Standing Tree Weight and Volume Tables for Natural Loblolly Pine at the First Delivery Point

by
G. Shane Lee
Robert C. Parker

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STANDING TREE WEIGHT AND VOLUME TABLES

FOR

NATURAL LOBLOLLY PINE

AT THE FIRST DELIVERY POINT

by

G. Shane Lee

and

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Forest and Wildlife Research Center

Mississippi State University

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INTRODUCTION

There has been much research on generating volume and weight equations for many southern tree species. Most research on weight equations was conducted in the 1970's and 1980's when weight scaling of trees and logs had become standard practice in the Southern pulp and paper industry (Saucier and Clark 1985). This practice created a need for weight tables, equations, and conversion factors.

Green wood is preferred by most mills because it can be stored longer at the wood yard without deteriorating, which is of great concern in warm and humid regions (Avery and Burkhart 2002). Green weight functions and tables for standing trees are available; however, most equations predict green weight immediately after felling rather than delivered weight at the wood yard or mill. It was the intent of this study to simulate green weight at the wood yard for use in field inventory procedures. However, time and costs limitations prevent such a study when dealing with multiple-product timberstands. Therefore, trees were weighed at the next best place, the loading deck, which is referred to as the first delivery point for the remainder of this paper. Loss of bark, wood, or moisture during felling, skidding, loading, and hauling, may result in an inventory to delivery deficit at the mill. There are no studies to quantify differences between delivered tree functions and standing tree green weight functions. Therefore, the intent of this research was to develop compatible weight and volume equations that predict delivered weight and volume at the first delivery point. The intent of this bulletin is to provide weight and volume tables for loblolly pine (*Pinus taeda* L.) growing in mature, fully-stocked, natural stands. Field foresters and foresters alike should find these tables useful for looking up volumes and weights to common merchantability limits.

METHODS

Site Description

The study area was located on the John W. Starr Memorial Forest in Oktibbeha County, Mississippi. During 2000, three stands were selected from the forest and consisted of predominantly mature, natural loblolly pine sawtimber ranging from 40 - 85 years of age, 80 - 120 trees per acre, and 90 - 110 ft^2 of basal area per acre. Stands were planned for harvest in the fall of 2000.

Measurements

Ninety-two trees were initially selected for sample trees. However, some were lost during harvesting resulting in 87 sample loblolly pine trees. Trees selected from each stand covered a wide diameter distribution. Criteria for selection of sample trees included:

- no forks or broken tops
- little or no fusifom rust (*Cronartium quercuum f. sp. fusiforme*)
- no "severe" crooks.

Sample trees ranged in size of 4 - 29 inches in diameter at breast height (DBH) and 39.2 - 115.8 ft in total height (TH).

Sample trees were measured standing and after felling. Standing trees were tagged and numbered above breast height with bright red paint so they could be easily detected before and after felling. A red line was sprayed around breast height for detection after felling. Diameter at breast height was measured with a diameter tape, and height with the Haglöf Forestor™ Vertex III Hypsometer.

After felling, profile measurements were taken. Tree segments were measured with a logger's tape, and diameter with a caliper, perpendicular to the felled stem. Bark thickness, obtained with a bark gauge, was used to estimate diameter inside bark (dib).

After being skidded to the loading deck, de-limbed, and topped, sample trees were

measured for length to the cutoff point, for diameter outside bark (dob) at the cutoff point, and weighed individually. The loader operator picked up each log or tree segment separately while weighing was completed. A Dillon (ED-2000 Electronic Dynamometer with HR-2000 Remote; http://www.dillon-force.com/) load cell was used to obtain stem weights to the nearest 5 lbs. The load cell had an accuracy of 0.10% of the 20,000 lb load capacity.

RESULTS

Equations of the combined variable form were constructed from volumes computed from profile equations. A nonlinear, combined variable equation with an exponential term was chosen to predict weight and volume of loblolly pine:

$$Y = \beta_0 \left(DBH^{\beta_1} MH^{\beta_2}\right) e^{\beta_3 \left(\frac{MTD}{DBH}\right)^{\beta_4}} \qquad (1)$$

where: Y = tree weight or volume,
MH = merchantable height,
MTD = merchantable top-diameter, and
β_i = regression parameters to be estimated.

The exponential term allows the user to predict volume or weight to practically any MTD, making it a more versatile model.

Sample tree weights and volumes were fitted to Equation 1. The resulting regression equation coefficients and fit statistics are given in Table 1. Weight data were obtained from individually weighed trees, whereas volume data were computed from profile equations. Hence, fit statistics for volume equations were exceptionally good.

The model fit the data reasonably well and was logical. However, coefficients, β_3 and β_4, for the exponential term in the weight equation were somewhat difficult to estimate. These parameter estimates were important to the rationality of the model, and they would not converge to logical estimates due to a lack of observations. Therefore, coefficients of the exponential term for the weight equation were fixed to have the same relationship as cubic foot volume equation coefficients. This gave satisfactory results when compared to other green weight equations. In conclusion, all equations performed well for the sampled dataset and should be adequate for similar stands.

User Weight and Volume Tables

Based on the equations and tables presented in this bulletin, users must specify DBH, MH, and MTD. Tables 2 - 10 give the weight in tons and volume in cubic feet (ob), cords, Doyle board feet, and Scribner board feet of loblolly pine to a 6- and 8-inch MTD.

Table 1. Regression equation coefficients and fit statistics for predicting weight and sample profile volumes for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

	Weight and Volume Equations*						
Coefficients	Pounds	Ft^3 ob	Ft^3 ib	Cords	Doyle BF	Scribner BF	Int-¼" BF
β_0	0.284043	0.004315	0.003207	0.000117	0.001102	0.004858	0.007174
β_1	1.993407	2.012104	2.028062	1.651819	2.684712	2.282177	2.170757
β_2	0.866926	0.896237	0.923953	0.928341	1.094743	1.074633	1.084732
β_3	0.500000	0.498399	0.508773	0.465495	1.002157	0.881074	0.862677
β_4	1.140000	1.149355	1.136078	1.06535	2.052055	1.897239	1.890456
n	103	568	568	568	394	394	394
S_{yx}	451.677	0.705	0.579	0.010	12.162	8.550	6.721
I^2	97.46%	99.99%	99.99%	99.97%	99.89%	99.95%	99.97%

$$*Y = \beta_0 \left(DBH^{\beta_1} MH^{\beta_2}\right) e^{\beta_3 \left(\frac{MTD}{DBH}\right)^{\beta_4}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, *MTD* is merchantable top-diameter, and β_i are parameter estimates.

Table 2. Predicted weight in tons to a 6-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 6" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Tons*								
10	0.205	0.291	0.373	0.453	0.530	0.606	0.681	0.754	0.826
11	0.240	0.342	0.438	0.532	0.623	0.712	0.800	0.886	0.970
12	0.279	0.397	0.509	0.618	0.724	0.827	0.929	1.029	1.127
13	0.321	0.456	0.586	0.711	0.832	0.951	1.068	1.183	1.296
14	0.366	0.520	0.668	0.810	0.949	1.085	1.218	1.349	1.478
15	0.414	0.588	0.755	0.916	1.073	1.227	1.377	1.525	1.671
16	0.465	0.661	0.848	1.029	1.205	1.378	1.547	1.713	1.877
17	0.519	0.738	0.947	1.149	1.346	1.538	1.727	1.912	2.095
18	0.576	0.819	1.051	1.275	1.493	1.707	1.917	2.123	2.326
19	0.636	0.904	1.160	1.408	1.649	1.885	2.116	2.344	2.568
20	0.699	0.994	1.276	1.548	1.813	2.072	2.326	2.577	2.823
21	0.766	1.088	1.396	1.694	1.984	2.268	2.547	2.820	3.090
22	0.835	1.186	1.523	1.848	2.164	2.473	2.777	3.075	3.369
23	0.907	1.289	1.654	2.007	2.351	2.687	3.017	3.341	3.661
24	0.982	1.396	1.792	2.174	2.546	2.910	3.267	3.619	3.965
25	1.061	1.507	1.934	2.347	2.749	3.142	3.528	3.907	4.281
26	1.142	1.623	2.083	2.527	2.960	3.383	3.798	4.207	4.609
27	1.226	1.743	2.237	2.714	3.179	3.633	4.079	4.518	4.950
28	1.314	1.867	2.396	2.907	3.405	3.892	4.370	4.840	5.302
29	1.404	1.996	2.561	3.107	3.640	4.160	4.671	5.173	5.667
30	1.498	2.128	2.731	3.314	3.882	4.437	4.981	5.517	6.045

$$*Y = \left[0.284043 \left(DBH^{1.993407} \, MH^{0.866926} \right) e^{0.5\left(\frac{MTD}{DBH} \right)^{1.14}} \right] \Big/ 2000 \; lbs / ton$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 3. Predicted weight in tons to an 8-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 8" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Tons*								
10	0.228	0.324	0.416	0.505	0.591	0.676	0.759	0.840	0.920
11	0.265	0.377	0.483	0.586	0.687	0.785	0.881	0.976	1.069
12	0.305	0.433	0.556	0.675	0.790	0.903	1.014	1.123	1.231
13	0.348	0.495	0.635	0.770	0.902	1.031	1.158	1.282	1.405
14	0.394	0.560	0.719	0.872	1.022	1.168	1.311	1.452	1.591
15	0.443	0.630	0.809	0.981	1.149	1.313	1.475	1.633	1.789
16	0.496	0.704	0.904	1.097	1.284	1.468	1.648	1.825	2.000
17	0.551	0.783	1.004	1.219	1.428	1.632	1.832	2.029	2.223
18	0.609	0.866	1.111	1.348	1.579	1.804	2.026	2.244	2.458
19	0.670	0.953	1.223	1.484	1.738	1.986	2.230	2.469	2.706
20	0.735	1.044	1.340	1.626	1.904	2.177	2.444	2.706	2.965
21	0.802	1.140	1.463	1.775	2.079	2.376	2.668	2.955	3.237
22	0.873	1.240	1.591	1.931	2.261	2.585	2.902	3.214	3.521
23	0.946	1.344	1.725	2.093	2.452	2.802	3.146	3.485	3.818
24	1.022	1.453	1.865	2.263	2.650	3.029	3.401	3.766	4.126
25	1.102	1.566	2.010	2.439	2.856	3.264	3.665	4.059	4.447
26	1.184	1.683	2.160	2.621	3.070	3.509	3.940	4.363	4.780
27	1.270	1.805	2.316	2.810	3.292	3.762	4.224	4.678	5.126
28	1.359	1.931	2.478	3.006	3.521	4.025	4.519	5.004	5.483
29	1.450	2.061	2.645	3.209	3.759	4.296	4.823	5.342	5.853
30	1.545	2.195	2.817	3.419	4.004	4.576	5.138	5.691	6.235

$$*\bar{Y}=\left[0.284043\left(DBH^{1.993407}\,MH^{0.866926}\right)e^{0.5\left(\frac{MTD}{DBH}\right)^{1.14}}\right]\Big/2000\ lbs/ton$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 4. Predicted volume in cubic feet (ob) to a 6-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 6" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Cubic Feet (ob)*								
10	7	10	13	16	19	22	24	27	30
11	8	12	15	19	22	25	29	32	35
12	10	14	18	22	26	30	33	37	41
13	11	16	21	25	30	34	38	43	47
14	13	18	24	29	34	39	44	49	54
15	14	21	27	33	38	44	50	55	61
16	16	23	30	37	43	50	56	62	68
17	18	26	34	41	48	55	62	69	76
18	20	29	37	45	54	61	69	77	85
19	22	32	41	50	59	68	77	85	94
20	24	35	45	55	65	75	84	94	103
21	27	38	50	61	71	82	92	103	113
22	29	42	54	66	78	89	101	112	123
23	32	46	59	72	85	97	110	122	134
24	34	49	64	78	92	105	119	132	145
25	37	53	69	84	99	114	128	143	157
26	40	57	74	91	107	123	138	154	169
27	43	62	80	98	115	132	149	165	182
28	46	66	86	105	123	141	159	177	195
29	49	71	92	112	132	151	170	189	208
30	53	76	98	119	141	161	182	202	222

$$*Y = 0.004315\left(DBH^{2.012104}\, MH^{0.896237}\right) e^{0.498399\left(\frac{MTD}{DBH}\right)^{1.149355}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 5. Predicted volume in cubic feet (ob) to an 8-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 8" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Cubic Feet (ob)*								
10	8	11	15	18	21	24	27	30	33
11	9	13	17	21	24	28	32	35	39
12	11	15	20	24	28	32	36	40	44
13	12	17	22	27	32	37	42	46	51
14	14	20	25	31	36	42	47	52	58
15	15	22	29	35	41	47	53	59	65
16	17	25	32	39	46	53	59	66	73
17	19	27	36	43	51	59	66	74	81
18	21	30	39	48	57	65	73	81	89
19	23	34	43	53	62	72	81	90	99
20	26	37	48	58	68	79	89	98	108
21	28	40	52	63	75	86	97	108	118
22	30	44	57	69	81	93	105	117	129
23	33	47	61	75	88	101	114	127	140
24	36	51	66	81	96	110	124	137	151
25	38	55	72	88	103	118	133	148	163
26	41	60	77	94	111	127	143	159	175
27	44	64	83	101	119	137	154	171	188
28	48	68	89	108	127	146	165	183	201
29	51	73	95	115	136	156	176	196	215
30	54	78	101	123	145	166	188	208	229

$$*Y = 0.004315\left(DBH^{2.012104}\, MH^{0.896237}\right) e^{0.498399\left(\frac{MTD}{DBH}\right)^{1.149355}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 6. Predicted volume in cords to a 6-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 6" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Cords*								
10	0.090	0.131	0.172	0.211	0.250	0.289	0.327	0.365	0.402
11	0.103	0.150	0.196	0.241	0.285	0.329	0.373	0.416	0.458
12	0.116	0.169	0.221	0.272	0.322	0.372	0.421	0.470	0.518
13	0.130	0.190	0.248	0.305	0.361	0.417	0.472	0.526	0.581
14	0.145	0.211	0.276	0.339	0.402	0.464	0.525	0.586	0.646
15	0.160	0.234	0.305	0.375	0.445	0.513	0.581	0.648	0.714
16	0.176	0.257	0.336	0.413	0.489	0.564	0.639	0.712	0.786
17	0.193	0.281	0.367	0.452	0.535	0.617	0.699	0.779	0.859
18	0.210	0.306	0.400	0.492	0.583	0.672	0.761	0.849	0.936
19	0.228	0.332	0.434	0.533	0.632	0.729	0.825	0.921	1.015
20	0.246	0.359	0.469	0.576	0.683	0.788	0.892	0.995	1.097
21	0.265	0.386	0.505	0.621	0.735	0.848	0.960	1.071	1.181
22	0.285	0.415	0.542	0.666	0.789	0.911	1.031	1.150	1.268
23	0.305	0.444	0.580	0.713	0.845	0.975	1.103	1.231	1.357
24	0.325	0.474	0.619	0.761	0.902	1.041	1.178	1.314	1.449
25	0.346	0.505	0.659	0.811	0.960	1.108	1.254	1.399	1.543
26	0.368	0.536	0.700	0.861	1.020	1.177	1.333	1.487	1.639
27	0.390	0.568	0.742	0.913	1.082	1.248	1.413	1.576	1.738
28	0.413	0.602	0.786	0.966	1.145	1.321	1.495	1.668	1.839
29	0.436	0.635	0.830	1.021	1.209	1.395	1.579	1.762	1.943
30	0.460	0.670	0.875	1.076	1.275	1.471	1.665	1.857	2.048

$$*Y = 0.000117\left(DBH^{1.651819}\, MH^{0.923953}\right) e^{0.465495\left(\frac{MTD}{DBH}\right)^{1.063535}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 7. Predicted volume in cords to an 8-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 8" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Cords*								
10	0.099	0.145	0.189	0.233	0.276	0.318	0.360	0.402	0.443
11	0.112	0.164	0.214	0.263	0.311	0.359	0.407	0.454	0.500
12	0.126	0.183	0.240	0.295	0.349	0.403	0.456	0.509	0.561
13	0.140	0.204	0.267	0.328	0.389	0.449	0.508	0.566	0.625
14	0.155	0.226	0.295	0.363	0.430	0.496	0.562	0.627	0.691
15	0.171	0.249	0.325	0.400	0.473	0.546	0.618	0.690	0.761
16	0.187	0.272	0.356	0.438	0.518	0.598	0.677	0.755	0.833
17	0.204	0.297	0.388	0.477	0.565	0.652	0.738	0.823	0.908
18	0.221	0.322	0.421	0.518	0.613	0.708	0.801	0.894	0.986
19	0.239	0.349	0.455	0.560	0.663	0.766	0.867	0.967	1.066
20	0.258	0.376	0.491	0.604	0.715	0.825	0.934	1.042	1.149
21	0.277	0.404	0.527	0.649	0.768	0.886	1.003	1.119	1.234
22	0.297	0.432	0.565	0.695	0.823	0.950	1.075	1.199	1.322
23	0.317	0.462	0.603	0.742	0.879	1.014	1.148	1.281	1.413
24	0.338	0.492	0.643	0.791	0.937	1.081	1.224	1.365	1.505
25	0.359	0.523	0.684	0.841	0.996	1.149	1.301	1.451	1.600
26	0.381	0.555	0.725	0.892	1.057	1.219	1.380	1.540	1.698
27	0.404	0.588	0.768	0.945	1.119	1.291	1.461	1.630	1.798
28	0.426	0.621	0.812	0.998	1.182	1.364	1.544	1.723	1.900
29	0.450	0.655	0.856	1.053	1.247	1.439	1.629	1.817	2.004
30	0.474	0.690	0.902	1.109	1.314	1.516	1.716	1.914	2.111

$$*Y = 0.000117\left(DBH^{1.651819}\, MH^{0.923953}\right) e^{0.465495\left(\frac{MTD}{DBH}\right)^{1.063535}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 8. Predicted volume in Doyle board feet to a 6-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 6" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Doyle Board Feet*								
12	23	36	49	63	77	91	105	120	134
13	28	43	59	75	92	109	126	143	160
14	33	51	70	89	109	129	149	169	190
15	38	60	82	105	128	151	175	199	224
16	45	70	96	122	149	177	204	232	261
17	52	81	111	142	173	205	237	269	302
18	60	93	128	163	199	235	272	310	348
19	68	106	146	186	227	269	311	354	398
20	78	121	166	212	258	306	354	403	452
21	88	137	187	239	292	346	400	456	511
22	99	154	211	269	329	389	451	513	575
23	111	172	236	302	368	436	505	574	644
24	123	192	263	336	411	486	563	640	718
25	137	214	293	374	456	540	625	711	798
26	152	236	324	413	505	597	691	787	883
27	167	261	357	456	556	659	762	867	973
28	184	286	392	501	611	724	838	953	1070
29	201	314	430	549	670	793	918	1044	1172
30	220	343	469	599	732	866	1003	1141	1280

$$*Y = 0.001102\left(DBH^{2.684712}\, MH^{1.094743}\right) e^{1.002157\left(\frac{MTD}{DBH}\right)^{2.052055}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 9. Predicted volume in Doyle board feet to an 8-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 8" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Doyle Board Feet*								
12	28	44	60	76	93	110	128	145	163
13	32	51	69	89	108	128	148	169	189
14	38	59	80	103	125	148	172	195	219
15	43	68	93	118	145	171	198	225	253
16	50	78	107	136	166	197	228	259	291
17	57	89	122	156	190	225	260	296	332
18	65	101	139	177	216	256	296	337	378
19	74	115	157	201	245	290	336	382	429
20	83	130	178	227	277	328	379	431	484
21	93	146	199	255	311	368	426	485	544
22	104	163	223	285	348	412	477	542	608
23	116	181	249	317	388	459	531	604	678
24	129	202	276	353	430	509	590	671	753
25	143	223	305	390	476	564	652	742	833
26	158	246	337	430	525	622	720	819	919
27	173	270	370	473	577	683	791	900	1010
28	190	296	406	518	633	749	867	986	1107
29	208	324	444	566	692	819	947	1078	1210
30	226	353	484	617	754	892	1033	1175	1319

$$*Y = 0.001102\left(DBH^{2.684712}\, MH^{1.094743}\right) e^{1.002157\left(\frac{MTD}{DBH}\right)^{2.052055}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 10. Predicted volume in Scribner board feet to a 6-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 8" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Scribner Board Feet*								
12	35	54	74	94	114	135	156	177	198
13	41	63	86	109	133	157	181	206	230
14	47	73	99	126	153	181	209	237	265
15	54	83	114	144	176	207	239	271	304
16	61	95	129	164	200	236	272	309	346
17	69	107	146	186	226	267	308	350	392
18	78	121	165	209	254	300	347	393	440
19	87	135	184	234	285	336	388	440	493
20	97	151	205	261	317	374	432	490	549
21	108	167	228	289	352	415	479	544	609
22	119	184	251	319	388	458	529	601	673
23	131	203	276	351	427	504	582	661	740
24	144	222	303	385	468	553	638	724	811
25	157	243	331	421	512	604	697	791	886
26	171	265	360	458	557	658	759	862	965
27	186	287	391	497	605	714	824	936	1048
28	201	311	424	539	655	773	893	1013	1135
29	217	336	458	582	708	835	964	1094	1225
30	234	362	493	627	763	900	1039	1179	1320

$$*Y = 0.004858\left(DBH^{2.282177}\, MH^{1.074633}\right) e^{0.881074\left(\frac{MTD}{DBH}\right)^{1.897239}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

Table 11. Predicted volume in Scribner board feet to an 8-inch merchantable top for loblolly pine on the John W. Starr Memorial Forest, Oktibbeha County, Mississippi.

DBH (inches)	Merchantable Height to 8" top (16 ft logs and half logs)								
	1	1½	2	2½	3	3½	4	4½	5
	Scribner Board Feet*								
12	42	65	88	112	136	160	185	210	235
13	47	73	100	127	154	182	210	238	267
14	54	83	113	143	174	206	237	269	302
15	60	93	127	162	196	232	268	304	340
16	68	105	143	181	221	261	301	341	382
17	76	117	160	203	247	292	337	382	428
18	85	131	178	226	275	325	375	426	477
19	94	145	198	252	306	361	417	473	530
20	104	161	219	278	339	400	461	523	586
21	115	177	241	307	373	441	509	577	646
22	126	195	265	337	410	484	559	634	710
23	138	213	291	369	449	530	612	695	778
24	151	233	317	403	491	579	668	758	849
25	164	254	345	439	534	630	728	826	925
26	178	275	375	477	580	684	790	896	1004
27	193	298	406	516	628	741	855	971	1087
28	208	322	439	558	678	800	924	1049	1174
29	224	347	473	601	731	863	996	1130	1266
30	241	373	508	646	786	928	1071	1215	1361

$$*Y = 0.004858\left(DBH^{2.282177}\, MH^{1.074633}\right) e^{0.881074\left(\frac{MTD}{DBH}\right)^{1.897239}}$$

where: *DBH* is tree diameter in inches, *MH* is height in feet to specified top-diameter limit, outside bark, and *MTD* is merchantable top-diameter.

SUMMARY

The model chosen for predicting weights and volumes to any MTD was logical and reasonably accurate. However, users should take caution in predicting weights beyond the range of data. No weight data were collected above a 3-inch top for pulpwood size trees, and none were collected above a 6-inch top for sawtimber size trees. As the tree increased in diameter and roughness, so did the cutoff limit.

The main limitation for the weight equation, was a lack of data. This was an operational study where loggers felled trees and assisted researchers with the weighing process. Individual sample trees were not weighed to multiple top-diameters, which is time consuming and expensive. Only tree sections utilized by loggers were weighed. Nonetheless, these models should perform well for loblolly pine trees occurring in older, well stocked, natural stands in Mississippi. With the compatible weight and volume equations, users can compute useful ratios, such as lbs per cubic foot, board feet per cubic foot, and lbs or tons per thousand board feet. Users should apply these equations only to stands that are similar to those in which data were collected.

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