FORESTRY EXTENSION NOTES

FIREWOOD VOLUME TABLES FOR RED AND WHITE OAK

Even though energy prices are low, firewood is still utilized in Iowa for both home heating and as fireplace wood. The production of firewood permits more intensive woodland management by opening additional markets for material that would normally be left in the woods. To better manage woodlands, the amount of merchantable timber on the site must be determined. Sawtimber volume tables are available, but firewood volume tables for whole trees or the tops are not published for Iowa species. This publication estimates such volumes for red and white oak (Quercus rubra and Q. alba) in standard cords. The equations used to predict volume were developed from actual field measurements on the two species and include a range of diameters and heights.

Tables 1 and 2 show the number of cords of firewood in whole red and white oak trees. If the diameter of the main stem at 4.5 feet above the ground (DBH) and the total height of a tree are measured, the tables can be used to estimate the number of cords of firewood in a tree. For example, a red oak that is 60 feet tall and 16 inches in diameter should make about 0.5 cords of firewood.

Tables 3 and 4 show the number of cords of firewood in just the tops of red oak and white oak trees. These tables can be used when the merchantable bole or main stem of trees is sold for sawtimber and only the tops are available for firewood. To use these tables, measure DBH, total tree height, and merchantable height (the length of the stem saleable for sawlogs) for each tree. For example, a white oak tree that is 20 inches in diameter and 70 feet tall with a merchantable height of 24 feet should have about 0.62 cords of firewood left after the mer-chantable stem has been taken for sawlogs.

The values in these tables are just estimates; a particular tree will typically not have exactly the volume listed in the tables. However, if a number of trees are considered, the per tree volume will be close to the estimate

To use these volume tables, it is important to know how various terms are defined. The unit of measure in these tables is the standard cord. A standard cord is a stack of wood 4 feet high, 4 feet wide, and 8 feet long comprised of wood and air spaces totaling 128 cubic feet. For these volume tables the wood was cut to 16-inch lengths and split to a 6-inch maximum width. Limb wood to a 2-inch diameter was included. Fire-wood volume produced depends upon a variety of harvesting and processing factors. These tables should only be used for red and white oak; other species may have dramatically different firewood volumes.

To help decide whether the main stem of stand-ing trees should be marketed as firewood or sold as sawtimber, compare the price offered for an equal volume of fire-wood vs. sawtimber. Lumber and veneer logs are sold based on a price per thousand board feet. For the species and sizes of trees considered here, there are approximately 450 board feet of lumber in a cord. Therefore, if the price offered per cord for stand-ing timber is greater than 45 percent of the price offered per thousand board feet, sell the main stem for firewood. Conversely, when the price per cord is less than 45 percent of the price per thousand, sell the main stem as sawlogs. For example, if the price per cord is $30 and the price per thousand board feet is $60, you would realize a greater return by selling the main stem as firewood (30/60 = 0.50). On the other hand, if the price per cord was only $20 and the price for sawlogs was $80, you would be advised to sell the main stem as sawlogs (20/80 = 0.25).

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Table 1. Volume of firewood in standard cords for whole red oak trees.

Tree DBH (inches)	TOTAL HEIGHT (feet)							
	20	30	40	50	60	70	80	90
4	.01	.01	.02	.02	.03			
6	.02	.03	.04	.05	.06	.07		
8	.04	.06	.08	.10	.12	.14		
10	.06	.09	.12	.15	.19	.22	.25	.28
12		.13	.18	.22	.27	.32	.37	.42
14		.18	.25	.31	.38	.45	.51	.58
16			.33	.41	.50	.59	.68	.77
18			.42	.53	.64	.76	.87	.99
20				.66	.81	.95	1.09	1.24
22				.81	.99	1.16	1.34	1.51
24				.98	1.18	1.39	1.61	1.82
26				1.16	1.40	1.65	1.90	2.16
28				1.35	1.64	1.93	2.33	2.52
30				1.57	1.90	2.24	2.58	2.92

*Volume in cords = $0.00001847 \times (DBH^2 \times \text{Total Height})^{1.0592}$

Table 2. Volume* of firewood in standard cords for whole white oak trees.

Tree DBH (inches)	TOTAL HEIGHT (feet)							
	20	30	40	50	60	70	80	90
4	.01	.01	.01	.02	.02			
6	.02	.03	.03	.05	.06	.07		
8	.03	.05	.07	.09	.11	.13		
10	.05	.08	.11	.15	.18	.22	.25	
12		.12	.17	.22	.28	.33	.38	.44
14		.18	.25	.32	.39	.47	.55	.63
16			.34	.43	.54	.64	.75	.86
18			.44	.57	.71	.85	.99	1.13
20				.73	.90	1.08	1.26	1.44
22				.91	1.13	1.35	1.57	1.80
24				1.12	1.38	1.65	1.92	2.21
26				1.34	1.66	1.98	2.32	2.66
28				1.59	1.97	2.36	2.75	3.16
30				1.87	2.31	2.77	3.23	3.70

*Volume in cords = $0.00000743 \times (DBH^2 \times \text{Total Height})^{1.1608}$

Table 3. Volume* of firewood in standard cords for the tops of red oak trees.

Tree DBH (inches)	Length of stem removed (feet)	TOTAL HEIGHT (feet) 40	50	60	70	80	90
12	8	.16	.20	.24	.28		
	16		.16	.20	.24		
14	8	.20	.26	.31	.36	.42	
	16	.14	.20	.25	.30	.36	
	24		.14	.19	.25	.30	
16	8	.25	.32	.39	.46	.53	.60
	16	.17	.24	.31	.38	.46	.53
	24		.17	.24	.31	.38	.45
	32			.16	.23	.30	.37
18	8	.30	.39	.48	.57	.66	.75
	16	.21	.30	.39	.48	.57	.65
	24		.20	.29	.38	.47	.56
	32			.19	.28	.37	.46
	40				.18	.27	.36
20	16		.36	.47	.58	.69	.80
	24		.24	.35	.46	.57	.68
	32			.23	.34	.45	.56
	40				.22	.33	.44
22	16		.42	.56	.69	.82	.96
	24		.28	.41	.54	.68	.81
	32			.27	.40	.53	.67
	40				.25	.39	.52
24	16		.49	.65	.81	.97	1.13
	24		.32	.48	.64	.80	.96
	32			.31	.47	.63	.79
	40				.29	.45	.61
26	24		.37	.56	.74	.93	1.12
	32			.35	.54	.73	.91
	40				.34	.53	.71
28	24			.64	.86	1.07	1.29
	32			.40	.62	.84	1.05
	40				.39	.60	.82

*Topwood Volume (cords) = 0.043 + (.00002762 X DBH^2 X Total Height)
- (0.000036282 X DBH^2 X Length of Stem Removed)

Table 4. Volume* of firewood in standard cords for the tops of white oak trees.

Tree DBH (inches)	Length of stem removed (feet)	TOTAL HEIGHT (feet) 40	50	60	70	80	90
12	8	.04	.10	.16	.22		
	16		.06	.11	.17		
14	8	.11	.19	.27	.35	.43	
	16	.05	.13	.21	.29	.37	
	24		.07	.15	.23	.31	
16	8	.19	.29	.39	.50	.60	.70
	16	.11	.21	.32	.42	.52	.63
	24		.14	.24	.34	.45	.55
	32			.16	.27	.37	.47
18	8	.28	.41	.54	.67	.80	.93
	16	.18	.31	.44	.57	.70	.83
	24		.21	.34	.47	.61	.74
	32			.25	.38	.51	.64
	40				.28	.41	.54
20	16		.42	.58	.74	.90	1.06
	24		.30	.46	.62	.78	.94
	32			.34	.50	.66	.82
	40				.38	.54	.70
22	16		.54	.73	.93	1.12	1.32
	24		.39	.59	.78	.98	1.17
	32			.44	.64	.83	1.03
	40				.49	.69	.88
24	16		.67	.90	1.13	1.36	1.59
	24		.50	.73	.96	1.19	1.42
	32			.55	.79	1.02	1.25
	40				.61	.85	1.08
26	24		.61	.88	1.15	1.42	1.69
	32			.68	.95	1.22	1.49
	40				.75	1.02	1.29
28	24			1.04	1.36	1.67	1.99
	32			.81	1.12	1.44	1.75
	40				.89	1.20	1.52

*Topwood Volume (cords) =-0.147 + (0.000040253 X DBH^2 X Total Height)
- (0.000036282 X DBH^2 X Length of Stem Removed)