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TECHNICAL NOTE

Subject: FORESTRY

Series No.: NO. 15

Reference: OREGON WHITE OAK

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SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE

No.: Woodland No. 14.

Reference: Oregon White Oak.

Oregon white oak, Quercus garryana, one of the western white oaks, is found principally in western Oregon and California. It extends northward to Vancouver Island, B. C., along the edge of Puget Sound, on the San Juan Islands and in the drier zones of the Chehalis Valley. It extends eastward up the Columbia River from the Portland-Vancouver area to the towns of Goldendale, Washington, and The Dalles, Oregon. In the Willamette Valley of Oregon, it attains its largest size and, further south, covers many of the drier soils in the Umpqua and Rogue Valleys in association with California black oak, Quercus kelloggii, and madrone, Arbutus menziesii. It continues south through the drier portions of the Siskiyous, through the Klamath and Scott Valleys, and western foothills of the Sacramento Valley. It is also found in the drier portions of the California coastal range south to San Francisco Bay. In the Cascade and Sierra foothills, it is found in association with California black oak and ponderosa pine as far south as Kern County, where it gives way to other southern California oaks, mainly the blue oak-digger pine sites.

Oregon white oak has been a useful tree over the centuries. Indians have long used it as a food source, using the acorns as a staple winter diet. Early white settlers used its heavy hard wood to make implements for farming and for building houses and barns where oak strength was needed.

As settlement continued and land cleared, many groves were cut for firewood and others simply disposed of by piling and burning. At first, the hill fields were cropped to grain, then as the valley floors were drained and cleared, the hill fields reverted back to pasture or were allowed to revegetate to oak, pine and fir. Today, especially in the Willamette Valley and throughout western Oregon and northwestern California, many white oak groves remain as remnants of early clearing or naturally seeded or sprouted stands on former cropland or pasture.

Since the oil crisis of the early seventies, Oregon white oak, along with other species, has enjoyed a resurgence of use for firewood. It has steadily risen in value and is considered a premier fuel along with other oaks and madrone.

Considerable interest has arisen regarding its volume and growth. Not much mensurational research has been developed regarding growth and yield. A few published research papers briefly mention it. In California, Hornibrook[1/] and others did some early work regarding oak volumes including Oregon white oak. Along with Schnur's[2/] work from the Midwest, most of what is known about white oak volume and yield is extrapolated from these publications. Recently, Pillsbury[3/] has begun to include Oregon white oak in his studies in southern California (personal communication).

California soils containing Oregon white oak include the mesic and thermic temperature regimes of lithic xerochrepts in the northern interior. There, the white oaks are generally mixed in with blue oaks and conifers on these soils. In the

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northern California coast range, the representative mesic soils include typic haploxerolls, typic haploxeralfs, dystric xerocrepts, and ultic argixerolls. Height-age measurements in Mendocino County indicate a range in oak site index of low to medium when compared to Schnur's data.

Washington soils supporting white oak include mesic temperature regimes of pachic ultic haploxerolls and umbric vitrandepts. These stands grow at about the same rate as those found in the Willamette Valley.

The author has examined Oregon white oak stands in the Willamette Valley for the past two years, and made numerous measurements along with staff members of the Oregon SCS. The stands seem to separate into two distinct groups -- hill stands and valley stands. The hill stands are generally on shallow or heavy soils, often on south or west slopes, or drier positions facing the valley floor. They tend to be short, dense, and of small diameter. Many are sprouts from earlier harvest. They tend to be extensive, and continue until giving way to deeper soils or higher precipitation zones where Douglas-fir can survive and grow faster than oak. On the valley floor, large trees found in groves dot the area, former remnants of early groves, or woodlots left to grow. These are the best sites found, and contain trees of good form and size. A number of stands were observed on several soils series in the Willamette Valley. These are all wet in winter and dry in summer. Moisture stress limits these soils to oak primarily, but they will support Douglas-fir or ponderosa pine with careful management.

Valley Soils	Hill Soils
Amity	Carlton
Dayton	Helmick
Woodburn	Willakenzie
	Yamhill

These soils vary in productivity from moderately low to medium. The lowest site observed is Willakenzie and the highest is Woodburn. Rating these soils by Schnur's upland oaks study, the site index varies from 47 (50 year base) to 68 (best site) for Woodburn. Rating these soils by actual yield as found by field examination, the productivity varies from 33 cu ft/ac/yr to 70 cu ft/ac/yr. The highest yield, per acre per year actual growth, was found in a Helmick stand about a century old, followed closely by a Woodburn stand of equal age. As a group, the Woodburn stand field plots contained the highest yields.

Using Hornibrook's cordwood volume tables for white oak, the yields varied from about 15 cords per acre on young stands on Carlton soils to over 100 cords per acre on a Woodburn site 135 years of age.

In lieu of locally developed site, yield and volume tables, Schnur's and Hornibrook's tables should be used to approximate growth and yield of Oregon white oak (see attached).

1/ Hornibrook, E. M.; Larson, R. W.; Van Akkeren, J. J.; Hasel, A. A., Board Foot and Cubic Foot Volume Tables for some California Hardwoods, Forest Res. Notes No. 67, Calif. Forestry & Range Exp. Sta., USFS, Berkeley, CA, 1950.

2/ Schnur, Luther G., Yield, Stand & Volume Tables for Even-Aged Upland Oak Forests, Tech. Bull. 560, Apr. 1937, USDA, Forest Service, Washington, D. C.

3/ Pillsbury, Norman H., Hardwood Stand Density Characteristics for Central Coast Counties in Calif., Central Coast Resource Consv. & Developmt Area, Calif., July 1978.

TABLE 5.—*Total height of average dominant and codominant oak*

Total age (years)	Total height by site index[1]—					Total age (years)	Total height by site index—				
	40	50	60	70	80		40	50	60	70	80
	Feet	*Feet*	*Feet*	*Feet*	*Feet*		*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
10	8	13	17	21	26	60	45	56	67	78	89
15	12	18	24	29	35	65	46	58	69	81	92
20	17	23	30	36	43	70	48	60	71	83	95
25	21	28	35	42	50	75	49	61	73	85	97
30	25	33	41	48	56	80	50	62	75	87	99
35	29	38	46	54	63	85	51	63	76	89	101
40	33	42	51	60	69	90	52	64	77	90	103
45	37	46	56	65	75	95	52	65	78	91	104
50	40	50	60	70	80	100	53	66	79	92	105
55	43	53	64	74	85						

[1] Total height of average dominant and codominant oak at 50 years.

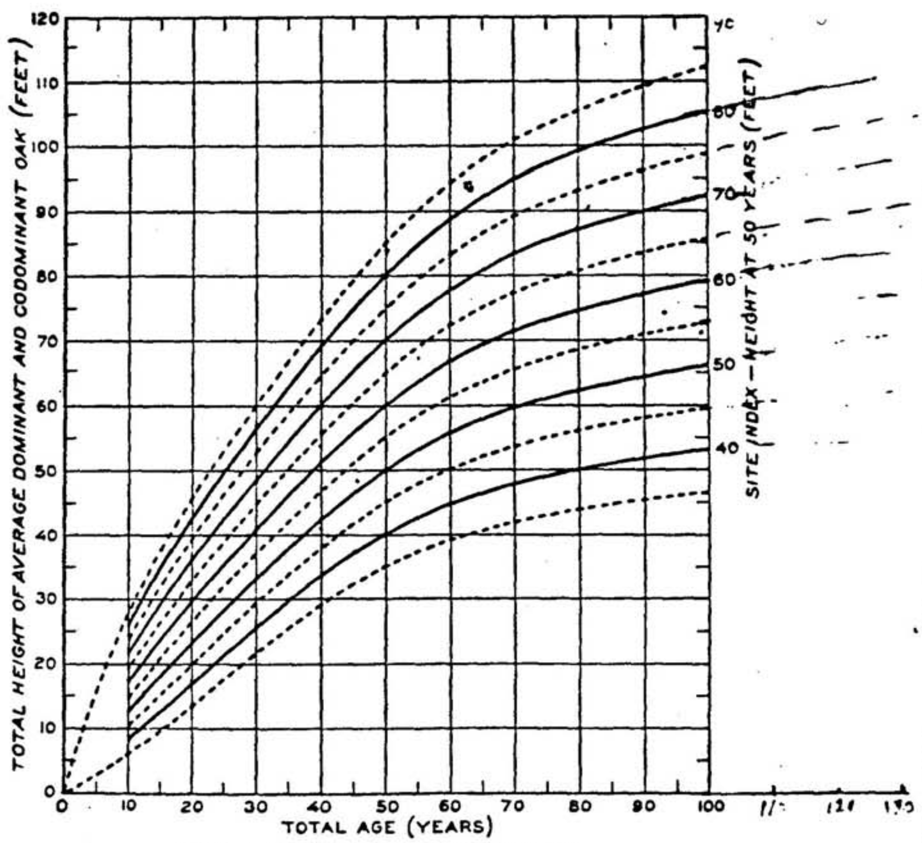

FIGURE 2.—Height curves used for site classification.

(Table 5 and Figure 2 are from Schnur's Upland Oaks bulletin.)

Table 6.- Form-class Volume Table for Oregon White Oak
CUBIC FEET INSIDE BARK BETWEEN STUMP AND
4-INCH TOP I.B.
Form Class 63

D.B.H.: in : inches:	Volume (cubic feet) by total height in feet									:Basis :No. of :trees
	20	30	40	50	60	70	80	90	100	
6	1.4	1.8	2.2	2.5						13
8	2.9	3.7	4.4	5.0						11
10	4.9	6.3	7.5	8.6	9.6					9
12	7.7	9.8	11.7	13.3	14.9	16.3	18.0			9
14	11.2	14.3	17.0	19.4	21.6	23.7	25.7			17
16	15.5	19.7	23.5	26.8	29.9	32.8	35.6	39.0		9
18		26.3	31.2	35.7	39.9	43.7	47.4	50.9	550	7
20		33.9	40.4	46.2	51.5	56.5	61.2	65.7		12
22		42.8	50.9	58.2	64.9	71.2	77.2	82.8	88.2	4
24		52.9	62.9	71.9	80.2	88.0	95.3	102.	109.	1
26		64.3	76.4	87.4	97.5	107.	116.	124.	132.	3
28		76.9	91.5	105.	117.	128.	139.	149.	159.	2
30			108.	124.	138.	151.	164.	176.	187.	4
32			127.	145.	161.	177.	192.	206.	219.	2
34				168.	187.	205.	222.	239.	254.	-
36				193.	215.	236.	255.	274.	292.	1
38				220.	245.	269.	291.	313.	333.	-
40				249.	278.	305.	330.	354.	377.	1
42				280.	312.	343.	371.	399.	425.	-
44					350.	384.	416.	447.	476.	-
46					390.	428.	464.	498.	530.	-
48					432.	474.	514.	552.	588.	-
Basis	4	19	29	22	12	11	7	1	-	105

Block indicates extent of basic data.
Form Class: Diameter inside bark at top of first 16.3-foot log divided by diameter outside bark at breast height, the result being multiplied by 100. Table above is for the average Form Class of the sample trees. Factors in the tabulation on the reverse side are to be used to get volumes for other Form Classes.
Table constructed from the equation: Logarithm cubic ft. vol. = 2.4306 (logarithm d.b.h. inches) + 0.6008 (logarithm total height ft.) + 0.0037 (form class) - 2.7519.
Basis: 105 trees measured in northwestern California.
Volume is cubic foot contents, excluding bark, of main stem and branches between stump and 4-inch top inside bark; stump height varied from 11 to 17 inches for trees up to 12 inches d.b.h., 18-inch stump for trees 12 or more inches d.b.h.
Average deviation of individual tree volumes from values estimated by the equation: ± 17.2 percent.
Aggregate difference: estimated values 0.37 percent high.

(Table 6 is from Hornibrooks' volume tables for California hardwoods.)

MULTIPLIERS FOR OTHER FORM CLASSES

Factors by which to multiply volumes in the average table to obtain volumes for other Form Classes

Form Class (Tens)	(Units) 0	1	2	3	4	5	6	7	8	9
	Factors									
4	0.82	0.83	0.84	0.84	0.85	0.86	0.87	0.87	0.88	0.89
5	0.90	0.90	0.91	0.92	0.93	0.93	0.94	0.95	0.96	0.97
6	0.97	0.98	0.99	1.00	1.01	1.02	1.03	1.03	1.04	1.05
7	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15
8	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25
9	1.26	1.27	1.28	1.29	1.30	1.31	-	-	-	-

Example: Volume of 34-inch, 70-foot tree of form class 80 =
205 x 1.16 = 237.8

WOOD

G. Example Problems Continued

Example Problem #2-

Given- Desired D+X=4

Species	Distance feet	Diameter inches	Condition
Douglas Fir	15	22	Good
Douglas Fir	18	12	Good
Douglas Fir	6	14	Good
Douglas Fir	6	20	Good
Port Orford Cedar	16	8	Poor
Douglas Fir	2	12	Fair
Port Orford Cedar	16	8	Poor
Douglas Fir	2	8	Fair
Douglas Fir	2	8	Fair
Douglas Fir	6	16	Good
Douglas Fir	10	16	Good
Douglas Fir	26	10	Good
White Fir	32	16	Poor
Douglas Fir	2	16	Good
White Fir	24	16	Good
Port Orford Cedar	28	10	Fair
Douglas Fir	24	16	Good
Douglas Fir	36	30	Good
Douglas Fir	30	12	Good
Douglas Fir	8	16	Good

Solution-

OWNER-EXAMPLE 2
ASSISTED BY- B WILSON
DATE-12/16/1985

U S D A S C S
Z I G - Z A G
T R A N S E C T

SPECIES	DIST FT	DIA IN	COND
1. DF	15	22	GOOD
2. DF	18	12	GOOD
3. DF	6	14	GOOD
4. DF	6	20	GOOD
5. POC	16	8	POOR
6. DF	2	12	FAIR
7. POC	16	8	POOR
8. DF	2	8	FAIR
9. DF	2	8	FAIR
10.DF	6	16	GOOD
11.DF	10	16	GOOD
12.DF	26	10	GOOD
13.WF	32	16	POOR
14.DF	2	16	GOOD
15.WF	24	16	GOOD
16.POC	28	10	FAIR
17.DF	24	16	GOOD
18.DF	36	30	GOOD
19.DF	30	12	GOOD
20.DF	8	16	GOOD

S U M M A R Y
AVG SPC=15FT
AVG DBH=14IN
D+X=1
DESRD D+X=4
TREES/AC=194
DESRD/AC=134
EX TREES=59
DIA= 8 TO 30 IN

SPECIES-
75% DF
15% POC
10% WF

QUALITY-
GOOD=65%
FAIR=20%
POOR=15%