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BULLETIN No. 28.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF FORESTRY.
GIFFORD PINCHOT, Forester.

A SHORT ACCOUNT

OF

THE BIG TREES OF CALIFORNIA.

Prepared in the Division of Forestry.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Division of Forestry,
Washington, D. C., July 28, 1900.

Sir: I have the honor to transmit herewith a report entitled "A Short Account of the Big Trees of California," and to recommend that it be issued as Bulletin No. 28 of this Division.

This report was prepared in accordance with your reference of Senator Hansbrough's letter of April 25, 1900, and has been transmitted to Congress and printed as Senate Document 393, Fifty-sixth Congress, first session.

The original purpose of this report was to furnish information to the Senate Committee on Public Lands, then considering the preservation of the Calaveras and Stanislaus Big Tree groves. Since there is extant no other succinct account of these mammoth trees, it is deemed advisable to issue this publication as one of the regular series of bulletins of the Division of Forestry. A more detailed account of the Big Trees is in preparation by Prof. W. R. Dudley, of Stanford University, a collaborator of this Division, to whom is due the valuable information in this bulletin upon the location and ownership of Big Trees in Fresno and Tulare counties.

Respectfully,

Gifford Pinchot,
Forester.

Hon. James Wilson,
Secretary.

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SUMMARY OF FACTS ABOUT THE BIG TREE.

1. The dimensions of the Big Tree are unequaled.
2. The age of the Big Tree makes it the oldest living thing.
3. The majestic beauty of the Big Tree is unique and world-renowned.
4. It now exists only in ten isolated groves on the west slope of the Sierra Nevada Mountains, and nowhere else in the world.
5. The Mariposa Grove is to-day the only one of consequence which is completely protected.
6. Most of the scattered groves of Big Trees are privately owned, and therefore in danger of destruction.
7. Lumbering is rapidly sweeping them off; 40 mills and logging companies are now at work wholly or in part upon Big Tree timber.
8. The southern groves show some reproduction, through which there is hope of perpetuating these groves; in the northern groves the species hardly holds its own.
9. The Big Tree and the smaller Coast Redwood represent a surviving prehistoric genus of trees (the *Sequoias*) once widely distributed over the globe.

A SHORT ACCOUNT

OF

THE BIG TREES OF CALIFORNIA.

INTRODUCTION.

Before the glacial period the genus of big trees called Sequoia flourished widely in the temperate zones of three continents. There were many species, and Europe, Asia, and America had each its share. But when the ice fields moved down out of the north the luxuriant vegetation of the age declined, and with it these multitudes of trees. One after another the different kinds gave way, their remains became buried, and when the ice receded just two species, the Big Tree and Redwood, survived. Both grew in California, each separate from the other, and each occupying, in comparison with its former territory, a mere island of space. As we know them now, the Redwood (*Sequoia sempervirens*) lives only in a narrow strip of the coast ranges 10 to 30 miles wide, extending from just within the southern border of Oregon to the bay of Monterey, while the Big Tree (*Sequoia washingtoniana*) is found only in small groves scattered along the west slope of the Sierra Nevada Mountains, from the middle fork of the American River to the head of Deer Creek, a distance of 260 miles. The utmost search reveals but ten main groups, and the total number of sizable trees in these groups must be limited to figures in the thousands. It is, moreover, the plain truth that all the specimens which are remarkable for their size do not exceed 500.

The Big Trees are unique in the world—the grandest, the largest, the oldest, the most majestically graceful of trees—and if it were not enough to be all this, they are among the scarcest of known tree species and have the extreme scientific value of being the best living representatives of a former geologic age. It is a tree which has come down to us through the vicissitudes of many centuries solely because of its superb qualifications. Its bark is often 2 feet thick and almost noncombustible. The oldest specimens felled are still sound at the heart, and fungus is an enemy unknown to it. Yet with all these means of maintenance the Big Trees have apparently not increased their range since the glacial epoch. They have only just managed to hold their own on the little strip of country where the climate is locally favorable.

At the present time the only grove thoroughly safe from destruction is the Mariposa, and this is far from being the most interesting. Most of the other groves are either in process of, or in danger of, being logged. The very finest of all, the Calaveras Grove, with the biggest and tallest trees, the most uncontaminated surroundings, and practically all the literary and scientific associations of the species connected with it, has been purchased recently by a lumberman who came

into full possession on the 1st of April, 1900. The Sequoia and General Grant National parks, which are supposed to embrace and give security to a large part of the remaining Big Trees, are eaten into by a sawmill each, and by private timber claims amounting to a total of 1,172.87 acres. The rest of the scanty patches of Big Trees are in a fair way to disappear—in Calaveras, Tuolumne, Fresno, and Tulare counties, they are now disappearing—by the ax. In brief, the majority of the Big Trees of California, certainly the best of them, are owned by people who have every right, and in many cases every intention, to cut them into lumber.

GENERAL FACTS.

First Grove Discovered.

The Calaveras Grove was the first one discovered, having been found in 1841 by John Bidwell, afterward candidate for member of Congress from California. But for some reason this discovery seems to have been generally credited to another person, as shown by the following story quoted from "In the Heart of the Sierras," by J. M. Hutchings:

In the spring of 1852, Mr. A. T. Dowd, a hunter, was employed by the Union Water Company, of Murphy's, Calaveras County, to supply the workmen engaged in the construction of their canal with fresh meat, from the large quantities of game running wild on the upper portion of their works. While engaged in this calling, having wounded a grizzly bear, and while industriously pursuing him, he suddenly came upon one of those immense trees. * * *

Returning to camp, he there related the wonders he had seen, when his companions laughed at him, and even questioned his veracity. * * *

For a day or two he allowed the matter to rest; submitting, with chuckling satisfaction, to their occasional jocular allusions to "his big tree yarn," but continued hunting as formerly. On the Sunday morning ensuing, he went out early as usual, but soon returned * * * when he exclaimed, "Boys, I have killed the largest grizzly bear that I ever saw in my life. While I am getting a little something to eat, you make every preparation for bringing him in; all had better go that can be spared, as their assistance will certainly be needed."

Nothing loath, they were soon ready for the start. * * * On, on they hurried, with Dowd as their guide, through thickets and pine groves; crossing bridges and canyons, flats, and ravines, each relating in turn the adventures experienced, or heard of from companions, with grizzly bears, and other formidable tenants of the mountains, until their leader came to a halt at the foot of the immense tree he had seen, and to them had represented the approximate size. Pointing to its extraordinary diameter and lofty height, he exultingly exclaimed, "Now, boys, do you believe my big tree story? That is the large grizzly I wanted you to see. Do you now think it a yarn?"

Discovery of Other Groves.

Just how and when the other groves of Big Trees were found is difficult to determine. As early as 1864 Professor Brewer, of Yale, and a party from the California Geological Survey visited the Calaveras and Mariposa groves and also several tracts in the region of Kings River, and by 1870 the majority of Big Trees had been located.

The following account of the different groves, which is in the main accurate and complete, is taken from J. D. Whitney's "Yosemite Guide-Book" (1870):

General Description and Location of Big Tree Groves.

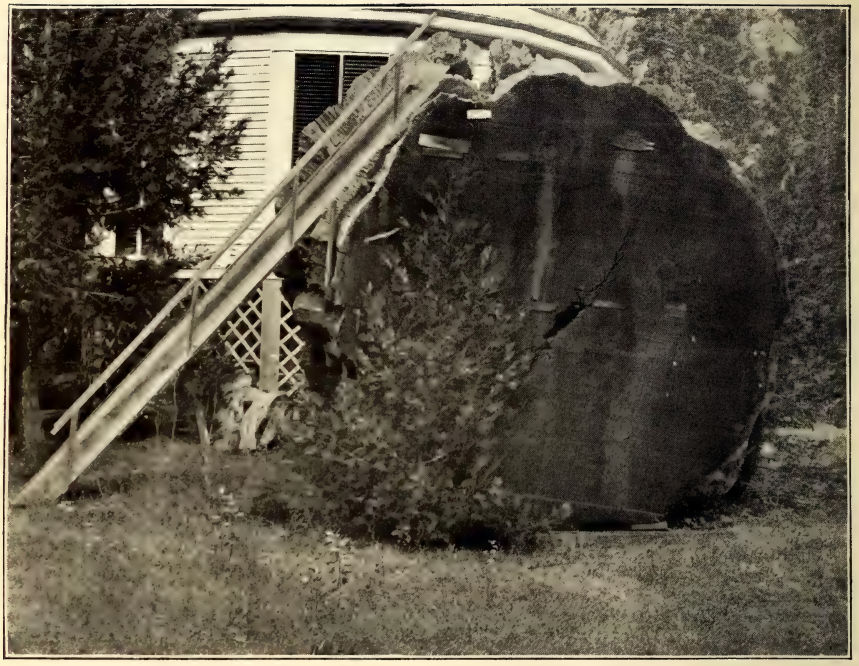
The Big Tree occurs exclusively in "groves" or scattered over limited areas, never forming groups by themselves, but always disseminated among a much larger number of trees of other kinds. These patches on which the Big Trees stand do not equal in

CALAVERAS BIG TREE GROVE: EDGE OF GROVE, SHOWING THE "SENTINELS" AND THE RELATIVE HEIGHT OF OTHER ASSOCIATED FOREST TREES.

FIG. 1.—CALAVERAS BIG TREE GROVE: SPERRY'S HOTEL FROM ENTRANCE OF GROVE, WITH THE "SENTINELS" ON EITHER SIDE.

FIG. 2.—CALAVERAS BIG TREE GROVE, NORTH BORDER: ONE OF THE LARGEST BIG TREES BARKED MANY YEARS AGO FOR EXHIBITION PURPOSES; SUGAR PINE, YELLOW PINE, AND WHITE FIR IN VIEW.

THE "GRIZZLY GIANT" IN THE MARIPOSA BIG TREE GROVE.



CALAVERAS BIG TREE GROVE: SECTION OF THE BIG TREE FELLED IN 1854 BY CUTTING OFF THE TRUNK WITH AUGERS; THE STUMP FORMS THE FLOOR IN THE BUILDING.

area a hundredth part of that which the redwoods cover exclusively. We are quite unable to state the number of square miles or acres on which the Big Trees grow, except for two of the groves, the Calaveras and Mariposa, both of which have been carefully surveyed by our parties. It may be roughly stated, however, that this area does not, so far as yet known, exceed 50 square miles, and that most of this is in one patch, between Kings and Kaweah rivers, as will be noticed farther on.

The Calaveras Grove is the most northerly, and one on the south fork of the Tule is the farthest south of any yet known to us. They are also quite limited in vertical range, since they nowhere descend much below 5,000 or rise above 7,000 feet. They follow the other trees of California, in this respect, that they occur lower down on the Sierra as we go northwards; the most northerly grove, that of Calaveras, is the lowest in elevation above the sea level.

There are eight [ten as now constituted] distinct patches or groves of the Big Trees—or nine, if we should consider the Mariposa trees as belonging to two different groups, which is hardly necessary, inasmuch as there is only a ridge half a mile in width separating the upper grove from the lower [now counted as one grove]. The eight groves are in geographical order from north to south: First, the Calaveras; second, the Stanislaus [or "South Calaveras" Grove]; third, Crane Flat [or Tuolumne Grove]; fourth, Mariposa; fifth, Fresno; sixth, Kings and Kaweah rivers; seventh, North Fork Tule River; eighth, South Fork Tule River.

Two small groves, the Merced and Dinky, and six trees, called the "North Grove," in southern Placer County, must be added to the above list. Mr. Whitney's description of the first eight groves is as follows:

CALAVERAS OR "MAMMOTH" GROVE.

The Calaveras Grove is situated in the county of that name, about 16 miles from Murphy's Camp, and near the Stanislaus River. It is on or near the road crossing the Sierra by the Silver Mountain Pass. This being the first grove of the Big Trees discovered, and the most accessible, it has come more into notice and been much more visited than any of the others; indeed, this and the Mariposa Grove are the only ones which have become a resort for travelers. The Calaveras Grove has also the great advantage over the others that a good hotel is kept there, and that it is accessible on wheels, all the others being at a greater or less distance from any road. (See Pls. I, II, IV, XIV, and XV.)

This grove occupies a belt 3,200 feet long by 700 feet broad, extending in a northwest and southeast direction, in a depression between two slopes, through which meanders a small brook which dries up in summer. There are between 90 and 100[1] trees of large size in the grove, and a considerable number of small ones, chiefly on the outskirts. Several have fallen since the grove was discovered, one has been cut down, and one has had the bark stripped from it up to the height of 116 feet above the ground. (See Pl. II, fig. 2.) The bark thus removed was exhibited in different places, and finally found a resting place in the Sydenham Crystal Palace [England], where it was unfortunately burned in the fire which consumed a part of that building a few years since. The two trees thus destroyed were perhaps the finest in the grove; the tallest now standing is the one called the "Keystone State;" the largest and finest is known as the "Empire State." The height of this grove above sea level is 4,759 feet.

STANISLAUS OR "SOUTH CALAVERAS" GROVE.

The next grove south of the one just noticed is south of the Stanislaus River, near the borders of Calaveras and Tuolumne counties. It has been described to us as being about 10 [now estimated to be 6] miles southeast of the Calaveras Grove, on Beaver Creek, a branch of the Stanislaus. It is said to contain from 600 to 800[2] trees, but none as large as those already described.

TUOLUMNE GROVE.

About 25 miles southeast of the last-mentioned grove is another, which may be called the Crane Flat Grove, as it is from a mile to a mile and a half from the station of that name on the Coulterville trail to the Yosemite, in a northwesterly direction. It was visited by our party in haste, and its extent was not ascertained nor the num-

[1] The former owner of this grove, Mr. J. L. Sperry, gives the number as 101.
[2] The former owner, Mr. J. L. Sperry, places the number at 1,380.

ber of trees counted. They stand mostly on the north slope of a hill, rather sheltered from the wind, and, so far as observed, are rather smaller than those of the Calaveras Grove. The largest sound tree measured was 57 feet in circumference at 3 feet from the ground. A stump so burned that only one-half remained was 23 feet in diameter, inside the bark at 3 feet from the ground.

A single Big Tree stands in the woods by itself somewhere southwest of the Crane Flat Grove, and between it and the Merced. It is the only instance, so far as we know, of the occurence of this species solitary and alone. There is an almost entirely unexplored region between the Beaver Creek and the Crane Flat groves, and there may possibly be some more Big Trees existing there and not yet discovered. It is about 20 miles, still in a southwesterly direction, from Crane Flat to the Mariposa Grove, and that region has been so thoroughly explored by the Survey, that there is no reason to suppose that any more of these trees will be found there.

MARIPOSA GROVE.

The Mariposa Grove is situated about 16 miles directly south of the Lower Hotel in the Yosemite Valley, and between 3 and 4 miles southeast of Clark's ranch, and at an elevation of about 1,500 feet above the last-named place, or of some 5,500 feet above the sea level. It lies in a little valley, occupying a depression on the back of a ridge which runs along in an easterly direction between Big Creek and the South Merced. One of the branches of the creek heads in the grove.

The grant made by Congress is 2 miles square, and embraces, in reality, two distinct or nearly distinct groves; that is to say, two collections of Big Trees between which there is an intervening space without any. The upper grove is in a pretty compact body, containing, on an area of 3,700 by 2,300 feet in dimensions, just 365 trees of the *Sequoia gigantea* of a diameter of 1 foot and over, besides a great number of small ones. The lower grove, which is smaller in size and more scattered, lies in a southwesterly direction from the other, some trees growing quite high up in the gulches on the south side of the ridge which separates the two groves.

The principal trees associated with the Big Trees in this grove are the pitch and sugar pines, the Douglas spruce, the white fir (*Picea grandis*) [now *Abies concolor*], and the bastard cedar (*Libocedrus decurrens*).

There are but very few of the young Big Trees growing within the grove, where probably they have been destroyed by fire. Around the base of several of the large trees on the outskirts of the grove there are small [natural] plantations of young Sequoias of all sizes up to 6 or 8 inches in diameter, but only a few as large as this. Those trees which are about 10 feet in diameter and entirely uninjured by fire, in the full symmetry of a vigorous growth of say 500 years, are, although not as stupendous as the older giants of the forest, still exceedingly beautiful and impressive.

The southern division of the Mariposa Grove, or Lower Grove, as it is usually called, is said to contain about half as many (182) trees as the one just described. They are much scattered among other trees, and do not, therefore, present as imposing an appearance as those in the other grove, where quite a large number can often be seen from one point. The largest tree in the lower grove is the one known as the "Grizzly Giant," which is 93 feet 7 inches in circumference at the ground, and 64 feet 3 inches at 11 feet above. (See Pl. III.) Its two diameters at the base, as near as we could measure, were 30 and 31 feet. The calculated diameter at 11 feet above the ground is 20 feet, nearly. The tree is very much injured and decreased in size by burning, for which no allowance has been made in the above measurements. Some of the branches of this tree are fully 6 feet in diameter, or as large as the trunks of the largest elms in the Connecticut Valley, of which Dr. Holmes has so pleasantly discoursed in the Atlantic Monthly. This tree, however, has long since passed its prime, and has the battered and war-worn appearance conveyed by its name.

FRESNO GROVE.

The next grove south of the Mariposa is one in Fresno County, about 14 miles southeast of Clark's, and not far from a conspicuous point called Wammelo Rock. Mr. Clark has described this grove, which we had not visited, as extending for above 2½ miles in length by from 1 to 2 in breadth. He has counted 500 trees in it, and believes the whole number to be not far from 600. The largest measured 81 feet in circumference at 3 feet from the ground.

No other grove of Big Trees has been discovered to the southeast of this along the slope of the Sierra, until we reach a point more than 50 miles distant from the Fresno Grove. Here, between the Kings and Kaweah rivers, is by far the most extensive collection of trees of this species which has yet been discovered in the State.

KINGS RIVER AND KAWEAH RIVER GROVE.

This belt of trees, for grove it can hardly be called, occurs about 30 miles north-northeast of Visalia, on the tributaries of the Kings and Kaweah rivers, and on the divide between. They are scattered over the slopes and on the valleys, but are larger in the depressions, where the soil is more moist. Along the trail which runs from Visalia to the Big Meadows, the belt is 4 or 5 miles wide, and it extends over a vertical range of about 2,500 feet; its total length is as much as 8 or 10 miles, and maybe more. The trees are not collected together into groves, but are scattered through the forests, and associated with the other species usually occurring at this altitude in the Sierra. They are most abundant at from 6,000 to 7,000 feet elevation above the sea level. Their number is great; probably thousands might be counted. Their size, however, is not great, the average being from 10 to 12 feet in diameter, and but few exceeding 20 feet; but smaller ones are very numerous. One tree, which had been cut, had a diameter of 8 feet, exclusive of the bark, and was 377 years old. The largest one seen was near Thomas's Mill; this had a circumference of 106 feet near the ground, no allowance being made for a portion which was burned away at the base. When entire the tree may have been 10 or 12 feet more in circumference. At about 12 feet from the ground the circumference was 75 feet. Its height was 276 feet. The top was dead, however, and, although the tree was symmetrical and in good growth, it had passed its prime.

Another tree, which had fallen, and had been burned hollow, was so large, that three horsemen could ride abreast into the cavity for a distance of 30 feet, its height and width being about 11 feet. At a distance of 70 feet the diameter of the cavity was still as much as 8 feet. The base of this tree could not be easily measured, but the trunk was burned through at 120 feet from the ground, and at that point had a diameter (exclusive of the bark) of 13 feet 2 inches; and at 169 feet from its base the tree was 9 feet in diameter. The Indians stated that a still larger tree existed to the north of Kings River. This tree should be looked up and carefully measured; unfortunately, it was not in the power of our party to do this.

All through these forests there are numerous young Big Trees, of all sizes, from the seedling upward, and at Thomas's Mill they are cut up for lumber in a manner quite at variance with the oft-repeated story of the exceptional character of the species. Prostrate trunks of old trees are also numerous; some of them must have lain for ages, as they were nearly gone, while the wood is very durable.

TULE RIVER GROVES.

The only other groves yet discovered are those on the Tule River, of which there are two, one on the north and the other on the south branch of that stream. They are 15 miles apart, and the most northerly of the two is about 30 miles from the grove last described. As the intervening region has been but little explored, it is not at all unlikely that more of the Big Trees may be found along the fork of the Kaweah which intersects this region with its numerous branches. We are not aware that these two Tule groves were known previous to their discovery by Mr. D'Heureuse, one of the topographers of the Geological Survey, in 1867; at least, no notice of them had ever appeared in print. The number of trees in these groves is quite large, as they are scattered over several square miles of area. The largest of them were said by Mr. D'Heureuse to be about the size of the largest in the other groves.

DINKY AND MERCED GROVES.

Very little reliable information is obtainable at present concerning these groves. The Dinky Grove is located on Dinky Creek, one of the north tributaries of Kings River, and is said to have been accidentally discovered by two hunters in the early seventies. It is also said to contain only a small number of trees.

The Merced Grove is a small group located on and near the headwaters of the Merced River, and reported to contain less than 100 trees.

THE NORTH GROVE.

This can hardly be called a grove, but is so named for uniformity of designation with other larger groups. It comprises six living trees,

and is located in southern Placer County, on a tributary stream of the middle fork of the American River. The elevation of the grove is 5,100 feet above sea level. The grove is about 20 miles southeast of Red Point Mine, on the Forest Hill Divide, and about 15 miles west of the mining camp, Michigan Bluff, from both of which points the trees can be reached by trail. The grove is about 70 miles north of the Calaveras or "Mammoth" Big Tree Grove.

This grove is said to have been discovered by an old miner, Joe Matlock, in 1855. It appears also to have been long known to the settlers of the region, as shown by the dates 1860 to 1890 cut into the smooth-barked alders near the Big Trees. But the first authentic account of this grove was published by W. W. Price in the January issue of the Sierra Club Bulletin for 1893.

Of the six trees comprising the grove, only two are of large size. These are respectively 220 and 240 feet high and 12 and 10 feet in diameter at 4 feet from the ground. The other trees are about 180 feet high and 3 feet in diameter.

A few small Big Trees in this grove have been blown down, and one quite large tree is said to have gone down subsequent to 1885. About 200 feet of the trunk is still intact. The full height is not known, as the top of the tree was broken off before the trunk fell. The diameter at the roots of the tree was 20 feet. One other large dead tree, 28 feet in diameter, is said to have been blown down in 1855, but the trunk has since disappeared—probably by forest fires, which have frequently raged through the region.

History and Size of Notable Big Trees.

CALAVERAS OR "MAMMOTH" GROVE.

The history and figures showing the size of notable Big Trees in this grove occur in the following extracts.

DEAD TREES.

In 1853 one of the largest trees was cut down. It is said to be the original tree discovered by John Bidwell (or by A. T. Dowd, as the more current story has it).

Its diameter across the solid wood, after the bark was removed (and which was from 15 to 18 inches in thickness), is 25 feet, although the tree was cut off 6 feet above the ground. However incredible it may appear, on July 4, 1854, the writer[1] formed one of a cotillion party of 32 persons dancing upon this stump, in addition to which the musicians and lookers-on numbered 17, making a total of 49 occupants on its surface at one time. The accompanying sketch was made at that time, and, of course, before the present pavilion was erected over it. There is no more srikingly convincing proof, in any grove, of the immense size of the Big Trees, than this stump. [See Pl. IV.]

This tree was 302 feet in height, and, at the ground, 96 feet in circumference, before it was disturbed. Some sacrilegious vandals, from the motive of making its exposition "pay," removed the bark to the height of 30 feet; and afterwards transported it to England, where it was formed into a room; but was afterwards consumed by fire with the celebrated Crystal Palace at Kensington, England. This girdling of the tree very naturally brought death to it; but even then its majestic form must have perpetually taunted the belittled and sordid spirits that caused it. It is, however, but an act of justice to its present proprietor, Mr. James L. Sperry,[2] to state that,

[1] J. M. Hutchings in "In the Heart of the Sierras."

[2] Mr. Sperry has recently sold this grove to a lumberman, as stated in the introduction.

although he has been the owner of the grove for over twenty years, that act of vandalism was perpetrated before he purchased it, or it would never have been permitted.

Mr. Hutchings[1] describes the felling of this tree as follows:

The next act in this botanical tragedy was the cutting down of the tree, in order to accommodate those who wished to carry home specimens of its wood as souvenirs of their visit. But how to do this was the puzzling conundrum! If one could fittingly imagine so ludicrous a sight as a few lilliputian men attempting to chop down this brobdingnagian giant, his contempt would reach its becoming climax. This, therefore, was given up as altogether too chimerical and impracticable. Finally, the plan was adopted of boring it off with pump augers. This employed five men twenty-two days to accomplish; and after the stem was finally severed from the stump, the uprightness of its position, and breadth of its base, prevented its overthrow; so that two and a half of the twenty-two days were spent in inserting wedges, and driving them into the butt of the tree, by logs suspended on ropes, thereby to compel its downfall. While these slow and apparently hopeless attempts were being undertaken, and the workmen had retired for dinner, a gust of wind took hold of its top, and hurled it over without the least seeming effort; its fall causing the earth to tremble as by an earthquake. Thus this noble monarch of the forest was dethroned after "braving the battle and the breeze" for nearly two thousand years. Verily, how little real veneration does the average man possess.

The Mother of the Forest.—In this grove once stood a most beautiful tree, graceful in form and unexcelled in proportions; hence (as in human experience) those very qualities at once became the most attractive to the eyes of the unfeeling spoliator. This bore the queenly name of The Mother of the Forest.

In the summer of 1854, the bark was stripped from its trunk, by a Mr. George Gale, for purposes of exhibition in the East, to the height of 116 feet. (See Pl. II, fig. 2.) It now measures in circumference, at the base, without the bark, 84 feet; 20 feet from base, 69 feet; 70 feet from base, 43 feet 6 inches; 116 feet from base, and up to the bark, 39 feet 6 inches. The full circumference at base, including bark, was 90 feet. Its height was 321 feet. The average thickness of bark was 11 inches, although in places it was about 2 feet. This tree is estimated to contain 537,000 feet of sound inch lumber. To the first branch it is 137 feet.

The small black marks upon the tree indicate points where 2½-inch auger holes were bored, and into these rounds were inserted, by which to ascend and descend while removing the bark. At different distances upward, especially at the top, numerous dates and names of visitors have been cut. It is contemplated to construct a circular stairway around this tree. When the bark was being removed, a young man fell from the scaffolding—or rather out of a descending noose—at a distance of 79 feet from the ground, and escaped with a broken limb. The writer was within a few yards of him when he fell, and was agreeably surprised to discover that he had not broken his neck.

The Father of the Forest.—But a short distance from this [The Mother of the Forest] lies the prostrate form of one that was probably the tallest Sequoia that ever grew—The Father of the Forest. This tree, when standing in its primitive majesty, is accredited with exceeding 400 feet in height, with a circumference at its base of 110 feet; and, although limbless, without bark, and even much of its sap [wood] decayed and gone, has still proportions that once could crown him king of the grove. In falling it struck against "Old Hercules," another old-time rival in size, by which the upper part of his trunk was shivered into fragments, that were scattered in every direction. While fire has eaten out the heart of "The Father of the Forest," and consumed his huge limbs, as of many others, the following measurements, recently taken, will prove that he was among the giants of those days, and that "even in death still lives." From the roots, to where the center of the trunk can be reached on horseback, it is 90 feet. The distance that one can ride erect through it on horseback is 82 feet 6 inches. Height of entrance, 9 feet 4 inches; of arch to floor, 10 feet 9 inches. Across the roots it is 28 feet; to where one would have an idea of standing to chop it down, 23 feet 2 inches; 10 feet from the roots its diameter is 20 feet 8 inches; 100 feet from roots, 12 feet 1 inch; 150 feet from roots, 10 feet 4 inches; extreme length, to where any sign of top can be found, 365 feet.

But no one can approximately realize the immense proportions of this prostrate forest sire, without climbing to its top, and walking down it for its entire length; by this, moreover, he will ascertain that it was nearly 200 feet to the first branch. At the end of the burnt cavity within, is a never-failing spring of deliciously cool water.

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[1] J. M. Hutchings in "In the Heart of the Sierras."

The handsome group of stately trees that encompass the "Father of the Forest," make it an imposing family circle, and probably assisted in originating the name.

And this is only one of the numerous vegetable giants that Time's scythe has laid low, for near here lies "Old Hercules," the largest standing tree in the grove until 1862, then being 325 feet in height by 95 feet in circumference, at the ground; this was blown down that year during a heavy storm; "The Miner's Cabin," 319 feet long by 21 in diameter, thrown over by a gale in 1860; and "The Fallen Monarch," which has probably been down for centuries.

This trunk is still 18 feet in diameter, and was probably over 300 feet high and 25 or more feet in diameter.

LIVING TREES.

The following list[1] includes the notable living trees in the Calaveras Grove. Most of them are marked with marble tablets, which bear the names of States, distinguished statesmen, generals, and scholars.

The "Two Sentinels," over 300 feet high, the larger 23 feet in diameter. [See Pl. I and Pl. II, fig. 1.]

"U. S. Grant," named in 1865.

"W. T. Sherman," named in 1865.

"J. B. McPherson," named in 1865.

"Pride of the Forest," once named "The Eagle;" 300 feet high and 23 feet in diameter.

"Phil Sheridan," 300 feet high.

"Three Graces," standing in close line and the most beautiful cluster in the grove.

"Andrew Johnson," named in 1865.

"Florence Nightingale," once named "Nightingale;" named in 1865 by a nephew of the English lady.

"Bay State."

"W. C. Bryant," named in 1865 by a lady, an admirer of the poet.

"W. H. Seward."

"Pioneer's Cabin," named from the cabin-like chamber and chimney formed by its hollow trunk.

"Pluto's Chimney," 280 feet high and 17 feet in diameter; hollowed out on one side by fire for 90 feet above ground.

"Quartette," a cluster of four trees, the tallest, 220 feet.

"America," 280 feet high and 13 feet in diameter; named in 1865 by a San Francisco lady.

"California," once called "Ada;" named in 1865.

"Broderick," once called "Mary;" named in 1865.

"Henry Ward Beecher," 280 feet high and 14 feet in diameter.

"Abraham Lincoln," once called "Hermit;" 320 feet high and 18 feet in diameter.

"Elihu Burritt."

"Uncle Sam."

"Alta (Upper) California."
"Union."
"General Wadsworth."
"The Twins."
} Average height, 260 feet; average diameter, 15 feet.

"General Sutter." The trunk divides at 30 feet above ground and forms two trunks, each 280 feet high.

"Salem Witch."

"Longfellow."

"Prof. Asa Gray."
"Dr. John Torrey."
} Named in honor of distinguished American botanists.

"The Trinity"; three trees from one trunk, the circumference of which is 60 feet.

"Starr King," 360 feet high.

"Richard Cobden."

"John Bright."

"Daniel O'Connel."

"Edward Everett."

"Keystone State."

"Sir John Franklin."
"Dr. Kane."
} Named in 1862 by Lady Franklin.

[1] Compiled from Nelson's "Atlantic and Pacific Tourists' Guide."

"Century"; named in 1865 in honor of The Century Association, of New York, of which the poet Bryant was president.

"John LeConte." }
"Joseph LeConte." } Standing close together.

"Sequoia Queen." }
"Maids of Honor." } A cluster of three, the "Queen" in the center.

"Sir Joseph Hooker"; named in honor of the English botanist.

"John Lindley"; named in honor of the English botanist who was the first to name and describe the Big Tree.

"Mother and Son"; a large and small tree together.

"General Scott," 325 feet high.

"Old Bachelor."

"Kentucky."

"The Siamese Twins." }
"Daniel Webster." } Average height, 305 feet; average diameter, 20 feet.
"Granite State." }

"The Old Republican."

"Henry Clay."

"Andrew Jackson."

"Vermont."

"Empire State," 94 feet in circumference.

"Old Dominion."

"George Washington."

"Uncle Tom's Cabin."

"The Beauty of the Forest."

The following table gives additional measurements for some of the above-named Big Trees in the Calaveras Grove. These figures are believed to be conservative and to express more nearly the actual sizes of the trees named:

Height and diameter measurements of trees in the Calaveras Grove.[1]

Name of tree.	Diameter 6 feet above ground.	Height.
	Feet.	*Feet.*
Keystone State	14.3	325
General Jackson	12.7	319
Mother of the Forest (without bark)	19.4	315
Daniel Webster	15	307
T. Starr King	16.6	283
Richard Cobden	13.1	284
Pride of the Forest	15.3	282
Henry Clay	15	280
Bay State	14.6	275
James King of William	16.2	274
Sentinel	15.6	272
Dr. Kane	15.9	271
Arborvitæ Queen	9.6	269
Abraham Lincoln	14	268
Maid of Honor	8.6	266
Old Vermont	12.7	265
Uncle Sam	13.7	265
Mother and Son (Mother)	16.2	261
Three Graces (highest)	9.6	262
William Cullen Bryant	15.3	262
U. S. Grant	10.8	261
George Washington	16.2	256
General Scott	13.7	258
Henry Ward Beecher	10.8	252
California	10.5	250
Uncle Tom's Cabin	15.9	250
Beauty of the Forest	12.4	249
J. B. McPherson	9.9	246
Florence Nightingale	11.8	246
James Wadsworth	8.6	239
Elihu Burritt	9.9	231

[1] From J. D. Whitney's "Yosemite Guide-Book." For a readier conception of size, Mr. Whitney's circumference measurements are here converted into equivalent diameters.

These measurements will have a new value when it is remembered that they are now nearly 40 years old—old enough to make remeasurement very interesting for comparison.

STANISLAUS OR "SOUTH CALAVERAS" GROVE.

This grove contains 1,380 Big Trees, ranging in diameter from 1 foot to 34 feet.

Mr. Hutchings describes the trees of note in this grove as follows:

The large number of these immense trees, from 30 feet to over 100 feet in circumference, at the ground, and in almost every position and condition, would become almost bewildering were I to present in detail each and every one; a few notable examples, therefore, will suffice as representatives of the whole. (See Pl. V.)

The first Big Tree that attracts our attention, and which is seen from the ridge north of the Stanislaus River, is the "Columbus," a magnificent specimen, with three main divisions in its branches, and standing alone. Passing this we soon enter the lower end of the South Grove[1] and arrive at the "New York," 104 feet in circumference, and over 300 feet in height. Near to this is the "Correspondent," a tree of stately proportions, named in honor of the "Knights of the Quill." The "Ohio" measures 103 feet in circumference, and is 311 feet in height. The "Massachusetts" is 98 feet, with an altitude of 307.

Near to a large black stump, above this, stands a tree that is 76 feet in circumference, that has been struck by lightning, 170 feet from its base; where its top was shivered into fragments, and hurled in all directions for over 100 feet from the tree; the main stem being rent from top to bottom, the apex of this dismantled trunk being 12 feet in diameter. The "Grand Hotel" is burned out so badly that nothing but a mere living shell is left. This will hold 40 persons. Then comes the "Canal Boat;" which, as its name implies, is a prostrate tree; the upper side and heart of which have been burned away, so that the remaining portion resembles a huge boat; in the bottom of which thousands of young Big Trees have started out in life; and, if no accident befalls them, in a thousand or two years hence, they may be respectable-sized trees, that can worthily take the places of the representatives of this noble genus, and, like these, challenge the admiring awe of intellectual giants of that day and age. (See Pl. V, fig. 1.)

"Noah's Ark" was another prostrate shell that was hollow for 150 feet; through which, for 60 feet, three horsemen could ride abreast; but the snows of recent winters have broken in its roof, and blocked all further passage down it. Next comes the "Tree of Refuge," where, during one severe winter, 16 cattle took shelter; but subsequently perished from starvation. They found protection from the storm, but their bleaching bones told the sad tale of their sufferings and death from lack of food. Near to this lies "Old Goliath," the largest decumbent tree in the grove; whose circumference was over 100 feet, and, when erect, was of proportionate height to the tallest. During the gale that prostrated "Hercules," in the Calaveras Grove, this grand old tree had also to succumb. One of his stalwart limbs was 11 feet in diameter.

SMITH'S CABIN.

There is another notable specimen, which somewhat forms a sequel to the above, known as Smith's Cabin, on account of its having been the chosen residence of a trapper and old mountaineer named A. J. Smith—Andrew Jackson Smith—who made the charred hollow of this burnt-out tree hi lonely home for three years. (See Pl. VI.) There is no telling what these old denizens of the mountains can or will do when they have made up their minds to anything. The diameter of his cabin—which was to him a bedroom, sitting room, kitchen, and sometimes, during stormy weather, a stable for his horse—was 21 feet by 16. * * * On one occasion a regular "south-easter" was on the rampage, hurling down trees, twisting off branches, tossing about tree tops, and limbs, in all directions. As the old trapper dare not venture out, he sat listening, with unquestionable interest, to ascertain whether the wind or "Smith's Cabin" was becoming the better wrestler of the two. At this juncture an earth-trembling crash came with nerve-testing force, that made his hair stand on end, when he jumped to his feet, using certain emphatic words (the synonyms of which can be found in "holy writ," or elsewhere), thinking, as he afterwards expressed it, "that it

[1] So called by many from its position immediately southeast of the Calaveras Grove, which is often called "North Grove."

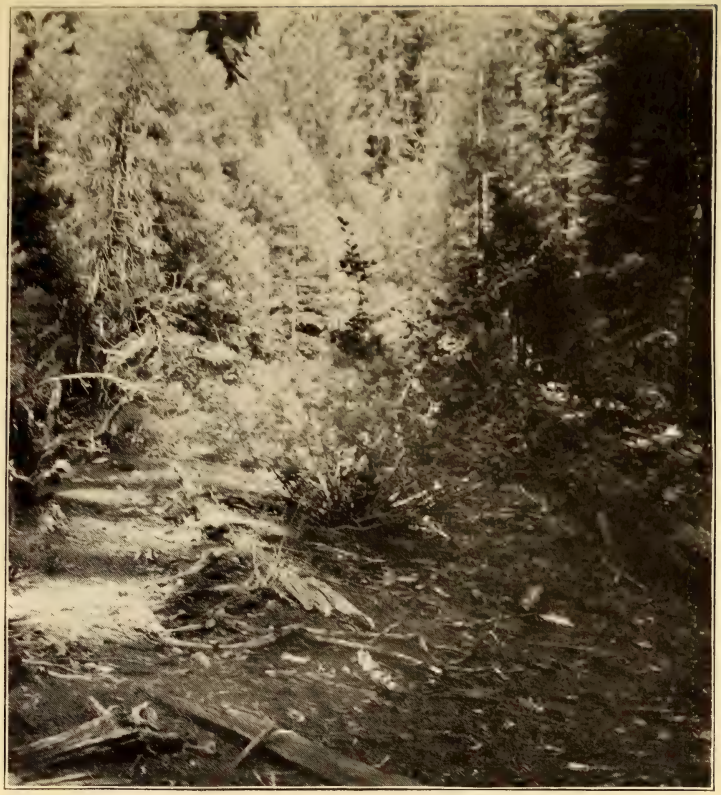
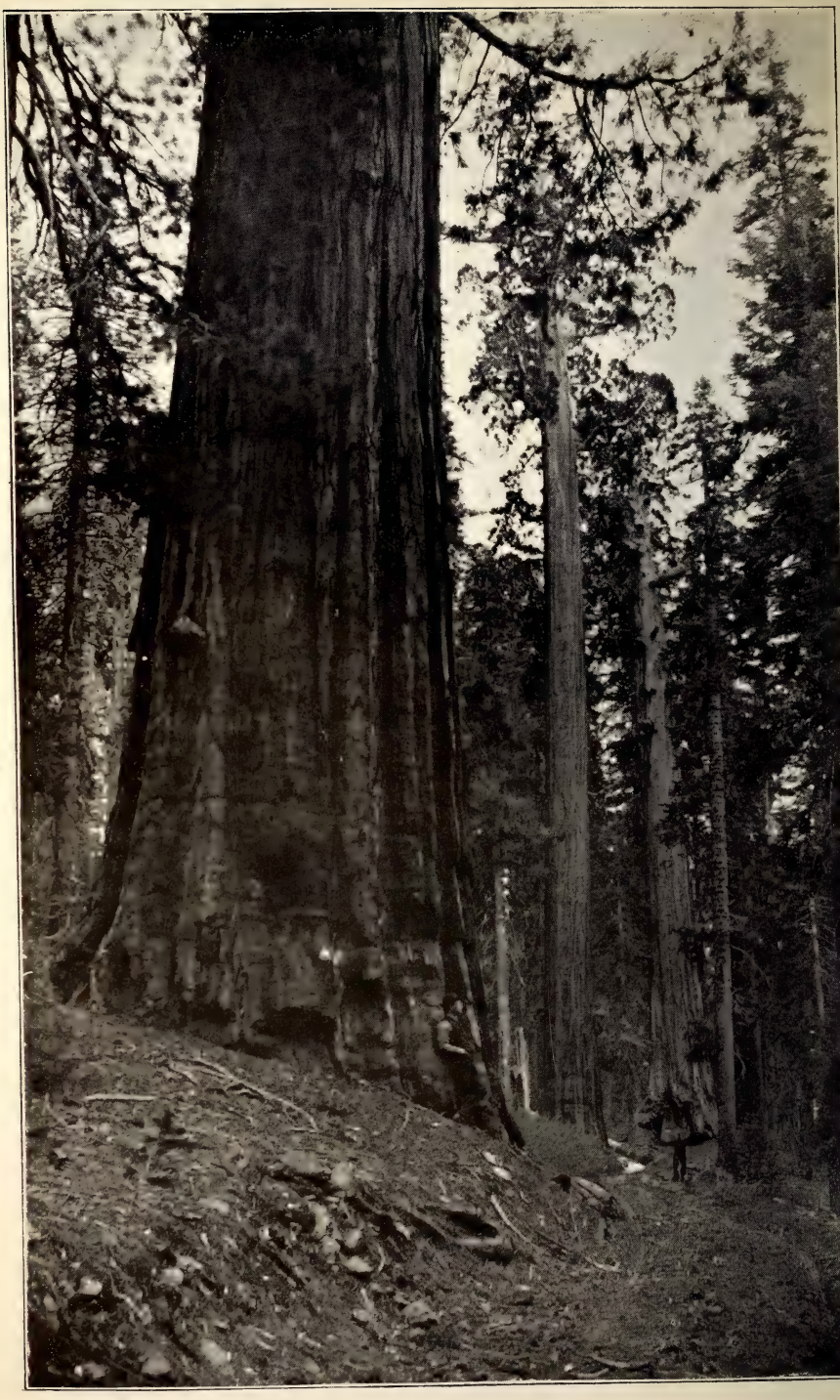


FIG. 1.—STANISLAUS BIG TREE GROVE, SHOWING INTERIOR OF FOREST WITH DENSE STAND OF SEEDLING AND SAPLING BIG TREES, WITH GRAZED AND TRAMPLED SPOT IN FOREGROUND.

FIG. 2.—THE STANISLAUS BIG TREE GROVE: INTERIOR OF FOREST, SHOWING BIG TREE, 22 FEET IN DIAMETER, AND GENERAL APPEARANCE OF FOREST.

SMITH'S CABIN. A GIANT BIG TREE IN THE STANISLAUS GROVE, THE HOLLOW BASE HAVING BEEN USED IN EARLY YEARS AS A HUNTER'S CABIN.



BIG TREES IN THE MARIPOSA GROVE.

THE BIG TREE "WAWONA" IN THE MARIPOSA GROVE, SHOWING THE RELATIVE SIZE OF OTHER CONIFERS COMPARED WITH BIG TREES.

was all u-p with him." As this was the downfall of "Old Goliath," he began to fear that old Boreas was getting the best of the match, if he did not claim the gate-money, and that "Smith's Cabin" would be the next giant thrown. But, being a brave man—and who could live such a life as his if he were not?—and knowing well that he could not do better, concluded to look this danger unquailingly in the face, as he had done many a one before it, stay where he was, and take the best, or worst, that might befall him.

MARIPOSA GROVE.

From the following table it will be seen that there are several trees in this grove larger than any in the Calaveras, and that their average size is greater. The average height of the Mariposa trees, however, is less than that of the Calaveras; and the highest of the former, 272 feet, is 53 feet less than the tallest one of the latter. There is a burned stump on the north side of the grove, nearly all gone, but indicating a tree of a size perhaps a little greater than any now existing there. The beauty of the Mariposa Grove has been sadly marred by the ravages of fire, which has evidently swept through it again and again, almost ruining many of the finest trees. Still, the general appearance of the grove is extremely grand and imposing. There are about 125 trees over 40 feet in circumference.[1] (See Pls. VII and VIII.)

Height and diameter measurements of trees in the Mariposa Grove.[2]

No.	Height.	Diameter at ground.	Diameter at 6 feet above the ground.	Remarks.
	Feet.	*Feet.*	*Feet.*	
6	.....	24.7	.....	
7	.....	23.1	.....	
11	.....	19.8	.....	
12	244	19.8	.....	
15	272	.....	.....	
16	.....	27.6	.....	Hollow.
20	.....	23.1	17.5	
21	.....	.....	14.0	
27	250	15.3	.....	
29	.....	28.6	.....	
31	186	11.4	9.4	
35	.....	20.7	16.2	
38	226	8.6	.....	
49	194	.....	.....	
51	218	17.8	12.4	
52	249	.....	12.7	
60	.....	26.0	18.8	Burned at base.
64	.....	26.0	15.9	
66	221	12.7	.....	
69	219	11.4	.....	
70	225	14.0	.....	
77	197	.....	8.8	
102	255	.....	15.9	
158	223	.....	.....	
164	243	.....	8.8	
169	.....	25.4	.....	Much burned at base.
171	.....	26.3	.....	Badly burned on one side.
174	268	.....	13.0	
194	192	.....	14.6	Two trees, united at the base.
205	229	28.0	.....	Much burned on one side; formerly over 100 feet in circumference.
206	235	22.4	.....	
216	.....	.....	20.1	Much burned at base.
226	219	.....	15.3	
236	256	.....	14.6	
238	.....	.....	18.2	Burned on one side.
239	187	.....	8.5	
245	270	26.0	21.4	Do.
253	.....	23.7	19.1	
262	.....	17.8	.....	Half burned away at base.
275	.....	21.0	.....	
286	.....	24.2	.....	Burned on one side nearly to center.
290	.....	.....	14.6	
301	.....	.....	16.2	
304	260	29.5	.....	All burned away on one side.
330	.....	29.2	.....	
348	227	.....	16.2	

[1] From J. D. Whitney's "Yosemite Guide-Book."
[2] Compiled from J. D. Whitney's "Yosemite Guide-Book" (1870).

THE BEAUTY OF BIG TREES AND THEIR ENVIRONMENT.

The beauty of the Big Trees and their surroundings is nowhere more vividly described than in Mr. John Muir's "Mountains of California." He says:

So exquisitely harmonious and finely balanced are even the very mightiest of these monarchs of the woods in all their proportions and circumstances there never is anything overgrown or monstrous-looking about them. On coming in sight of them for the first time, you are likely to say, "Oh, see what beautiful, noble-looking trees are towering there among the firs and pines!" their grandeur being in the meantime in great part invisible, but to the living eye it will be manifested sooner or later, stealing slowly on the senses, like the grandeur of Niagara, or the lofty Yosemite domes. Their great size is hidden from the inexperienced observer as long as they are seen at a distance in one harmonious view.

When, however, you approach them and walk round them, you begin to wonder at their colossal size and seek a measuring rod. These giants bulge considerably at the base, but not more than is required for beauty and safety; and the only reason that this bulging seems in some cases excessive is that only a comparatively small section of the shaft is seen at once in near views. One that I measured in the Kings River forest was 25 feet in diameter at the ground, and 10 feet in diameter 200 feet above the ground, showing that the taper of the trunk as a whole is charmingly fine. And when you stand back far enough to see the massive columns from the swelling instep to the lofty summit dissolving in a dome of verdure, you rejoice in the unrivaled display of combined grandeur and beauty. About 100 feet or more of the trunk is usually branchless, but its massive simplicity is relieved by the bark furrows, which instead of making an irregular network run evenly parallel, like the fluting of an architectural column, and to some extent by tufts of slender sprays that wave lightly in the winds and cast flecks of shade, seeming to have been pinned on here and there for the sake of beauty only.

The young trees have slender, simple branches down to the ground, put on with strict regularity, sharply aspiring at the top, horizontal about half way down, and drooping in handsome curves at the base. By the time the sapling is five or six hundred years old this spiry, feathery, juvenile habit merges into the firm, rounded, dome form of middle age, which in turn takes on the eccentric picturesqueness of old age. No other tree in the Sierra forest has foliage so densely massed or presents outlines so firmly drawn and so steadily subordinate to a special type. A knotty ungovernable-looking branch 5 to 8 feet thick may be seen pushing out abruptly from the smooth trunk, as if sure to throw the regular curve into confusion, but as soon as the general outline is reached it stops short and dissolves in spreading bosses of law-abiding sprays, just as if every tree were growing beneath some huge, invisible bell glass, against whose sides every branch was being pressed and molded, yet somehow indulging in so many small departures from the regular form that there is still an appearance of freedom.

The foliage of the saplings is dark bluish green in color, while the older trees ripen to a warm brownish-yellow tint like Libocedrus. The bark is rich cinnamon brown, purplish in young trees and in shady portions of the old, while the ground is covered with brown leaves and burs, forming color masses of extraordinary richness, not to mention the flowers and underbrush that rejoice about them in their seasons. Walk the Sequoia woods at any time of year and you will say that they are the most beautiful and majestic on earth. Beautiful and impressive contrasts meet you everywhere; the colors of tree and flower, rock and sky, light and shade, strength and frailty, endurance and evanescence, tangles of supple hazel bushes, tree pillars about as rigid as granite domes, roses and violets, the smallest of their kind, blooming around the feet of the giants, and rugs of the lowly Chamæbatia where the sunbeams fall. Then in winter the trees themselves break forth in bloom, myriads of small four-sided staminate cones crowd the ends of the slender sprays, coloring the whole tree, and when ripe dusting the air and the ground with golden pollen.

The fertile cones are bright grass-green, measuring about 2 inches in length by 1½ in thickness, and are made up of about 40 firm rhomboidal scales densely packed, with from 5 to 8 seeds at the base of each. A single cone, therefore, contains from 200 to 300 seeds, which are about a fourth of an inch long by three-sixteenths wide, including a thin, flat margin that makes them go glancing and wavering in their fall like a boy's kite. The fruitfulness of Sequoia may be illustrated by two specimen branches 1½ and 2 inches in diameter on which I counted 480 cones. No other Sierra conifer produces nearly so many seeds. Millions are ripened annually by a single tree, and in a fruitful year the product of one of the northern groves would be enough

to plant all the mountain ranges of the world." But very few of the millions of seeds which fall to the ground germinate, "and of those that do perhaps not 1 in 10,000 is suffered to live through the many vicissitudes of storm, drought, fire, and snow-crushing that beset their youth."

AGE OF THE BIG TREES.

The extreme age attained by the Big Tree is still an unsettled question. Statements on the subject vary considerably, some appearing to be exaggerations. One great difficulty, however, in settling the question of age, at least for existing trees, is the lack of a proper number of trunk sections on which to count the rings of annual growth, thus giving unquestionable data on age.

Ring countings from prostrate and burned or decayed trunks and sections of trees felled for other purposes than ring counting, have largely furnished the basis of the age estimates made so far, and from these countings age estimates have been made for trees of other sizes which could not of course be cut down.

These generalizations not being based on ring countings from a series of trunk sections representing the full range in diameter of all trees now known, the statements as to the extreme age possible for these trees are necessarily approximative. It is the opinion of Mr. Hutchings that the average rate of growth is 1 inch of diameter for every twelve years, which would make a tree 25 feet through 3,600 years old. Mr. Muir's observations also roughly corroborate this theory. He writes:

> Under the most favorable conditions these giants probably live 5,000 years or more, though few of even the larger trees are more than half as old. I never saw a Big Tree that had died a natural death; barring accidents they seem to be immortal, being exempt from all the diseases that afflict and kill other trees. Unless destroyed by man they live on indefinitely until burned, smashed by lightning, or cast down by storms, or by the giving way of the ground on which they stand. The age of one that was felled in the Calaveras Grove, for the sake of having its stump for a dancing floor, was about 1,300 years, and its diameter, measured across the stump, 24 feet inside the bark. Another that was cut down in the Kings River forest was about the same size, but nearly a thousand years older (2,200 years), though not a very old-looking tree. It was felled to procure a section for exhibition, and thus an opportunity was given to count its annual rings of growth. The colossal scarred monument in the Kings River forest mentioned above is burned half through, and I spent a day in making an estimate of its age, clearing away the charred surface with an ax and carefully counting the annual rings with the aid of a pocket-lens. The wood-rings in the section I laid bare were so involved and contorted in some places that I was not able to determine its age exactly, but I counted over 4,000 rings, which showed that this tree was in its prime, swaying in the Sierra winds, when Christ walked the earth. No other tree in the world, as far as I know, has looked down on so many centuries as the Sequoia, or opens such impressive and suggestive views into history.

These estimates are confirmed by the most recent investigations on the age of the Big Tree.

GEOLOGIC HISTORY OF THE BIG TREE.

Perhaps more impressive even than the size or age of the Big Tree is the past life of the species. As already stated, the fossils show the present survivor to be the remnant of a once numerous family. Dr. Asa Gray writes:

> The same Sequoia which abounds in the same Miocene formations in Northern Europe has been abundantly found in those of Iceland, Spitzbergen, Greenland,

Mackenzie River, and Alaska. It is named *S. Langsdorfii*, but is pronounced to be very much like *S. sempervirens*, our living redwood of the California coast, and to be the ancient representative of it. Fossil specimens of a similar, if not the same, species have been recently detected in the Rocky Mountains by Hayden, and determined by our eminent paleontological botanist, Lesquereux; and he assures me that he has the common redwood itself from Oregon, in a deposit of tertiary age. Another Sequoia (*S. Sternbergii*), discovered in miocene deposits in Greenland, is pronounced to be the representative of *S. gigantea*, the Big Tree of the Californian Sierra. If the Taxodium of tertiary time in Europe and throughout the arctic regions is the ancestor of our present bald cypress, which is assumed in regarding them as specifically identical, then I think we may, with our present light, fairly assume that the two redwoods of California are the direct or collateral decendants of the two ancient species which so closely resemble them.

The forests of the arctic zone in tertiary times contained at least three other species of Sequoia, as determined by their remains, one of which, from Spitzbergen, also much resembles the common redwood of California. Another, "which appears to have been the commonest coniferous tree on Disco," was common in England and some other parts of Europe. So the Sequoias, now remarkable for their restricted station and numbers, as well as for their extraordinary size, are of an ancient stock; their ancestors and kindred formed a large part of the forests which flourished throughout the polar regions, now desolate and ice clad, and which extended into the low latitudes in Europe. On this continent one species at least had reached to the vicinity of its present habitat before the glaciation of the region. Among the fossil specimens already found in California, but which our trustworthy paleontological botanist has not yet had time to examine, we may expect to find evidence of the early arrival of these two redwoods upon the ground which they now, after much vicissitude, scantily occupy.

NATURAL REPRODUCTION OF THE BIG TREE.

It may be said that the north groves of Big Trees show little or no signs of extending their very limited range, hardly, even, of holding their present place, except under the most favorable conditions. Mr. Sudworth, dendrologist of the Division of Forestry, makes the following statements about the Calaveras Grove and Stanislaus Grove of Big Trees, which, it is important to notice, have been protected from both fire and grazing since the early fifties:

Unlike the other species of its kind (Sequoia), the Coast Redwood, the Big Tree reproduces itself so slowly and with such uncertainty as to be practically at a standstill in these groves. A few seedlings took root in 1853–1855 in the Calaveras Grove, and are now 2 or 3 feet in diameter. There is no other evidence of increase in this grove, although the large trees are in a most thrifty state. The forest is not well watered, and the humus is too dry to encourage the reproduction of this species. Pines, firs, and cedars appear better able to propagate themselves on the same ground. On the borders of the grove the soil is so constantly dry and exposed to the trampling of grazing herds as to allow no reproduction outside of the forest. Moreover, the small, heavy seeds are carried to no considerable distance by the winds, as in the case of the pines, firs, and cedars. But if the reproduction of the Big Tree were the best conceivable, it would take several thousand years to replace the present groves after they were destroyed.

The Stanislaus Grove is sparingly watered in parts by small perennial spring streams, and as a result shows a few small patches of Big Tree seedlings. (See Pl. V. fig. 1.) The constant soil moisture in the vicinity of these streams enables the seed to germinate, but only where big logs and other heavy débris exclude cattle and sheep. To lumber this tract would certainly soon effect the drying up of the small water supply, as it has already done elsewhere. The preservation of the race of Big Trees in this locality is unquestionably dependent on maintaining the present groves intact.

One region there is, however, where the Big Trees are reproducing themselves with some regularity. This is on the South Fork of the Kaweah River, and particularly on both branches of the Tule River, where there are young trees in abundance and of almost every age. But the discouraging aspect is that these groves are at present likely

to be cut down, and should this happen, the reproduction noted will avail little in perpetuating the species, without the protecting influence of the mother forest.

BOTANICAL DESCRIPTION OF THE BIG TREE.

The following technical description of the Big Tree is taken from Prof. C. S. Sargent's "Silva of North America:"

The average height of Sequoia Wellingtonia is about 275 feet, and its trunk diameter near the ground 20 feet, although individuals from 300 to 320 feet tall, with trunks from 25 to 35 feet thick, are not rare. During four or five centuries the tapering stem is clothed with slender, crowded branches, which are erect above and horizontal near the middle of the tree, and below sweep toward the ground in graceful curves, thus forming a dense narrow strict pyramid. Gradually the lower branches disappear, and those at the top of the tree lose their aspiring habit; the trunk, which is much enlarged and buttressed at the base, and fluted with broad low rounded ridges, becomes naked for 100 or 150 feet; and the narrow, rounded crown of short horizontal branches loses its regularity, and gains picturesqueness from the eccentric development of some of the branches or the destruction of others. (See Pls. III, VII, and VIII.)

The bark of old trees is from 1 to 2 feet in thickness, and is divided into flat rounded lobes 4 or 5 feet wide, corresponding to the lobes of the trunk, and separating into loose-fibrous scales; it is light cinnamon-red, and the outer scales are slightly tinged with purple, which is more conspicuous on the much thinner bark of young trees. The leading branchlets are stout, pendulous, and furnished with numerous slender crowded much-divided rather closely appressed lateral branchlets, forming dense masses of spray; dark blue-green, like the leaves when they first appear, at the end of two or three years and after the disappearance of their leaves the branchlets are reddish-brown, more or less tinged with purple, and covered with thin close or slightly scaly bark.

The leaves are ovate, acuminate, or lanceolate, rounded and thickened on the lower surface, concave on the upper surface, and marked with bands of stomata on both sides of the obscure midribs, rigid and sharp pointed, decurrent below, spreading or closely appressed above the middle, and from one-eighth to one-quarter of an inch, or on stout leading shoots often one-half an inch in length; on young seedling plants they are linear-lanceolate, short-pointed, thin, spreading, pilose, often ciliate on the margins, and from one-half to three-fourths of an inch in length.

The flowers, which open late in the winter or in early spring, are produced in great profusion, especially the staminate, which often cover the whole tree, and dust the forest and the ground below it with their golden pollen. The staminate flower, which is usually terminal, varies from one-sixth to one-third of an inch in length, with ovate acute or acuminate denticulate connectives, and is subtended by broadly ovate scales rounded or acute at the apex, keeled on the back, concave on the inner surface, and slightly erose on the margins. The pistillate flower is about one-third of an inch long, with from 25 to 30, or rarely from 35 to 40 pale yellow scales, slightly keeled on the back, gradually narrowed into long slender points, and bearing from 3 to 7 ovules under each scale.

The fruit is ovate-oblong, from 2 to 3½ inches in length, from one-half inch to 2¼ inches in width, and dark red-brown; the scales are furnished on the upper side, near the base, with two or three large deciduous dark resin-glands, and are gradually thickened upward from the base to the apex, which is only slightly dilated, and is from three-fourths of an inch to 1¼ inches long, and from one-fourth to one-half of an inch wide, deeply pitted in the middle, which is often furnished with an elongated reflexed mucro, and frequently transversely ridged; at maturity they remain straight and rigid and open only slightly, the cone retaining its original form even when dry. From 3 to 7 seeds are produced under each scale; they are linear-lanceolate, compressed, from one-eighth to one-fourth inch in length, light brown, and surrounded by lateral united wings broader than the body of the seed, apiculate at the apex, and often unequal.

The Big Tree is the largest inhabitant of the American forests, and the most massive-stemmed although not the tallest tree in the world. It grows in an uninterrupted belt, chiefly associated with the Sugar Pine, the Douglas Fir, and the Incense Cedar, from the middle fork of the American River southward along the western flank of the California Sierras for a distance of about 260 miles to the head of Deer Creek, the northern limit of this belt being near the thirty-ninth and its southern just south

of the thirty-sixth degree of north latitude, and its elevation from 5,000 to 8,400 feet above the level of the sea.

The wood of the Big Tree is very light, soft, not strong, brittle, and coarse-grained, but very durable in contact with the soil. It is bright clear red, turning darker on exposure, with thin nearly white sapwood, and contains thin dark-colored conspicuous bands of small summer-cells and numerous thin medullary rays. The specific gravity of the absolutely dry wood is 0.2882, a cubic foot weighing 17.96 pounds. Manufactured into lumber, it is used locally for fencing and in construction, and is made into shingles.

BOTANICAL NOMENCLATURE OF THE BIG TREE.

The selection of the proper scientific name for the Big Tree has been the subject of much discussion, and is a question concerning which there is still considerable disagreement among authorities. Since the tree first became known to botanists it has received the five following scientific names:

1. Wellingtonia gigantea Lindley. 1853.
2. Sequoia gigantea Decaisne. 1854.
3. Taxodium Washingtonianum Winslow. 1854.
4. Sequoia Wellingtonia Seeman. 1855.
5. Sequoia Washingtoniana (Winsl.) Sudworth. 1898.

For reasons founded on the fixed principles in botanical law, the first two names are permanently barred from use. The present dissension among authorities centers on which of the last two names should be applied to the Big Tree. It is believed, however, that Sequoia Washingtoniana is the correct name for this tree, as shown in Bulletin 17, Division of Forestry, United States Department of Agriculture.

INTRODUCTION OF THE BIG TREE INTO CULTIVATION.

William Lobb visited the Calaveras Grove in 1854 and succeeded in introducing this Sequoia into English gardens. It is now one of the most universally cultivated coniferous trees in all the countries of central and southern Europe, but, while it has grown rapidly, it is already beginning to show that the existing climates of Europe do not suit it, and that this glory of the Sierra forests need fear no rival among the emigrants of its race. It has also been occasionally cultivated in the eastern United States, where it does not flourish, although it has occasionally survived in a few sheltered or particularly favorable situations.[1]

The best examples of success in cultivating this tree in the East are to be seen in the nursery of Messrs. Elwanger and Barry, Rochester, N. Y., where there are two trees about 35 feet high.

OWNERSHIP OF BIG TREE LANDS.

The ownership of the Big-Tree timber lands of California is divided among the State, the Federal Government, and private individuals.

State Holdings.

California owns but one tract, which includes the Mariposa Grove. This was ceded to California by the United States in 1865, in an act known as the "Yosemite and Big Tree Grant," by the terms of which the State received the Yosemite Valley proper and the Mariposa Grove, to hold and protect as State parks. The extent of the Mariposa grant is 2 square miles, or, roughly, about 4 per cent of the total area on which the Big Tree grows.

[1] Prof. C. S. Sargent, in "Silva of North America."

LUMBERING BIG TREES ON KINGS RIVER: MAKING GRAPEVINE STAKES; SHOWS THE EFFECT OF BLASTING WITH POWDER.

BIG TREE TIMBER CUT FOR GRAPEVINE STAKES, SHOWING ENORMOUS WASTE IN LUMBERING AND DESOLATE APPEARANCE OF SUCH DENUDED LANDS.

FELLING A BIG TREE WITH AXES.

HAULING OUT BIG TREE SAW LOGS ON A LOG SLIDE.

LOGGING RAILROAD IN A BIG TREE FOREST, SHOWING TRAIN CARRYING BIG TREE AND YELLOW PINE LOGS.

FIG. 1.—CALAVERAS BIG TREE GROVE, SHOWING TRAIL IN INTERIOR OF FOREST, WITH WELL-PRESERVED, DENSE UNDERGROWTH OF TREE SEEDLINGS, SHRUBS, AND HERBACEOUS PLANTS; SHOWS A BIG TREE BADLY BURNT AT BASE ON THE RIGHT.

FIG. 2.—CALAVERAS BIG TREE GROVE, SHOWING DENSE UNDERGROWTH IN INTERIOR OF FOREST, WITH FIRE-SCARRED BIG TREE ON RIGHT AND SUGAR PINE 8 FEET IN DIAMETER ON LEFT.

FIG. 1.—CALAVERAS BIG TREE GROVE, SHOWING DENSE, WELL-PRESERVED UNDERGROWTH, WITH "THE PIONEER" NEAR CENTER OF GROVE, 32 FEET IN DIAMETER NEAR BASE.

FIG. 2.—CALAVERAS BIG TREE GROVE, SHOWING DENSE UNDERGROWTH OF TREE SEEDLINGS, SHRUBS, AND HERBACEOUS PLANTS IN INTERIOR OF FOREST, WITH BIG TREE 28 FEET IN DIAMETER ON THE RIGHT AND LARGEST SUGAR PINES ON THE LEFT BEYOND.

PLATE XVI

Map showing Location of Big Tree Groves in Fresno and Tulare Counties, California.

R.22E. R.23E. R.24E. R.25E. R.26E. R.27E. R.28E. R.29E. R.30E. R.31E. R.32E. R.33E. R.34E. R.35E. R.36E.

T.13S. T.14S. T.15S. T.16S. T.17S. T.18S. T.19S. T.20S. T.21S. T.22S. T.23S.

3RD STANDARD PARALLEL SOUTH

4TH STANDARD PARALLEL SOUTH

5TH STANDARD PARALLEL SOUTH

FRESNO COUNTY
TULARE COUNTY
KINGS COUNTY
INYO COUNTY

KING'S RIVER
SQUAW VALLEY
DUNLAP
SANGER
CLIFTON
WHITOKA
MT CAMPBELL
CAMP BADGER
SANDERS
REEDLEY
SELMA
DINUBA
OROSI
AUCKLAND
KINGSBURG
MONSON
CHURCHILL
TRAVER
THREE RIVERS
HANFORD
VISALIA
GOSHEN
EXETER
FARMERSVILLE
LIME KILN
YOKOL
TULARE
LINDSAY
MILO
CRAMER
FRAZIER
DAUNT
WOODVILLE
TIPTON
PORTERSVILLE
PLANO
POPLAR
PIXLEY
BELLEVILLE
ALITA
MINERAL KING
BALO MT
SUGAR LOAF PK
OLANCHA
MT MONARCHE
VOLO MT
VOLO HILLS
MANZANITA KNOB
MONARCHO VALLEY
MT TYNDALL
MT WHITNEY
PINNACLE
SHEEP MT
CASTLE PKS
MORO PK
NEEDLE PKS
DOME PK
CAPITOL PK

Kings River
Dry Cr.
Mill Cr.
Sand Cr.
Redinger Cr.
Rattlesnake Cr.
Limekiln Cr.
Kehew Cr.
N.Fk. Kaweah Riv.
Marble Fk. Kaweah Riv.
Middle Fk. Kaweah Riv.
E.Fk. Kaweah Riv.
S.Fk. Kaweah Riv.
Kaweah Riv.
Packwood Cr.
Cross Cr.
Yokol Cr.
Tulare Riv.
New Tulare Riv.
Flat or Deer Cr.
Boulder Cr.
Sugar Loaf Cr.
Cloudy Riv.
Alpine Cr.
Soda Cr.
Bear Cr.
N.Fk. Tule Riv.
Middle Fk. Tule Riv.
S.Fk. of Middle Fk.
Tule Riv.
Redwood Cr.
Tehipite Valley
Whitney Cr.
Sugar Loaf Cr.
Kern Riv.
S.Fk. Kern Riv.
Brush Cr.
Salmon Cr.
Harris Cr.
Fish Cr.
Trout Cr.
Cabin Cr.
Cage Canyon
Rocky Pk.
S.Fk. Kings Riv.
Canyon

Sequoia National Park

Tule River Indian Reservation

Mount Whitney Military Reservation

Owens Lake

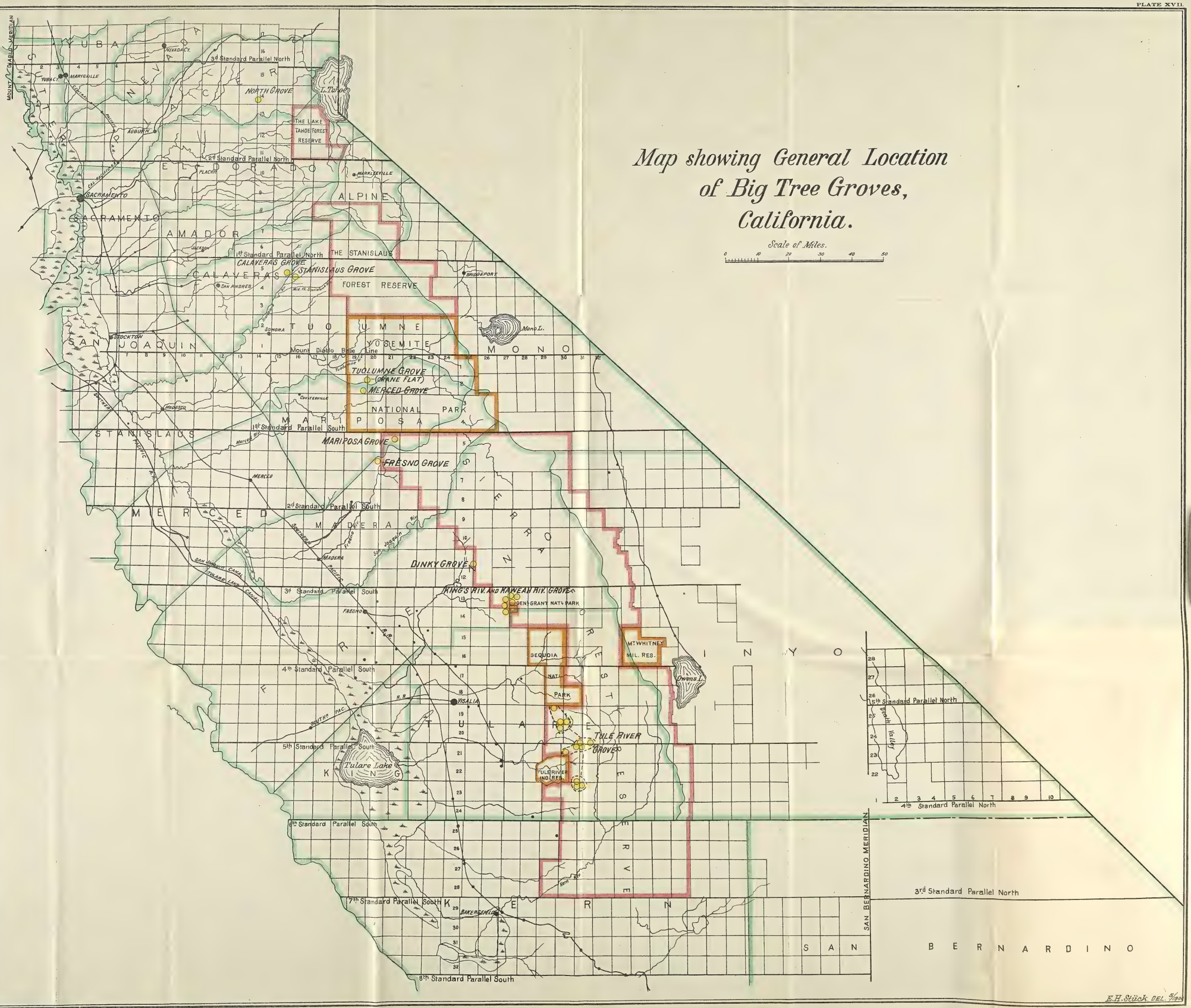
Tulare Lake

SOUTHERN PACIFIC R.R.

Summit of Sierra Nevada

Scale 2 Miles = 1 Inch.

E. H. Stuck, del.


Map showing General Location
of Big Tree Groves,
California.
Scale of Miles.
0 10 20 30 40 50
MOUNT DIABLO MERIDIAN
YUBA
NEVADA
SUTTER
PLACER
ELDORADO
ALPINE
SACRAMENTO
AMADOR
CALAVERAS
TUOLUMNE
SAN JOAQUIN
MONO
STANISLAUS
MARIPOSA
MERCED
MADERA
SIERRA
FRESNO
TULARE
KING
KERN
INYO
SAN BERNARDINO
SAN BERNARDINO MERIDIAN
3d Standard Parallel North
2d Standard Parallel North
1st Standard Parallel North
1st Standard Parallel South
2d Standard Parallel South
3d Standard Parallel South
4th Standard Parallel South
5th Standard Parallel South
6th Standard Parallel South
7th Standard Parallel South
8th Standard Parallel South
3rd Standard Parallel North
4th Standard Parallel North
5th Standard Parallel North
NORTH GROVE
L. Tahoe
THE LAKE TAHOE FOREST RESERVE
CALAVERAS GROVE
STANISLAUS GROVE
THE STANISLAUS FOREST RESERVE
Mono L.
Mount Diablo Base Line
TUOLUMNE GROVE (CRANE FLAT)
MERCED GROVE
NATIONAL PARK
MARIPOSA GROVE
FRESNO GROVE
DINKY GROVE
KING'S RIV. AND KAWEAH RIV. GROVE
GEN'L GRANT NAT'L PARK
SEQUOIA NAT'L PARK
MT. WHITNEY MIL. RES.
Owens L.
TULE RIVER GROVE
TULE RIVER IND. RES.
Tulare Lake
Death Valley
SACRAMENTO
SAN ANDRES
SONORA
STOCKTON
MODESTO
MERCED
MADERA
FRESNO
VISALIA
BAKERSFIELD
BRIDGEPORT
MARYSVILLE
AUBURN
PLACER
MARKLEEVILLE
SOUTHERN PACIFIC R.R.
SAN JOAQUIN CANAL
TULARE LAKE CANAL
SOUTHERN PAC. R.R.
Kern Riv.
E.H. Stück DEL. 5/1908

Government Holdings.

The United States owns and in part controls two considerable areas, comprised within the Sequoia and General Grant National parks. These are very difficult to define. According to the acts of Congress which established them October 1, 1890, they amount, respectively, to 161,280 and 2,560 acres. But it is well known that in the first at least, the Big Trees stand largely in one group on the Marble Fork of the Kaweah River, with only very scattering neighbors of their own kind; and a like distinction prevails in the General Grant National Park grove. Furthermore, along the west and south boundaries of the Sequoia National Park, there are seven valid private holdings, amounting to 1,012.87 acres, and an equally good claim of 160 acres in the General Grant National Park. In the first, also, there is a sawmill operating at the edge of the main clump of Big Tree timber, which is again true of the second grove. Consequently, as it is not possible to assert what proportion of these parks contain Big Trees, or just what the private tracts comprise, it is equally impossible to state the extent of the Government holdings in Big Tree timber. It can only be said that they are considerable, but imperfectly defined and poorly protected.

Private Holdings.

These include by far the greater part of the Big Trees, and, except some groves in Tulare County, they are held by sawmill or logging companies. The large tract on Kings River is almost entirely so owned; and the famous Calaveras or "Mammoth" Grove, which has been carefully preserved since the early fifties, is now owned by a man who is said to represent a lumber syndicate. The Big Trees of Fresno County are controlled by the Sanger Lumber Company. The rest of the southern tracts, in and about and to the south of the Sequoia National Park, are divided chiefly into small areas among private owners.

Location of Big Tree Lands.

The following list, and accompanying large map (Pl. XVI), compiled from notes and a sketch map prepared by Prof. William R. Dudley,[1] give the location, amount, and ownership of Big Tree lands in Fresno and Tulare counties. The data compiled is based upon the Tulare County records of 1899–1900, and upon Professor Dudley's personal examination of the areas in question. The accompanying small map (Pl. XVII) gives the general location of all the Big Tree groves.

Fresno County.

TOWNSHIP 13 SOUTH, RANGE 27 EAST.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
1	1	*a* 40	Fannie Wilcox	
2	1	*a* 80	.....do	
2	2	*a* 40	G. T. Nightbert and J. M. Fox	
2	3	120	Sanger Lumber Co.	Sanger, Cal.
11	4	40	Ellen S. Eastwood	
11	3	440	Sanger Lumber Co	Do.
12	3	480	.....do	Do.
12	5	160	J. W. Blade	
13	3	280	Sanger Lumber Co	Do.

[1] A collaborator in the Division in Forestry, United States Department of Agriculture.

Fresno County—Continued.

TOWNSHIP 13 SOUTH, RANGE 27 EAST—Continued.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
13	6	340	S. Sweet & Co	Visalia, Cal.
14	3	40	Sanger Lumber Co	Sanger, Cal.
15	3	40	.....do	Do.
16	3	320	.....do	Do.
16	7	320	E. D. Sullivan	
21	3	320	Sanger Lumber Co	Do.
22	3	480	.....do	Do.
22	8	160	M. W. Kirkland and D. McRea	San Francisco, Cal.
23	3	440	Sanger Lumber Co	Sanger, Cal.
24	3	40	.....do	Do.
24	9	160	W. N. Switzer	
25	3	640	Sanger Lumber Co	Do.
26	3	640	.....do	Do.
27	3	640	.....do	Do.
28	3	640	.....do	Do.
29	3	560	.....do	Do.
29	10	80	James L. Young	Lindsay, Cal.
30	10	160	.....do	Do.
31	11	80	John C. Dunlap	Dunlap, Cal.
32	11	160	.....do	Do.
32	3	40	Sanger Lumber Co	Sanger, Cal.
33	3	320	.....do	Do.
34	3	440	.....do	Do.
35	3	640	.....do	Do.
36	3	640	.....do	Do.

TOWNSHIP 13 SOUTH, RANGE 28 EAST.

3	3	80	Sanger Lumber Co	Sanger, Cal.
4	3	440	.....do	Do.
5	3	440	.....do	Do.
5	12	160	J. A. Schapp	
7	3	640	Sanger Lumber Co	Do.
8	3	640	.....do	Do.
9	3	640	.....do	Do.
10	3	640	.....do	Do.
13	3	320	.....do	Do.
13	6	160	S. Sweet & Co	Visalia, Cal.
13	13	160	E. Jacob	Do.
14	U. S.	160	United States	
14	3	480	Sanger Lumber Co	Sanger, Cal.
15	3	440	.....do	Do.
15	14	120	August Bergin	
16	3	640	Sanger Lumber Co	Do.
17	3	640	.....do	Do.
18	3	640	.....do	Do.
19	U. S.	640	United States	
20	U. S.	160	.....do	
20	3	480	Sanger Lumber Co	Do.
21	3	40	.....do	Do.
21	U. S.	600	United States	
22	15	40	Mrs. Ella Byrnes	Visalia, Cal.
22	16	160	S. Mitchell	
22	3	280	Sanger Lumber Co	Sanger, Cal.
22	U. S.	160	United States	
23	3	480	Sanger Lumber Co	Do.
23	16	160	S. Mitchell	
24	3	480	Sanger Lumber Co	Do.
24	17	160	Fox and Sweetland	Lemoore, Cal.
25	3	480	Sanger Lumber Co	Sanger, Cal.
26	3	640	.....do	Do.
27	3	480	.....do	Do.
27	U. S.	160	United States	
28	U. S.	160	.....do	
28	18	200	John W. Parker	Dinuba, Cal.
28	3	280	Sanger Lumber Co	Sanger, Cal.
29	3	640	.....do	Do.
30	3	640	.....do	Do.
31	3	160	.....do	Do.
33	U. S.	640	United States	
34	19	160	Louis Seligman	Dinuba, Cal.
34	3	320	Sanger Lumber Co	Sanger, Cal.
35	20	160	W. E. Weld	Visalia, Cal.
35	3	480	Sanger Lumber Co	Sanger, Cal.
36	3	640	.....do	Do.

a Sold for taxes, 1899.

Fresno County—Continued.

TOWNSHIP 13 SOUTH, RANGE 29 EAST.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
7	3	320	Sanger Lumber Co	Sanger, Cal.
15	3	160	.....do	Do.
16	3	640	.....do	Do.
17	3	320	.....do	Do.
17	21	160	S. W. Finker	Alma, Mich.
17	U. S.	80	United States	
18	U. S.	320	.....do	
18	3	320	Sanger Lumber Co	Sanger, Cal.
19	3	320	.....do	Do.
21	3	320	.....do	Do.
21	22	40	D. K. Zumwalt	Visalia, Cal.
22	3	160	Sanger Lumber Co	Sanger, Cal.
26	3	120	.....do	Do.
27	3	240	.....do	Do.
27	16	120	S. Mitchell	
27	21	80	S. W. Finker	Alma, Mich.
28	21	80	.....do	Do.
28	23	40	Richard Hedinger	Fresno, Cal.
28	3	120	Sanger Lumber Co	Do.
29	3	40	.....do	Do.
30	3	240	.....do	Do.
31	3	160	.....do	Do.
32	3	40	.....do	Do.
34	3	160	.....do	Sanger, Cal.
35	3	160	.....do	Do.
36	3	160	.....do	Do.

Tulare County.

TOWNSHIP 14 SOUTH, RANGE 27 EAST.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
1	3	640	Sanger Lumber Co	Sanger, Cal.
2	3	640	.....do	Do.
3	3	160	.....do	Do.
11	24	120	Granville Millsap	Sold for taxes, 1899.
12	24	40	.....do	Do.
12	25	80	Frankeman & Son	Sanger, Cal.
12	3	200	Sanger Lumber Co	Do.
12	26	160	Adaline Comstock	
13	26	400	.....do	
13	28	80	E. W. Jardine	
14	26	40	Adaline Comstock	
24	29	200	J. R. Rodgers	

TOWNSHIP 14 SOUTH, RANGE 28 EAST.

1	30	80	S. Plunkett	Visalia, Cal.
1	31	160	L. M. Atwill and Benj. Hicks	Do.
1	32	80	L. O. Cutler	Do.
1	33	40	A. J. Weston	Do.
2	33	120	.....do	Do.
2	34	80	Otto Sweet	Do.
2	3	80	Sanger Lumber Co	Sanger, Cal.
3	3	80	.....do	Do.
5	35	160	E. O. Miller	Visalia, Cal.
7	3	80	Sanger Lumber Co	Sanger, Cal.
8	36	40	Meyer E. Iseman	Visalia, Cal.
10	37	80	Peter McArthur	Detroit, Mich.
11	33	120	A. J. Weston	Visalia, Cal.
12	33	200	.....do	Do.
13	37	80	Peter McArthur	Detroit, Mich.
14	37	240	.....do	Do.
14	38	200	George D. Bliss	San Francisco, Cal.
15	38	280	.....do	Do.
15	39	40	P. Dougherty	Visalia, Cal.
15	37	120	Peter McArthur	Detroit, Mich,
15	40	120	Horace Whitaker	Orosi, Cal.
15	41	40	J. S. Boyd or —. —. Howard	Reedley, Cal.

Tulare County—Continued.

TOWNSHIP 14 SOUTH, RANGE 28 EAST—Continued.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
15	42	40	R. Z. Dudley	Visalia, Cal.
16	40	160	Horace Whitaker	Orosi, Cal.
16	43	160	Tax deed, State of California	
16	44	320	William Coburn	Springville, Cal.
18	13	80	E. Jacob	Visalia, Cal.
19	13	160	do	Do.
21	40	80	Horace Whitaker	Orosi, Cal.
21	45	120	Mary I. Evans	
21	46	40	T. Rooney	
21	47	80	J. W. Guinn and E. L. Huffman	Visalia, Cal.
21	48	40	Estelle Ruggles	
22	40	40	Horace Whitaker	Orosi, Cal.
22	47	40	J. W. Guinn and E. L. Huffman	Visalia, Cal.
22	42	40	R. Z. Dudley	Do.
22	37	400	Peter McArthur	Detroit, Mich.
22	35	120	E. O. Miller	Visalia, Cal.
23	38	440	George D. Bliss	San Francisco, Cal.
23	37	40	Peter McArthur	Detroit, Mich.
23	49	80	Wm. Z. Garton	
24	37	400	Peter McArthur	Do.
24	43	80	Tax deed, State of California	
25	50	160	Claus Spreckels	San Francisco, Cal.
25	35	160	E. O. Miller	Visalia, Cal.
26	37	160	Peter McArthur	Detroit, Mich.
26	51	160	Estate of Thos. Wootton	Fresno, Cal.
26	52	160	C. W. Clark	Sacramento, Cal.
27	35	40	E. O. Miller	Visalia, Cal.
27	53	120	J. Goldman	Tulare, Cal.
27	54	80	A. R. Orr, one-half, and R. Chatten, one-half.	Visalia, Cal.
27	42	40	R. Z. Dudley	Do.
27	55	40	R. Chatten	Do.
27	56	40	J. O. Osborn	Exeter, Cal.
28	53	280	J. Goldman	Tulare, Cal.
28	57	80	A. Lewis	
33	58	160	A. D. Halstead	Visalia, Cal.
33	37	320	Peter McArthur	Detroit, Mich.
34	37	40	do	Do.
35	52	160	C. W. Clark	Sacramento, Cal.
35	35	160	E. O. Miller	Visalia, Cal.
36	59	40	Floyd B. Wilson	

TOWNSHIP 15 SOUTH, RANGE 28 EAST.

3	37	120	Peter McArthur	Detroit, Mich.
4	37	480	do	Do.
4	60	160	James Halstead	Visalia, Cal.
5	37	80	Peter McArthur	Detroit, Mich.

TOWNSHIP 15 SOUTH, RANGE 30 EAST.

28	61	40	J. F. Jordan	Visalia, Cal.
29	62	120	N. W. Tharp	Do.
30	61	40	J. F. Jordan	Do.
33	61	80	do	Do.

TOWNSHIP 16 SOUTH, RANGE 30 EAST.

5	61 62 63	280	J. F. Jordan, one-half N. W. Tharp, one-quarter H. D. Tharp, one-quarter	Visalia, Cal.
6	61 62 63	160	H. D. Tharp	Do.
7	64	40	Gus. Weinman	

TOWNSHIP 16 SOUTH, RANGE 31 EAST.

20	65	40	J. L. Hamilton	Exeter, Cal.
21	65	40	do	Do.

Tulare County—Continued.

TOWNSHIP 17 SOUTH, RANGE 29 EAST.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
23	66	80	Ira Chrisman	Visalia, Cal.
25	67	40	Wm. T. Bell	
26	67	80	....do	
26	68	40	Mary E. Southworth	
26	69	40	A. Hammer	Do.
26	70	160	James Fisher	Do.
26	71	160	C. F. Bahwell	Threerivers, Cal.
26	72	120	Lon Lewis	Visalia, Cal.
27	73	240	L. M. Howell	Do.
35	67	80	Wm. T. Bell	
35	35	160	E. O. Miller	Do.
36	72	320	Lon Lewis	Do.

TOWNSHIP 17 SOUTH, RANGE 30 EAST.

10	75	80	James McFadzean	Threerivers, Cal.
11	75	80	....do	Do.
11	76	40	J. H. Moore, one-fourth	Do.
	77		W. F. Dean, one-fourth	
	78		Maria Luce, one-fourth	
	79		J. D. Mollinex, one-fourth	
11	80	80	Mary M. Atwill	Visalia, Cal.
12	80	80	....do	Do.

TOWNSHIP 17 SOUTH, RANGE 31 EAST.

18	81	200	John Cutler	Visalia, Cal.

TOWNSHIP 19 SOUTH, RANGE 30 EAST.

2	82	240	J. M. Canty	Grayson, Cal.
2	83	40	N. P. Dillon	Milo, Cal.
3	82	280	J. M. Canty	Grayson, Cal.
3	83	360	N. P. Dillon	Milo, Cal.
4	83	120	....do	Do.
9	83	40	....do	Do.
10	83	160	....do	Do.
10	84	80	J. F. Lindsay	Said to be same interest as N. P. Dillon.
11	83	40	N. P. Dillon	Milo, Cal.
23	85	80	F. J. Nash, one-half, and Alice A. Nash, one-half.	Salem, Mass.
	86			
24	87	80	J. J. Doyle	Porterville, Cal.
25	88	320	Louisa Greenwald	San Francisco, Cal.
25	89	80	Enterprise Lumber Co	Springville, Cal.
25	90	80	Jesse Hoskins	Lindsay, Cal.
25	91	120	George E. Guerne in Enterprise Lumber Co.	Springville, Cal.
	89			
26	88	160	Louisa Greenwald	San Francisco, Cal.
26	92	40	A. M. Rexroat	Tipton, Cal.
26	93	40	E. T. Dibble	
26	86	200	Alice A. Nash one-half and L. Bertch one-half.	Salem, Mass.
	94			Tulare, Cal.
26	95	160	Bank of Tulare	Do.
34	95	120	....do	Do.
34	96	40	Achille Weil	San Francisco, Cal.
34	97	240	F. H. Smith	
34	98	40	H. F. Rose	
34	99	40	Ida G. Sharp	Munson, Cal.
35	100	160	James Redfield	
35	101	160	E. W. Haughton	Springville, Cal.
36	101	80	....do	Do.
36	88	320	Louisa Greenwald	San Francisco, Cal.
36	102	80	James Parriman	
36	103	160	A. M. Coburn	Springville, Cal.

Tulare County—Continued.

TOWNSHIP 19 SOUTH, RANGE 31 EAST.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
18	88	120	Louisa Greenwald	San Francisco, Cal.
19	88	200	do	Do.
19	104	160	C. M. Stone	Tulare, Cal.
19	105	160	Martha E. Taggart	Bakersfield, Cal.
19	106	40	Elizabeth J. Shirley	Council Bluffs, Iowa.
20	88	40	Louisa Greenwald	San Francisco, Cal.
28	88	40	do	Do.
29	88	320	do	Do.
30	88	200	do	Do.
30	106	80	Elizabeth J. Shirley	Council Bluffs, Iowa.
30	107	160	Bella Van Valkenburg	Hanford, Cal.
30	91, 89	80	George E. Guerne, in Enterprise Lumber Co.	Springville, Cal.
31	91, 89	80	do	Do.
31	108	80	E. T. Cosper	Hanford, Cal.
31	109	80	J. M. Talbot	Santa Rosa, Cal.
31	110	80	J. M. Bowles	Do.

TOWNSHIP 20 SOUTH, RANGE 30 EAST.

1	88	520	Louisa Greenwald	San Francisco, Cal.
1	85	40	F. J. Nash	Salem, Mass.
2	101	160	E. W. Haughton	Springville, Cal.
2	88	160	Louisa Greenwald	San Francisco, Cal.
2	99	40	Ida G. Sharp	Munson, Cal.
3	99	80	do	Do.
10	103	80	A. M. Coburn	Springville, Cal.
11	103	40	do	Do.
12	88	80	Louisa Greenwald	San Francisco, Cal.

TOWNSHIP 20 SOUTH, RANGE 31 EAST.

6	88	80	Louisa Greenwald	San Francisco, Cal.
9	111	40	Frank T. Bowers	E. O. Miller, Visalia, Cal., agent.
16	112	640	Samuel Davis	
35	113	280	Estate of John P. Fleitz	Detroit, Mich.
35	114	160	Nellie L. Marshall	
36	113	640	Estate of John P. Fleitz	Detroit, Mich.

TOWNSHIP 20 SOUTH, RANGE 32 EAST.

28	88	320	Louisa Greenwald	San Francisco, Cal.
29	88	400	do	Do.
31	88	40	do	Do.
32	88	360	do	Do.
32	113	80	Estate of John P. Fleitz	Detroit, Mich.
33	113	320	do	Do.
33	88	160	Louisa Greenwald	San Francisco, Cal.
34	113	280	Estate of John P. Fleitz	Detroit, Mich.

TOWNSHIP 21 SOUTH, RANGE 31 EAST.

1	113	640	Estate of John P. Fleitz	Detroit, Mich.
2	113	240	do	Do.
6	113	160	do	Do.
7	113	480	do	Do.
7	115	120	James L. Miner	Poplar, Cal.
8	115	120	do	Do.
8	88	240	Louisa Greenwald	San Francisco, Cal.
8	113	40	Estate of John P. Fleitz	Detroit, Mich.
9	113	160	do	Do.
16	88	640	Louisa Greenwald	San Francisco, Cal.
17	88	400	do	Do.
17	113	240	Estate of John P. Fleitz	Detroit, Mich.
18	113	160	do	Do.

Tulare County—Continued.

TOWNSHIP 21 SOUTH, RANGE 32 EAST.

No. of section.	No. on map.	Size of claim.	Name of owner.	Residence.
		Acres.		
6	115	120	Cornelius A. Davidson	San Bernardino.
6	88	80	Louisa Greenwald	San Francisco, Cal.
6	113	240	Estate of John P. Fleitz	Detroit, Mich.
7	113	400	do	Do.
18	113	80	do	Do.

TOWNSHIP 22 SOUTH, RANGE 31 EAST.

35	113	400	Estate of John P. Fleitz	Detroit, Mich.

TOWNSHIP 23 SOUTH, RANGE 31 EAST.

1	113	640	Estate of John P. Fleitz	Detroit, Mich.
2	113	640	do	Do.
3	113	520	do	Do.
10	113	40	do	Do.
11	113	440	do	Do.
12	113	640	do	Do.
13	113	480	do	Do.

TOWNSHIP 23 SOUTH, RANGE 32 EAST.

6	113	40	Estate of John P. Fleitz	Detroit, Mich.
7	113	240	do	Do.
18	113	40	do	Do.

LUMBERING THE BIG TREES.

The lumbering of the Big Tree is destructive to a most unusual degree. In the first place the enormous size and weight of the trees necessarily entails very considerable breakage when one of them falls. Such a tree strikes the ground with a force of many hundreds or even thousands of tons, so that even slight inequalities are sufficient to smash the brittle trunk at its upper extremity into almost useless fragments. The loss from this cause is great, but it is only one of the sources of waste. The great diameter of the logs and, in spite of the lightness of the wood, their enormous weight make it impossible to handle many of them without breaking them up. For this purpose gunpowder is the most available means. The fragments of logs blown apart in this way are not only often of wasteful shapes, but unless very nice judgment is exercised in preparing the blast, a great deal of the wood itself is scattered in useless splinters. (See Pls. IX, X.)

At the mill, where waste is the rule in the manufacture of lumber in the United States, the Big Tree makes no exception. This waste, added as it is to the other sources of loss already mentioned, makes a total probably often considerably in excess of half the total volume of the standing tree; and this is only one side of the matter.

The Big Tree stands as a rule in a mixed forest composed of many species. The result of Sequoia lumbering upon this forest is best shown by the photographs. (See Pls. IX, X, XI, XII, XIII.) The destruction caused by the fall of the enormous trees is in itself great, but the principal source of damage is the immense amount of débris left on

the ground—the certain source of future fires. This mass of broken branches, trunks, and bark, is often 5 or 6 or even more feet in thickness, and necessarily gives rise to fires of great destructive power, even though the Big Tree wood is not specially inflammable. The devastation which follows such lumbering is as complete and deplorable as the untouched forest is unparalleled, beautiful, and worthy of preservation. As a rule it has not even had the advantage of being profitable. Very much of this appalling destruction has been done without leaving the owners of the Big Trees as well off as they were before it began.

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A short account of the big trees of Cali