

Rangeland and Oak Relationships¹

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Abstract: Hardwood rangelands are becoming an endangered resource on the Central Coast of California. Straightforward inventory processes and management guidelines on which to base sound management decisions provide the landowner the tools to protect and utilize these important hardwood resources. Utilizing a WOODLAND INFORMATION STICK and a ZIG ZAG TRANSECT, landowners can inventory their hardwood range without formidable plot establishment procedures. Utilizing the D+X method of expressing woodland stocking, the inventory results can relate the size of the trees to the growing space available to them. The guideline of forty to sixty percent canopy cover optimizes woodland growth and understory forage productivity. These procedures and stocking guides will assist the landowner to properly manage dense stands of hardwoods to promote hardwood health and a sustained use of the resource for both livestock and wildlife.

This paper outlines inventorying methods, interpretations and application guidelines for the management of coast live oak and blue oak. These methods and management outlines are those used by the US Department of Agriculture Soil Conservation Service. The figures and tables used in this paper are from Soil Conservation Service Handbooks and field investigation, unless otherwise noted.

OAK (*QUERCUS* SPP.)

The oaks are common trees on chaparral and woodland ranges and belong to the beech family. Depending on the species and site conditions, they vary from low shrubs to magnificent trees. The simple, alternate leaves are toothed or lobed, and attached singly on branches. Some oaks shed their deciduous leaves every year, but the leaves of evergreen species persist for two or three years. The flowers are very small and green. The male flowers are hanging tassels, and the females are in clusters at the base of young leaves. The fruits are acorns requiring one to two seasons to mature in the autumn. Nearly all of the oaks produce sprouts after cutting or burning.

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Palatability of oak foliage varies with the species, season, and animal. New growth is preferred, and the foliage of deciduous oaks is more palatable and nutritious than that of evergreen species. The acorns of all oaks are a basic feed in the fall and winter for deer, pigs, doves, quail, turkeys, squirrels and variety of other birds and small mammals. Although the acorns are relatively low in protein, they are high in energy-giving fat and carbohydrates. Both the foliage and acorns are eaten by livestock but are considered only fair as forage. They are high in resins, waxes and tannins which may harm livestock if consumed as a large proportion of their diet.

There are three species of oaks that are of primary concern on the rangelands of this area. Two of these species are discussed in this paper the coast live oak and blue oak. The valley white oak does not normally occur in dense stands. Therefore valley white oak does not require thinning as a management tool to increase both woodland and understory forage production.

Why Is Management Needed?

The occurrence of "dog hair" thickets of both coast live oak and blue oak are too numerous to ignore. They are not always economical to treat, but when they are treated resource productivity increases greatly. Forty to sixty percent canopy cover is optimal to maximize woodland growth and health and understory forage productivity. Oak regeneration is a concern of many landowners today. Seedling and saplings that exist in the "dog hair" community do not mature and often die while still in the sapling stage. Thinning of these stands can be difficult, especially when slopes can exceed 50 percent. The soils can be extremely fragile and highly erosive.

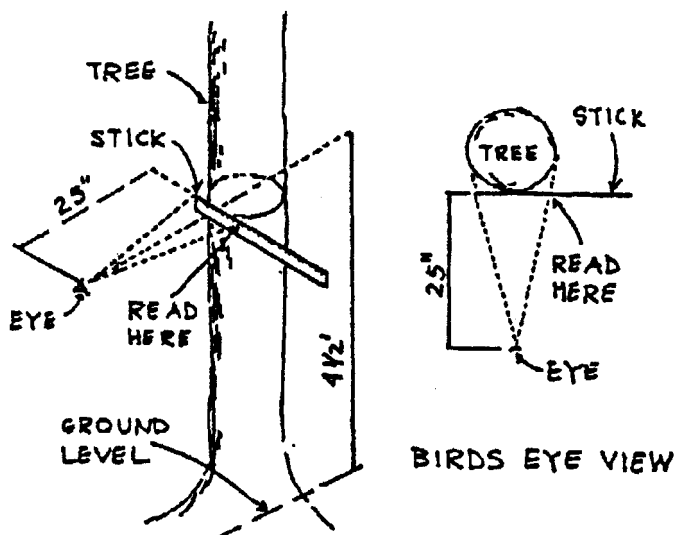
EQUIPMENT

The Woodland Information Stick contains scales for measuring tree diameter and height. This 25 inch woodland management tool also has a table for determining trees per acre from spacing information. A Woodland Information Stick can be obtained from the Yamhill Soil and Water Conservation District, 1120 S. Baker Street, McMinnville, Oregon 97128.

THE INVENTORY

How to Measure Tree Diameter

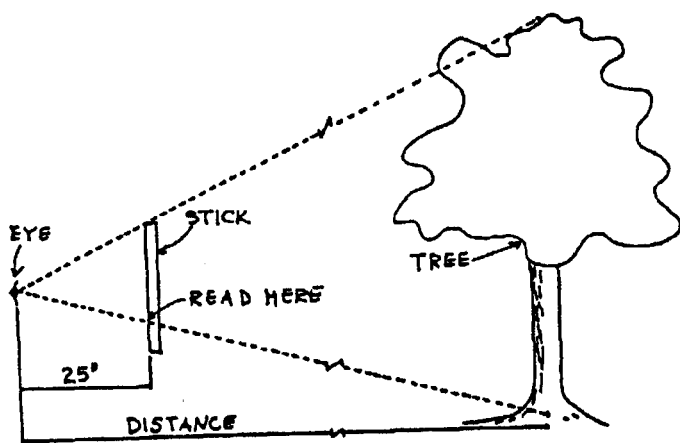
1. Use the "TREE DIAMETER SCALE"



2. Hold the stick horizontally against the tree at 4.5 feet.
3. Adjust the stick so that the left end is even with your line of sight to the left of the tree.
4. Turn your eye, not your head, and read on TREE DIAMETER SCALE the figure crossed by your line of sight to the right side of the tree. This is the diameter of the tree. Many trees are not round in cross-section. Measure them from two sides and use the average.

How to Measure Tree Height

1. Stand where you can see the top and base of the tree.



2. Hold the stick vertically, 25 inches from the eye, the "top" end even with your line of sight to the top of the tree. Where the line of sight to the tree base crosses, the scale reading will be the height of the tree—if you are 100 feet from the tree. At any other distance multiply the scale reading by the distance and point off two places (divide by 100).

Identify Main Stand

The trees which form the main stand are usually the larger ones, the dominant and co-dominant trees. Underneath the main stand, there is a secondary stand, and usually an understory stand made up of suppressed trees, advanced reproduction, and brushy species. Sometimes, there is a secondary stand of trees smaller or larger in size than the main stand. An occasional tree may be borderline between the main stand and the secondary stand. If in your opinion, the tree offers significant competition to the trees in the main stand, consider it as part of the main stand. Don't separate larger trees as a secondary stand unless they are considerably larger and clearly of an earlier generation than the trees of the main stand. If the larger trees are fairly numerous, there may be a question as to which is the main stand. In the case of doubt, consider the larger trees as the main stand.

Stand Examination by Zig Zag Transact

1. Choose a direction of travel which will take you through the woodland so as to see a good cross section of it. You could elect to go in a cardinal direction or toward a visible landmark. On a sunny day, use the sun as a direction marker. Go toward it, away from it, or at some angle to or from it.

2. Select a starter tree. This may be any tree which is a part of the main stand. No measurements are made on the starter tree. It serves only as a point of beginning.

3. At the base of the starter tree, face the chosen direction, and place heels together with feet making a 90 degree angle. A line along the direction of travel bisects the angle (see figure 1).

4. Locate the closest main stand tree, the center of which is within the angle defined by your feet. This is tree one (see figure 1).

5. Pace the distance from the center of the starter tree to the center of tree #1. Determine the species of the tree and measure its diameter with the information stick. Measure tree height and estimate or measure crown diameter. Make any notes regarding tree health and condition.

6. Standing at tree #1, repeat steps 3, 4 and 5, to select, measure and rate tree #2. Continue in this manner until 10 to 20 trees have been examined. The line of travel will continue in a zig zag fashion as shown in figure 2.

7. Skip over openings and clumps or patches of trees not part of and decidedly different in kind or size from the main stand. Do not include spacing measurements to or diameter measurements

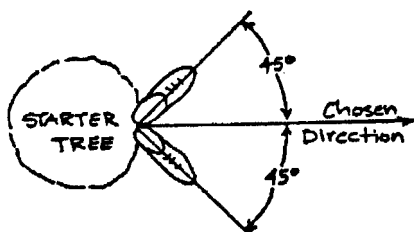


Figure 1—Forming the Angle at the Starter Tree

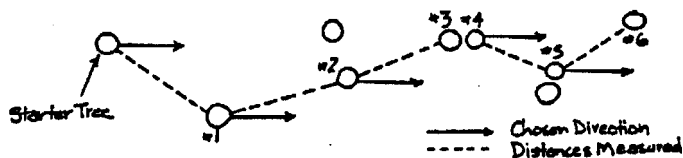


Figure 2—Sequence of Trees and Rules of Tree Selection

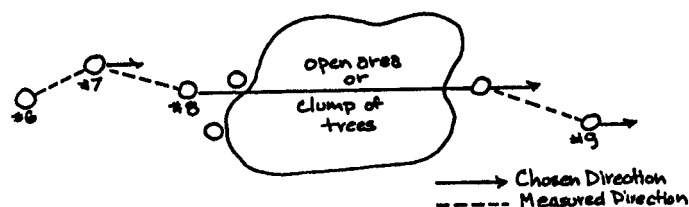


Figure 3—Openings or Clumps of Trees Not Part of the Main Stand

of trees on the edges of openings or clumps. Pass through them on the chosen direction of travel. Commence measurements on the opposite side. See figure 3. Record frequency of openings or groves encountered.

8. Measuring trees with forked bases follow two rules. When the tree forks below the ground, the two forks are counted as two separate trees and are counted or not depending how they occur in relation to your direction of travel. When the tree forks between the ground and 4.5 feet you record the fork with the largest diameter.

Taking a Zig Zag Transact

The closest main stand tree standing within the 90 degree angle projected by the feet, is selected as tree #1. This process is repeated at tree #1 to select tree #2, and so on.

1. Measure each distance from tree center to tree center.

2. When two eligible trees are equidistant, select the one closest to the direction of travel as shown at tree #2.

3. Trees joined at base are considered separate and individual. Both may be counted as #3 or #4. Only one is counted in a situation as shown at #5. Record the fork with the largest diameter.

3'-4840	11'-360	19'-121	88'-55
4'-2722	12'-304	20'-109	30'-48
5'-1742	13'-258	21'-99	32'-42
6'-1210	14'-222	22'-90	36'-34
7'-868	15'-194	23'-83	40'-27
8'-681	16'-170	24'-76	45'-22
9'-538	17'-151	25'-70	50'-17
10'-436	18'-135	26'-65	60'-12

Figure 4—Spacing and No. of Trees Per Acre.

species	dist. dbh height crown				notes
coast live oak	12	12	40	25	split trunk w/ 12" & 8" dbh
coast live oak	10	14	35	30	past small dead snag
coast live oak	24	8	20	18	
coast live oak	10	5	15	12	80% dead
coast live oak	25	8	25	15	
coast live oak	10	7	20	12	split trunk w/ 7" & 5" dbh
coast live oak	29	6	18	10	past understory w/ 2" dbh
coast live oak	18	9	22	20	
coast live oak	10	9	18	22	
coast live oak	21	16	30	35	
totals	169	94	243	199	
ave	17	9.4	24	20	

Figure 5—Field Notes of the Zig Zag Transact.

Table 1—coast live oak gross volume in cubic feet (*Hardwood volume and weight table for California's central coast, Norman H. Pillsbury & Jeffery A. Stephens, CDF, April 1978*)

DBH inches	HEIGHT IN FEET										
	5	10	15	20	25	30	35	40	45	50	55
4	0.6	1.1	1.6	2.0	2.4	2.8					
6	1.2	2.2	3.1	3.9	4.7	5.4	8.2	6.9	7.6		
8	2.0	3.5	5.0	6.3	7.5	8.8	10.0	11.1	12.3	13.4	14.5
10		5.1	7.2	9.1	11.0	12.7	14.5	18.2	17.8	19.4	21.0
12		7.0	9.8	12.4	14.9	17.3	19.6	21.9	24.2	26.4	28.5
14		9.0	12.6	16.0	19.2	22.4	25.4	28.4	31.3	34.1	36.9
16			15.8	20.0	24.1	28.0	31.8	35.5	39.1	42.7	46.1
18			19.2	24.4	29.3	34.1	38.7	43.2	47.8	51.9	56.2
20			22.9	29.1	34.9	40.6	46.1	51.5	56.8	61.9	67.0
22				34.1	41.0	47.6	54.1	60.4	66.6	72.7	78.6
24				39.4	47.4	55.1	62.6	69.9	77.0	84.0	90.9
26				45.1	54.2	63.0	71.6	79.9	88.1	96.1	103.9
28				51.0	61.4	71.3	81.0	90.4	99.7	108.8	117.7
30					68.9	80.0	90.9	101.5	111.9	122.1	132.0
32					76.7	89.2	101.3	113.1	124.8	136.0	147.1
34					84.9	98.7	112.1	125.1	137.9	150.6	162.8
38					93.4	108.6	123.3	137.7	151.8	165.8	179.1
38						118.9	135.0	150.7	166.1	181.2	196.1
40						129.5	147.1	164.2	181.0	197.5	213.8
42						140.5	159.6	178.2	196.4	214.3	231.8
44						161.9	172.5	192.6	212.3	231.6	250.8
46						163.6	185.8	207.5	228.7	249.5	269.9
48							199.5	222.8	245.8	267.9	289.8

THE RESULTS

Summarize the Transact in this Manner

One method of expressing woodland stocking is in terms of D+X and is a spacing term which relates the size of the tree to the growing space available to it. In this formula "D" equals tree diameter and "X" is an added quantity in feet. In the following example the trees average 9" diameter and are spaced 17 feet apart, we say they are spaced at D+8 ($9+8=17$).

The number of trees present per acre is by using the spacing and number of trees table.

Here the spacing was 17 feet. That would be 151 trees per acre. The measured crown diameter averaged 20 feet which calculates to 314 ft. sq. per acre. Now multiply the 314 by trees per acre (151), divide by 43560 feet/acre and multiply the results by 100. This calculates to 109 percent canopy cover.

Utilizing the volume table (Table 1) for coastal live oak, the gross wood volume for the average tree is 8.8 cubic feet. Trees per acre times 8.8 calculates to 1329 cubic feet per acre. The 85 is the volume conversion from the calculated solid wood cubic feet to the stacked wood cord measurement.

These guides are for management directed at full resource productivity:

Recommended Stocking Range

6 to 10 inches	D+15
10 to 15 inches	D+20
15 to 20 inches	D+30

Three major uses of the resource must be kept in mind. These are woodland, livestock forage, and wildlife habitats. Fine tune these guides with the information gathered for crown cover. Remember that a canopy cover of 40 to 60 percent is most desirable to accommodate these three uses simultaneously.

In the example average diameter is 9". Our target is D+15 using the management guide. Tree spacing would need to be 24 feet. Using the spacing and number of trees table we find 76 trees per acre. Thinning objectives for this site would be to remove 75 trees per acre ($151-75=76$).

When trees are harvested, the trees remaining should be healthy, straight and well formed. Trees that remain should not all be of large diameter. Remember your objectives for the land. You are not after even spacing between oaks. Groupings of oaks or groves are usually best for wildlife habitat concerns. You may also want to consider planting some shrub species. These are most commonly absent from the oak woodland in this area due to grazing and dense canopy cover. The last question to ask is, "Do I have free water in the area?" Water is required both for wildlife and well managed livestock grazing.