, called it Wellingtonia gigantea. The American botanists, determining it as a new species of Bald Cypress, and being equally patriotic, applied the name Taxodium washingtoniana. The controversy was eventually settled by a French botanist, who determined it to be another species of Sequoia, and called it Sequoia gigantea. This name has been universally accepted by all botanists except a few English botanists and an American, O. B. Sudworth, the latter of whom in his publications uses Sequoia washingtoniana. The former name, however, through popular choice is generally used. The second Sequoia was at first spoken of as the "Mammoth Tree", but is now commonly called the "Big Tree".

The Sequoia gigantea is restricted in its range to the west slope of the Sierra Nevada of California, between the elevation of 4600 feet and 8000 feet; and extends fromPlacer County, on the north, to Tulare County on the south. Within this 250 mile strip, the trees occur in isolated groups called "groves". Within the groves the Sequoia is always growing with Sugar pine, Yellow pine, Incense cedar, and White fir, all of which are typical Sierran forest trees. There are approximately seventy-six groves of Sequoia gigantea, which are distributed through their range as follows:

Placer County	-	1	Grove
Calaveras "	-	1	"
Tuolumne "	-	2	"
Mariposa "	-	2	"
Madera "	-	2	"
Fresno "	-	9	"
Tulare "	-	59	"

The above tabulation clearly indicates that the southern part of the sequoia range supports the greatest number of Big Trees. This massing in the south may be due to greater glacial activity in the northern part of the range during the Ice Age. Twenty-nine of the groves are in Sequoia National Park.

The coast species are restricted to the summer fog belt of the Coast Range from the Santa Lucia Mountains north to the most southwestern corner of Oregon. Within their range these trees form a belt 450 miles long and between one to forty miles wide. The maximum elevation is usually about 1,000 feet. Although the coast sequoia occurs along the Pacific Coast, the tree does not grow where it is exposed to the cold sea breezes.

This wide difference in habitat between the sequoias of the Coast and Sierra results in a great difference in growing conditions. On the Coast the climate is very mild and moist, so that the sequoia grows amid dense and luxuriant vegetation. Because of these advantageous growing conditions it develops very rapidly and is, as a result, one of the fastest growing of all our timber trees.

The Sierran tree thrives under conditions in which the species of the coast could not exist. In the Sierra, the winter climate is cold, with deep snow. In the summer, there are between three and four months of warm, nearly rainless days - a condition which the Coast Redwood very probably could not survive. On the other hand, the Big Tree, being accustomed to more severe growing conditions, would very likely thrive in the moist, mild habitat on the coast.

Botanically, there also is a wide difference in the Coast and Sierra sequoias. The Sierra species, which will be considered first, average about 275 feet in height, but occasionally taller trees are found. The tree commonly attains a diameter of twenty-five feet, and frequently grows to a size of over thirty-feet. The roots supporting this great bulk do not penetrate downward much more than six feet, but laterally may reach out 200 to 300 feet. This lateral spread, however, varies with the age of the tree and with soil conditions; occasionally roots lay so close to the surface that a part of their length is exposed.

Although a thickness of more than twenty-four inches is known, the Big Tree bark is usually between two to twelve inches thick; and on the mature trees is so deeply fissured as to give the trunk the appearance of an immense fluted column. The rich, brownish red coloring sometimes takes on a faint purplish sheen - particularly on the young trees, as Big Trees are judged, where the bark is exposed to sunlight and weathering. The soft, fibrous, almost stringy, consistency of the bark appears to be a rather imperfect protection for so rugged a body. Nevertheless, it is so well adapted for its function that it has no doubt contributed greatly in enabling the Big Tree to resist the ravages of fires and insects. As an additional protection, the bark is almost asbestos-like in its resistance to fire, and probably because of a high tannin content is repelling to insects.

The wood of Sequoia gigantea is a salmon pink to a rich, dark maroon, but turns very dark when weathered. It is soft and so brittle that it breaks off transversally with almost no splintering. Although very soft, the heartwood is practically invulnerable to decay and insect attacks, as it, like the bark, contains tannin. Because of this durability, fallen trees lay upon the ground for centuries without showing appreciable signs of decay, except for a gradual rotting of the sapwood, which is not so lasting as the heartwood. The almost complete lack of pitch causes the wood to burn rather slowly, compared to most conifers. This quality, together with the resistance to decay and insects, has made possible the continued existence of the sequoia despite numerous devastating forest fires. The tree seems equipped by Nature to endure as an individual and as a race for thousands of years.

In foliage, the Big Tree somewhat resembles the Incense cedar, except that the Big Tree twigs and leaf sprays are round instead of flattened, as in the cedar. The leaves of the Sierra Sequoia are one-quarter to one-half inch long, and are attached to the stem like closely arranged, sharp pointed scales. The flowers are catkins, of which the

staminate (male) and ovulate (female) are borne on the same stem. In early spring the pollen, which is wind disseminated, is often so abundant as to color the snow a rich yellow. The tree may produce fertile seeds after it is about seventy-five years of age and throughout its life.

Two years are required for the cones of the Big Tree to mature. These are from two to three inches long, and rather roughly egg-shaped. The scales are woody and remain attached to the cone. When mature, the cone is bright green, but as it ripens becomes brown in color, and the spaces between the scales open up to liberate the seeds. These tiny germs of Sequoia life are about the size and shape of a flake of rolled oats. There are about 200 seeds in a cone, and they are so light that from seventy-five thousand to one hundred thousand are required to weigh a pound.

Between the scales, with the seeds, is a purple crystalline substance that is particularly characteristic of the sequoia cone. The value of these crystals to the cones or the seeds is not definitely known, although chemical analysis has shown them to be almost pure tannin. When dissolved in water, they form a purplish ink or dye. Experiments conducted by Walter Fry indicate that seeds soaked in this solution retain their fertility longer than unstained seeds.

As hundreds of cones are produced by the mature trees, the profusion of seed production should result in abundant young growth. The contrary, however, is actually the case, because the seeds - although quite high in fertility - in order to sprout must fall upon soil perfectly suited for germination. Under ordinary conditions, there is a very remote possibility of the seeds sprouting, because the forest floor is covered with a deep layer of forest litter which prevents the wafer-like seed from reaching the soil beneath. If the soil beneath the litter is exposed by fire, uprooted trees, or clearing, Big Tree reproduction often comes in very thickly.

The Big Tree reproduces only from seed.

The Redwood of the Coast Range attains an average height greater than that of the Sierra species, and may reach 350 feet. In diameter, however, the Big Tree averages much larger than the Coast species, as the latter seldom grows larger than sixteen feet through the base. This difference in size indicates a divergence in age, as the Redwood, although reaching over two thousand years, does not attain the hoary life span of four thousand, as does the Big Tree.

Texture and general appearance of the bark of the two species is quite similar, but the Coast Redwood is more distinctly brown. Resistance to fire is a joint characteristic. The wood of Sequoia sempervirens is nearly the same in color and durability as the gigantea, but is not so brittle - hence better adapted for lumber.

In external appearance the most conspicuous difference in the two species is in the foliage. The leaves of the Coast Redwood are arranged along both sides of the stems so as to form flat sprays quite similar to the leaf arrangement of the white fir. The Redwood leaves are darker green, more sharply pointed, and somewhat stiffer than the fir leaves. The new growth tips of the Coast sequoia foliage occasionally resemble the general leaf arrangement of the Sierra tree.

The flowers of the Sequoia genus are similar, but the cones of the Coast Redwood mature in one year and are one-quarter to one-half as large as the Big Tree cones. Seeds of both species are similar except those of the Coast tree are darker and smaller than those of the Sierran species.

Reproduction takes place by seeds and root-crown sprouts. The Coast Redwood is one of the few strictly coniferous trees that have the habit of sprouting to any marked degree. When a Coast tree is felled, young trees sprouting from the roots of the stump form a circle which loggers call a "goose nest". The Big Tree does not sprout.

Because the sequoia was at one time a predominating tree of the Northern Hemisphere, and is now restricted to a very limited range in California, it is generally supposed to be a vanishing species. However, considering the phenomenal age of the tree and the present gradual changes in the crust of the earth, the sequoia may be destined to extend as far into the future as it has into the past. Even if the Sequoia should disappear from California, the genus may continue to exist in other parts of the world, because man is rapidly introducing it into other climates. New Zealand, particularly, is becoming a new home for the Coast Redwood through the planting of hundreds of pounds of seeds. That far off country has a climate ideally suited for Redwood growth, so that, because of its high lumber value, the Coast Sequoia is being rapidly established on the other side of the "globe". Rather than being a disappearing race, the sequoia may once more, through the efforts of man, become a widely distributed tree.

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