

# BIG TREE

## Understory Hidden

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Giant sequoia nearly hidden from view by understory of white fir trees.

Portion of .64-acre plot after most of the understory trees were removed. Photo by Harold Weaver.



**E**ARLY EXPLORERS in the Sierra Nevada described the groves of bigtrees, *Sequoia gigantea* (also called Sierra redwood, or giant sequoia) as essentially clean, open, and parklike. The frequent ground fires of primitive times, started by lightning and by Indians, kept the forest floor relatively clean. Today, as a result of fire suppression, many of the groves have a dense understory of shade-tolerant trees, mainly white fir and incense-cedar. The understory of crowded trees has come to be of considerable concern to people interested in park vegetation maintenance because the small trees add to the fire hazard and partially block out the views of the giants.

In the summer of 1964, a study was made of both the tree understory and of the views of the bigtrees on Whitaker's

Forest, a 320-acre forest owned by the University. Whitaker's Forest lies on the western slope of Redwood Mountain in Tulare County and is a part of the Redwood Mountain Grove of bigtrees, most of which is in Kings Canyon National Park. John Muir described the Redwood Mountain Grove as one of the most beautiful in California.

### Tree understory

Whitaker's Forest was logged from 1873 to 1879. Sugar pine and ponderosa pine were heavily logged, and about half of the bigtrees were felled. On a trip through this area in 1875, Muir noted the destructive and wasteful logging operations. Following the logging, however, sequoias, incense-cedar, and white fir reproduced abundantly. The young

TABLE 1. NUMBER OF UNDERSTORY TREES REMOVED FROM .64-ACRE PLOT BY SPECIES AND HEIGHT CLASSES

Height	White fir	Incense-cedar	Sugar pine	Ponderosa pine
0 - 2"	880*	41	1	0
2+ - 4"	574	168	12	3
4+ - 8"	640	202	18	4
8+ - 12"	385	62	14	4
12+ - 16"	139	20	6	1
16+ - 20"	49	18	3	1
20+ - 24"	53	17	5	0
2' - 3'	90	15	23	1
3+ - 4'	74	7	29	1
4+ - 5'	54	0	22	0
5+ - 6'	46	0	18	1
6+ - 7'	58	0	11	2
7+ - 8'	52	0	6	1
8+ - 9'	49	0	5	0
9+ - 10'	37	0	4	2
10+ - 15'	76	1	5	1
15+ - 20'	14	2	0	0
Over 20'	5	19	0	1
Total	3,275	572	182	22

\* Mostly young seedlings in the second season of growth.

TABLE 2. DATA CONCERNING TREES REMAINING ON .64 ACRE AFTER MOST OF THE UNDERSTORY TREES WERE REMOVED

Species	Number	Average d.b.h.	Basal area in sq. ft.	Equivalent basal area in sq. ft. per acre
Bigtree	63	19.3	145.1	226.1
White fir	5	14.5	6.6	10.2
Incense-cedar	25	11.9	20.5	31.9
Sugar pine	24	2.0	0.9	1.4
Ponderosa pine	7	19.5	19.3	30.1
Canyon liveoak	5	0.7	<0.1	0.2
White alder	1	15.6	1.3	2.1
Total	130		193.7	302.0
Trees remaining which are less than 4.5 feet tall:				
Bigtree	1			
White fir	1			
Incense-cedar	4			
Sugar pine	9			
Ponderosa pine	3			
Canyon liveoak	21			
Black oak	3			
Total	42			
Total for plot	172			

# and Views

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sequoias grew rapidly and tall, and now, at about 85 years of age, clearly dominate the views.

On a plot of .64 acre used in vista clearing studies, most of the understory trees were cut and measured, and the age was determined on many. The data are given in tables 1 and 2. A total of 4,051 trees were removed (equivalent to 6,313 trees per acre). This plot had been thinned lightly in the early thirties, and most of the understory trees had come in since that time. White fir trees were most abundant and were making reasonably good growth. Incense-cedar appears to follow soil disturbance or to invade open areas. In dense shade it makes very little growth in height. In this study, most of the young incense-cedars were less than three feet tall, though they were 20 to 30 years old. Under conditions at Whitaker's Forest, sugar pine reproduces surprisingly well in dense shade, ponderosa pine reproduces poorly, and sequoia hardly at all.

Although there is considerable variation in the number of understory trees in different parts of Whitaker's Forest, an earlier study of more than 80 acres showed a tree density ranging from 4,434 to 6,762 individuals of all species and all age classes per acre. Thus, this .64-acre plot can be considered fairly representative.

### Hidden views

The second part of the 1964 study on Whitaker's Forest was concerned with views of the giant redwoods. Four large specimens were selected and viewed from four directions at distances of 50, 100,

TABLE 3. PERCENTAGE OF GIANT TREES IN VIEW FROM DIFFERENT DIRECTIONS AND DISTANCES\*

	East		South		West		North	
	Top	Trunk	Top	Trunk	Top	Trunk	Top	Trunk
Pennsylvania Tree								
50 ft.	95	50	60	60	35	95	15	75
100 ft.	85	50	30	25	0	40	40	25
150 ft.	65	50	30	0	0	60	15	10
Washington, D.C. Tree								
50 ft.	5	70	50	60	65	80	60	75
100 ft.	75	45	5	10	20	0	15	60
150 ft.	5	0	15	0	50	0	15	15
Minnesota Tree								
50 ft.	25	55	25	70	60	60	15	60
100 ft.	25	50	5	10	75	50	35	35
150 ft.	30	20	5	0	75	40	40	25
California Tree								
50 ft.	25	30	10	35	5	85	5	70
100 ft.	85	10	5	50	10	45	5	10
150 ft.	25	25	5	5	5	20	5	5

\* Tops are from the lowest limb up, and trunks extend from the ground to the first limb.

and 150 feet. The percentages of tops and trunks showing at these distances were estimated (table 3). It may be seen that at only 50 feet, many of the giants were largely obscured from view.

The studies reported here show rather clearly that even in dense stands of big-trees, white fir and incense-cedar will continue to reproduce abundantly; and if vistas are to be maintained, measures must be taken occasionally to remove the

shade-tolerant understory trees. Future studies will consider means of bringing the giants into better view.

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GRAPH SHOWING HEIGHTS OF UNDERSTORY TREES REMOVED IN RELATION TO AGE

