The Rate of Value Increase for Black Cherry, Red Maple, and White Ash

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UNDER the financial-maturity concept, trees are viewed as capital investments that should be liquidated when they fail to yield an acceptable rate of return. Thus trees or stands expected to exceed the minimum acceptable return—because of rapid volume growth or quality improvement—should be left to grow, while those expected to fall below the minimum acceptable return are financially mature, and should be harvested.

To determine whether or not a tree or stand is financially mature, it is necessary to estimate its present value and its expected value at some future date. The original value and the future value are then used to compute the compound interest rate of return.

In this paper we present the dollar values and value increases, as well as the rates of value increase, for three of the most important tree species of the Allegheny Plateau of New York and Pennsylvania: black cherry (*Prunus serotina Ehrh.*), red maple (*Acer rubrum* L.), and white ash (*Fraxinus americana* L.).

This is one of a series of papers presenting annual rates of value increase over a 10-year period for several important northeastern hardwood tree species. The reader who is interested in the details of the procedure for developing and computing the compound interest rates should refer to one of two earlier research papers (*Trimble and Mendel 1969, Mendel and Trimble 1969*). The same methods were used in this work.

DETERMINING THE RATE OF VALUE INCREASE

The rate of value increase, which is the cornerstone of the financial-maturity concept, is determined by three components: (1) the present value of the tree (V_o); (2) the prospective future value of the tree (V_n); and (3) the time period (10 years) considered between the determinations of present value and prospective value (n). From these data, the rate of value increase can be determined by solving for the rate of interest (r) in the compound interest formula:

$$(1 + r)^n = \frac{V_n}{V_o}$$

Present value.—Present value was computed by using lumber grade yields, price relatives, conversion costs, tree volumes, and lumber prices in a manner identical to that described in Research Papers NE-129 and NE-140.

The expected lumber grade yields were obtained for logs of the various species, sizes, and log grades. Data for red maple and white ash were obtained from unpublished reports, while those for black cherry are from Hanks (*1965*). Relative values (log-quality indexes) were then assigned to the logs of various species, sizes, and grades, using ratios of prices for each grade of lumber to the price of No. 1 Common (price relatives). These price relatives (table 1) were calculated from lumber prices reported in the HARDWOOD MARKET REPORT (*Lemsky 1962-66*). The log-quality indexes and log volumes were then used to calculate tree-quality index from felled-tree data for 140 black cherry, 156 red maple, and 111 white ash sample trees in northwestern Pennsylvania.

Once tree-quality indexes (tables 9 to 11) are established, the calculation of present value can be summarized as follows:

1. (Tree Q.I. × price for 4/4 No. 1 C/M) = gross value/M.
2. (Gross value/M − conversion cost/M) = net value/M.
3. (Net value/M × volume in tree) = tree conversion value or present tree value.

The HARDWOOD MARKET REPORT of 6 January 1968 (*Lemsky 1968*) was used to obtain the prices of 4/4 No. 1 Common lumber. These prices were $200/M board feet for black cherry, $180 for red maple and $134 for white ash. Conversion costs were the same as those listed in the research papers previously cited; these data

Table 1.—Lumber price relatives[1]

Species	Lumber grade					
	FAS	SEL	IC	2C	3A	3B
Black cherry	1.47	1.42	1.00	.48	.27	.25
Red maple	1.28	1.22	1.00	.46	.38	.29
White ash	1.57	1.49	1.00	.50	—	.36

[1] Based on 1962-66 *Hardwood Market Report* prices for Appalachian hardwoods (f.o.b. mills in the Johnson City, Tennessee, area), with 4/4 thickness plain-sawed No. 1 Common as the reference grade.

recognize that costs per unit volume are lower for large logs than for small ones. The Girard Form Class 81 volume table (*Mesavage and Girard 1946*) was used in the calculations.

Prospective future value.—Prospective value is the present value plus the increase in value due to diameter growth, increase in volume, and improvement in quality over the next 10 years. Any change in lumber prices or conversion costs would also affect future value; but for this purpose it was assumed that there would be no change.

To compute future value, 10-year diameter growth rates (tables 12 to 14) were applied to the trees in each 2-inch diameter class and each vigor class of each species. Besides increasing in diameter, the tree 10 years hence might improve in butt-log grade and merchantable height. Several possible combinations of butt-log quality and merchantable height were provided for by assuming either no change or an improvement in one or both of these factors. It was assumed that vigor class would remain the same during the next 10 years. Finally, the prospective value of each tree was determined in the same manner as the present value.

Ten-year diameter growth rates were computed from regression equations developed in a field study in the high plateau of northwestern Pennsylvania and adjacent parts of southwestern New York. Sawtimber stands were visited to collect sample tree data from 524 black cherry, 427 red maple, and 277 white ash trees from 12 to 30 inches d.b.h. Diameter growth during the past 10 years was measured from two increment cores on each tree. Bark thickness was measured to account for its increase, and tree vigor (*Trimble 1960*) was judged. There were practically no vigor 4 trees among sawtimber-sized trees, so no computations were made for them. Since it was not possible to collect growth data by site classes, site variation was reduced by limiting the sampling to northern hardwood types. The poorer sites in this area tend to be occupied by other types.

The assumptions regarding height growth over the next 10 years were similar to those used in the two research papers previously cited, but were less restrictive. The following log height increase limitations were set for computation purposes:

Present d.b.h. (inches)	*Tree height classes that will not increase in height in next 10 years (16-foot logs)*
22	1
24	1 and 1½
26	1, 1½, and 2
28	No increase for any tree 28 inches d.b.h. or larger

Maximum log height used in the computations was 64 feet for all species.

The following assumptions were made about changes in butt-log grade:

1. The maximum butt-log grade improvement in 10 years would be one grade class.
2. No butt-log grade improvement would be computed for any tree over 27 inches d.b.h.
3. No trees with butt-log grades poorer than 4 would be considered acceptable. They may be assumed to have no value-increase potential and a zero rate of return.
4. No trees above 15 inches d.b.h. with butt-log grade 4 would be considered acceptable. While such trees may have a small value increase, they would not normally be left in a managed stand.

The computation.—After the values for each combination of present and prospective tree

size and quality were determined, the rate of value increase was obtained by solving the compound-interest formula, using a 10-year time period. These computations were made for over 5,000 combinations of tree characteristics at the beginning and end of the 10-year period.

THE RATES OF VALUE INCREASE

The rate of value increase is affected by the diameter, merchantable height, and quality of the tree at the beginning of the 10-year period, and by the changes in these variables during the period. The rates of value increase are summarized and presented as a range of rates in tables 2 to 4.

Tree earning power is less for trees with larger diameters.—Small sawtimber trees generally have a high rate of value increase because of a low volume and value at the beginning of the period. On the other hand, large trees have greater initial values; so the percentage increases will be smaller, even though the increases in dollar value may be large. For example, a 12-inch grade 3, one-log, vigor-1 red maple may be expected to make a 15.2-percent value increase annually with no change in butt-log grade or height, while a 26-inch tree with otherwise similar characteristics may be expected to increase in value at a rate of only 2.7 percent. The actual dollar amounts of these increases, though, are $1.80 and $9.34 respectively (table 16).

Tree earning power increases markedly with increasing diameter growth rate.—Of two trees that are alike in all other respects, the tree with the faster growth rate will earn a higher rate of return. This is due to the greater accumulation of volume and improvement in inherent quality within a given butt-log grade. Since tree-vigor class estimates diameter growth rate, trees in the higher vigor classes will earn higher interest rates. For example, the rate of value increase for 16-inch, 2½-log white ash trees with butt-log grade 2 that do not increase in butt-log grade or merchantable height is 6.1 percent for vigor 1 trees, 4.8 percent for vigor 2 trees, and 3.2 percent for vigor 3 trees. The actual difference may be even greater because the more vigorous trees have a better chance of improving in grade and log height.

Trees with greater merchantable height usually have slightly higher earning power.—When there is no change in butt-log grade or merchantable height, the increase in earning power due to diameter growth alone is usually about ½ percent greater for 3-log, 16-inch trees of all species than for 1½-log trees. A 16-inch, grade-2, vigor-1 black cherry with 3 logs, for example, earns 6.2 percent interest while a similar tree with 1½ logs earns 5.6 percent interest. An exception is in butt-log grade 3 white ash trees, where the rate of value increase is less for trees that are taller at the start of the 10-year period.

Trees that have an increase in merchantable height have higher earning power.—Since upper logs in these species all have positive values,

Table 2.—Expected rate of value increase for black cherry trees[1]
[In percent]

D.b.h. (inches)	Due to growth only[2]			Due to growth and quality increase		
	Vigor 1	Vigor 2	Vigor 3	Vigor 1	Vigor 2	Vigor 3
14	7-11	5- 8	3- 5	8-38	6-32	4-29
16	5-11	4- 7	3- 6	6-16	5-13	4-11
18	5-10	3- 7	2- 6	5-15	4-11	3-10
20	4-10	3- 6	2- 6	5-14	4-10	3- 9
22	4- 8	3- 5	2- 5	4-11	3- 8	3- 8
24	3- 6	2- 4	2- 4	3- 9	3- 7	2- 6
26	3- 5	2- 4	2- 3	3- 7	2- 6	2- 6
28	2- 3	2	2	([3])	—	—
30	2- 3	2	2	—	—	—

[1] Based on 4/4 factory-grade lumber recovery. These rates can have a variation of 1 to 2 percent due to differences in location, volume estimates, and quality estimates.
[2] For butt-log grade 1 and 2 trees. Rates for grade-3 trees would be slightly higher.
[3] No quality improvement is assumed in trees larger than 27 inches d.b.h.

Table 3.—Expected rate of value increase for red maple trees[1]
[In percent]

D.b.h. (inches)	Due to growth only[2]			Due to growth and quality increase		
	Vigor 1	Vigor 2	Vigor 3	Vigor 1	Vigor 2	Vigor 3
14	7-11	6-10	5- 7	8-20	7-18	6-15
16	5-10	4-10	3- 6	7-16	6-15	5-12
18	4-10	4- 9	2- 6	6-14	5-13	4-10
20	4- 9	3- 9	2- 5	5-13	4-12	3- 8
22	3- 7	3- 5	2- 4	4-10	4- 8	2- 6
24	3- 6	2- 4	1- 3	4- 8	3- 6	2- 5
26	2- 5	2- 4	1- 2	3- 6	3- 5	2- 4
28	2- 3	2	1	([3])	—	—
30	2	2	1	—	—	—

[1] Based on 4/4 factory-grade lumber recovery. These rates can have a variation of 1 to 2 percent due to differences in location, volume estimates, and quality estimates.
[2] For butt-log grade 1 and 2 trees. Rates for grade-3 trees would be slightly higher.
[3] No quality improvement is assumed in trees larger than 27 inches d.b.h.

Table 4.—Expected rate of value increase for white ash trees[1]
[In percent]

D.b.h. (inches)	Due to growth only[2]			Due to growth and quality increase		
	Vigor 1	Vigor 2	Vigor 3	Vigor 1	Vigor 2	Vigor 3
14	7-12	6- 8	4- 6	3-25	4-23	2-20
16	5-11	4- 7	3- 6	3-58	2-53	0-51
18	4-10	3- 7	2- 6	4-31	3-27	1-26
20	4-10	3- 6	2- 5	4-25	3-21	2-20
22	3- 8	3- 5	2- 4	4-17	3-15	2-14
24	3- 6	2- 4	2- 3	4-14	3-13	2-12
26	3- 5	2- 3	1- 3	3-13	3-12	2-11
28	2- 3	2	1	([3])	—	—
30	2- 3	2	1	—	—	—

[1] Based on 4/4 factory-grade lumber recovery. These rates can have a variation of 1 to 2 percent due to differences in location, volume estimates, and quality estimates.
[2] For butt-log grade 1 and 2 trees. Rates for grade-3 trees would be slightly higher.
[3] No quality improvement is assumed in trees larger than 27 inches d.b.h.

those trees that increase in log height earn higher interest rates than those that do not. The difference usually amounts to 1 to 4 percent. A 16-inch, 2-log, vigor-1 black cherry with butt-log grade 1, for example, earns a 5.2-percent return without a height increase; with a 1-log height increase, the rate of value increase is 8.4 percent. Short trees that increase in height have a higher rate of value increase than tall trees having the same height increase because they have less value in the beginning.

Earning power is lower for trees with high initial quality.—Trees with butt-log grade 1 have a lower rate of value increase than similar trees with butt-log grade 2, and the rate for butt-log grade 2 trees is less than for grade 3. Using the 16-inch, 2-log, vigor-1 black cherries for an example again, those with butt-log grades 1, 2, and 3 have 5.2, 5.8, and 7.0 percent rates of value increase, respectively, if there is no change in merchantable height or butt-log grade. Even though the monetary gain of a low-grade tree is often less, the percentage gain in value will be higher because of its lower initial value.

Earning power is greatly increased by improvement in tree quality.—As trees develop, they may be expected to improve in quality.

The most important gains in quality are indicated by a step-up in butt-log grade. For example, a 20-inch, 2-log, vigor-2 black cherry tree with a grade 3 butt log that remains 2-log and grade-3 over the next decade earns 3.7 percent annually. Another tree, similar except that the grade-3 butt log becomes grade 2, has a 6.9-percent rate of return. To disregard quality when logs are sold has the same effect on earning power as the lack of quality improvement.

The probability of butt-log grade improvement decreases with increasing tree size. There may still be grade improvement in upper logs of large trees, however. An average rate if improvement in upper log grades is provided for in the equations used to compute tree-quality indexes.

There is also an improvement in log and tree quality due to increase in size within a given butt-log grade. In two logs of the same grade, or two trees of the same butt-log grade, the one with the larger diameter will, on the average, produce higher grade lumber. These gains in quality are also reflected by the log- and tree-quality indexes.

We have not considered the valuable veneer-grade black cherry logs, but it is apparent that trees with veneer butt logs would have a lower rate of value increase than butt-log grade 1 trees that are otherwise similar. Conversely, trees or stands that have logs coming into veneer grade would be earning very high rates of return.

A large proportion of white ash in the study area is used in the manufacture of baseball bats and tool handles. Such utilization may cause somewhat higher conversion values for white ash, with similar but less marked effects on rate of return as compared to cherry veneer.

TEN-YEAR VALUE INCREASE

The actual dollar increases in conversion value to be expected over a 10-year period are presented in tables 15 to 17. The increases in dollar value do not follow the same pattern as the rates of value increase.

Initial tree diameter has a strong positive effect on actual dollar increases—that is, trees with larger diameters at the beginning of the 10-year period have greater value increases than smaller ones. On the other hand, trees of larger diameters have lower rates of value increase than small trees.

Initial merchantable height has the same positive effect on 10-year value increase as it has on the rate of value increase, but it is much stronger. That is, the difference in earning power between tall and short trees is greater for dollar earnings than for rate of value increase; and this positive trend is more consistent—there are fewer exceptions.

And, like diameter, initial tree quality has a positive effect on 10-year value increase. High-quality trees accumulate more value than low-quality trees, when butt-log quality remains the same during the period. Unlike 10-year value increase, the rate of value increase is lower on high-quality trees than it is on poor ones.

The *changes* in diameter, height, and quality during the 10-year period under consideration have the same effect on dollar earnings as on the rate of value increase. Diameter growth, increases in merchantable height, and improvements in quality all increase earnings in proportion to their extent.

APPLICATION OF FINANCIAL MATURITY

According to the financial maturity concept, the rate of value increase is the criterion of financial maturity. When a tree or stand is expected to earn less than some minimum acceptable rate of return, that tree or stand should be harvested, and the money thus obtained should be invested in other trees or stands or in alternative investments where the minimum acceptable rate of return will be obtained. This is true regardless of the actual dollar increases involved.

For example, assume that a person growing timber must decide which of two stands should be clearcut. One stand, a little younger and smaller than the other, has a current value of $10,000 and is expected to increase in value by $8,800 over the next 10-year period, which amounts to a 6.5-percent rate of value increase. The other stand is somewhat older, has larger trees, and is currently worth $20,000; it is expected to increase $9,600 in value—a 4-percent interest rate.

If the owner can reinvest money where it will earn 5 percent interest, whether it is in timber-growing or in other investments, he may wish to cut the older stand and retain the younger stand for 10 or more years. For him, the 4-percent rate of value increase is not acceptable.

Although the older stand has a greater potential value increment ($9,600 vs. $8,800), the landowner will receive more income if he cuts the older stand and reinvests its value where he can obtain 5-percent interest. The value increase on this $20,000 reinvested at 5 percent would amount to $12,600 in 10 years, compared to $9,600 for the stand if left to grow.

Of course, there are other considerations to be made in cutting decisions, even where multiple uses are not important. The regulation of the cut, for instance, may alter decisions based on financial maturity if the land is being held for continuous production of timber. The costs or ease of regenerating a new stand might affect the comparison of financial returns.

Management practices outside the 10-year time period considered here frequently affect financial-maturity decisions. These data provide a guide to a limited question: Will I earn more over the next 10 years by cutting now, or by not cutting? Costs of growing the tree or stand to its present size are important, but have not been considered here. They are outside the scope of this paper. Neither have the costs or value increases to be expected by cutting 20 or more years from now been considered.

The latter consideration is especially important in the case of even-age management. In management practice, groups of trees are managed as a unit (stand). Intermediate cuttings or thinnings made in stands have the objective of increasing financial returns from the entire stand when evaluated over the period of an entire rotation. Trees are removed during thinnings on the basis of the effect this removal will have on the stand, not on the basis of their own individual financial maturity.

The rigid use of financial maturity as a criterion for which trees to cut in thinnings in typical Allegheny hardwood sawtimber stands would generally produce an undesirable effect on the stand. These stands have a strong component of intolerant species. If financial-maturity criteria are applied, the larger, more valuable trees (those with highest current value and therefore low expected rate of return) are removed. In an even-age stand, this leaves trees that are smaller, but the same age as those removed. The faster-growing trees are often the less-shade-tolerant species. Intermediate or suppressed trees of the intolerant species that are left seldom respond to the thinning with increased growth; in fact, some die. If such thinnings are repeated several times, the effect is a severe high-grading, which leaves poor-vigor intolerants and slower-growing tolerants. The overall financial returns from such a practice have never been evaluated, but they are far different from those to be expected under a more appropriate thinning regime.

For these reasons, the rate of value increase of individual trees should not be used as a criterion for marking in stands of intolerant species under even-age management. Trees to be retained in such intermediate cutting should be selected on some other basis, depending upon stand objectives. In general, leaving trees with the highest expected actual dollar increase will frequently satisfy the silvicultural objectives of the thinning.

The rate-of-value-increase tables (tables 2 to 4) are included in this paper to complete the series of financial maturity guides for northeastern species. They would be appropriate to use where these species occur as a minor component in stands of tolerant species being handled under uneven-age management. The user should recognize that cherry, ash, and red maple trees may not regenerate under uneven-age management, so that these species may gradually disappear from the stand.

DETERMINATION OF STAND FINANCIAL MATURITY

Since the three species that are included in this paper are normally managed under an even-age system, financial maturity data presented here will be most useful in the determination of *stand* rather than individual-tree financial maturity.

In earlier papers of this series on financial maturity of northeastern species, such as Research Papers NE-129 and NE-140 cited above, the detailed rates of value increase were used to determine diameters for financial maturity of each species at three different rates of return. These rates were presented for use in determining average rotation size in even-age stands.

We are including these tables of diameters for financial maturity (tables 5 to 7) to complete the series for possible use where cherry, red maple, or ash trees occur as a minor component of oak or yellow-poplar stands. The diameters listed in the tables are maximum diameters that will earn the indicated interest rate in the next 10 years if no butt-log grade improvement is expected. Smaller diameters

Table 5.—Black cherry d.b.h. for financial maturity, based on value increase determined by diameter growth rate alone on trees with butt-log grades 1 and 2

Vigor class	For return of—		
	2 percent	4 percent	6 percent
	Inches	*Inches*	*Inches*
1	30+	22	16
2	30	17	13
3	27	—	—

Table 6.—Red maple d.b.h. for financial maturity, based on value increase determined by diameter growth rate alone on trees with butt-log grades 1 and 2

Vigor class	For return of—		
	2 percent	4 percent	6 percent
	Inches	*Inches*	*Inches*
1	30+	22	16
2	30+	19	14
3	21	15	—

Table 7.—White ash d.b.h. for financial maturity, based on value increase determined by diameter growth rate alone on trees with butt-log grades 1 and 2

Vigor class	For return of—		
	2 percent	4 percent	6 percent
	Inches	*Inches*	*Inches*
1	30+	22	16
2	27	18	14
3	23	14	—

earn higher rates of interest; larger diameters earn lower rates. Where grade improvement is still occurring, the diameters would be larger than those given.

For this paper, however, we developed a more detailed method of determining the financial maturity of stands. The analysis of stand financial maturity may be made as follows:

1. Using an appropriate sampling technique, tally the sawtimber trees in fixed plots in the stand under consideration. The intensity of sampling will depend upon the area involved, the value of the timber, and the variability within the stand. Variable plots (plots measured with an angle gauge) are not recommended because large trees would be weighted too heavily—they are weighted by volume and value in our method. Data needed include: species, d.b.h. class, present butt-log grade, present merchantable height, vigor class, and the expected butt-log grade and merchantable height 10 years in the future.

2. With these data, record the present value and value increase of each sawtimber tree on the plots, as determined from tables 15 to 17.

3. Sum the present values and value increases and add the two sums to obtain expected future value. Then divide future value by present value.

4. The ratio obtained in step 3 may be used to determine rate of return for the stand by reference to a table of compound interest, such as that of Marty and Neebe (*1966*). An abbreviated compound interest table for a 10-year period is included here for field use:

Ratio $\frac{V_n}{V_o}$	*Rate (percent)*
1.22	2.0
1.28	2.5
1.34	3.0
1.41	3.5
1.48	4.0
1.55	4.5
1.63	5.0
1.71	5.5
1.79	6.0
1.88	6.5
1.97	7.0
2.06	7.5
2.16	8.0

A calculation representing an actual ¼-acre portion of a stand sample is shown in table 8. In actual practice it is not necessary to record all of the data shown in table 8. If present and future values are looked up in the field, it is necessary only to record the initial value and value increase for each tree. Nor is the rate of value increase column necessary. It is included merely to illustrate its inverse relation to value increase.

From the steps outlined above with the sample stand in table 8, the expected future value

Table 8.—Sample of a stand considered for clearcutting under even-age management

Species	D.b.h.	Butt log grade	Merchantable height	Vigor	Future grade	Future height	Initial value	Value increase	Rate of value increase
	Inches		*Feet*			*Feet*	*Dollars*	*Dollars*	*Percent*
Red maple	14	3	32	3	3	32	2.80	2.72	7.0
Red maple	20	1	56	2	1	56	40.24	16.82	3.6
Red maple	12	3	16	3	3	24	.58	1.49	13.6
Red maple	18	1	32	1	1	32	19.71	11.09	4.6
Red maple	14	3	32	1	2	40	2.80	9.97	16.4
Red maple	26	Cull	48	2	Cull	56	0	0	0
Red maple	20	2	48	1	1	48	30.24	25.13	6.2
Red maple	16	1	32	1	1	48	12.84	14.72	7.9
Red maple	14	2	32	2	1	40	5.71	8.93	9.9
Red maple	20	1	56	1	1	64	40.24	24.02	4.8
Black cherry	12	3	32	3	2	40	1.83	5.46	14.8
White ash	14	1	40	3	1	48	6.64	4.14	5.0
Red maple	12	3	16	3	3	24	.58	1.49	13.6
White ash	20	1	64	1	1	64	37.63	19.35	4.2
White ash	16	1	48	1	1	48	13.34	8.91	5.2
Red maple	16	3	48	2	3	48	7.78	6.78	6.5
Red maple	18	1	56	1	1	56	27.18	16.25	4.8
White ash	14	2	32	1	1	40	3.94	8.18	11.9
Red maple	12	4	16	1	3	32	0	3.55	∝
Total	—	—	—	—	—	—	254.08	189.00	—

is \$254.08 plus \$189.00, or \$443.08. The ratio V_n/V_o is \$443.08/\$254.08 = 1.74. Interpolation of the above tabulation shows that a ratio of 1.74 indicates a 5.7-percent rate of return for the stand.

Now, if a forest manager had chosen 6 percent as an acceptable rate of return, he might wish to clearcut this stand if rate of return is his sole criterion. If he has a large property and is regulating the cut to produce a balance of age classes, he should determine the rate of return on several of the most likely candidate stands. He would then select his required acreage for clearcutting from those stands with the lowest rates of return, other considerations being equal (likelihood of obtaining regeneration, etc.).

In this particular sample, there were no tree species other than the three included in this study. Normally a few others, such as beech or sugar maple, will be found—often in the smaller sizes. If there are only a few stems of other species, data for red maple may be used without incurring large errors.

Since these data apply to sawtimber trees only, it is not possible to include the present or future value of smaller trees in the calculations. As long as evaluations are restricted to predominantly sawtimber stands, this omission should have only a minor influence on the overall rate of return. Cordwood values of the 12 6-to 10-inch trees present in the previous example (table 8) could hardly exceed \$8 per acre, versus a value of \$1,016 for the sawtimber. Including this value and its expected increase would not change the expected rate of value increase by more than 0.1 percent.

One final caution is necessary in the use of the data presented in this paper. The values presented are accurate only for the conditions stated; changes in such things as lumber prices, conversion costs, and growth rates would affect the values. Individual managers could obtain more accurate information by recalculating the values, using data appropriate to their own operations. The calculations can be handled by electronic computer, and this procedure is recommended for owners having comparatively large areas under management.

Data for several other species can be developed by using log-quality index tables (*Mendel and Smith 1970*), upper-log grade relationships, and other appropriate data. Details of the methods used were presented in the USDA Forest Service Research Papers NE-129 and NE-140, previously cited.

For those who cannot recalculate the values for themselves, the data presented here may be used directly if the conditions are reasonably similar to those assumed. The stand rates of value increase calculated may not be precise, but the relative rates of two stands thus calculated should still provide a good guide as to which should be harvested first.

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APPENDIX

TREE QUALITY INDEXES

Table 9.—Tree quality index, black cherry

Tree d.b.h. (inches)	Merchantable height to an 8-inch d.i.b. top, in feet						
	16	24	32	40	48	56	64
	BUTT-LOG GRADE 1						
16.0	0.847	0.845	0.843	0.841	0.840	0.838	0.836
18.0	.896	.894	.893	.891	.889	.887	.886
20.0	.946	.944	.942	.940	.939	.937	.935
22.0	.995	.993	.991	.990	.988	.986	.985
24.0	1.045	1.043	1.041	1.039	1.038	1.036	1.034
26.0	1.094	1.092	1.091	1.089	1.087	1.085	1.083
28.0	1.143	1.142	1.140	1.138	1.136	1.135	1.133
30.0	1.193	1.191	1.189	1.188	1.186	1.184	1.182
32.0	1.242	1.241	1.239	1.237	1.235	1.234	1.232
	BUTT-LOG GRADE 2						
14.0	0.742	0.715	0.687	0.660	0.633	0.606	.578
16.0	.796	.769	.742	.715	.687	.660	.633
18.0	.851	.824	.797	.769	.742	.715	.687
20.0	.906	.878	.851	.824	.797	.769	.742
22.0	.960	.933	.906	.878	.851	.824	.797
24.0	1.015	.988	.960	.933	.906	.878	.851
26.0	1.069	1.042	1.015	.988	.960	.933	.906
28.0	1.124	1.097	1.069	1.042	1.015	.988	.960
30.0	1.179	1.151	1.124	1.097	1.069	1.042	1.015
32.0	1.233	1.206	1.179	1.151	1.124	1.097	1.069
	BUTT-LOG GRADE 3						
12.0	0.510	0.498	0.486	0.474	0.462	0.450	0.438
14.0	.561	.549	.537	.525	.513	.501	.489
16.0	.613	.601	.589	.577	.565	.553	.541
18.0	.664	.652	.640	.628	.616	.604	.592
20.0	.715	.703	.691	.679	.667	.655	.643
22.0	.767	.755	.743	.731	.719	.707	.695
24.0	.818	.806	.794	.782	.770	.758	.746
26.0	.870	.858	.846	.834	.822	.810	.798
28.0	.921	.909	.897	.885	.873	.861	.849
30.0	.972	.960	.948	.936	.924	.912	.900
32.0	1.024	1.012	1.000	.988	.976	.964	.952

Table 10.—Tree quality index, red maple

Tree d.b.h. (inches)	Merchantable height to an 8-inch d.i.b. top, in feet						
	16	24	32	40	48	56	64
			BUTT-LOG GRADE 1				
16.0	0.772	0.761	0.751	0.741	0.731	0.721	0.711
18.0	.813	.803	.793	.783	.773	.762	.752
20.0	.854	.844	.834	.824	.814	.804	.794
22.0	.895	.885	.875	.865	.855	.845	.835
24.0	.937	.927	.917	.906	.896	.886	.876
26.0	.978	.968	.958	.948	.938	.928	.918
28.0	1.019	1.009	.999	.989	.979	.969	.959
30.0	1.061	1.051	1.040	1.030	1.020	1.010	1.000
32.0	1.102	1.092	1.082	1.072	1.062	1.052	1.041
			BUTT-LOG GRADE 2				
14.0	0.676	0.655	0.634	0.613	0.593	0.572	0.551
16.0	.719	.699	.678	.657	.636	.615	.595
18.0	.763	.742	.722	.701	.680	.659	.638
20.0	.807	.786	.765	.744	.724	.703	.682
22.0	.850	.830	.809	.788	.767	.746	.726
24.0	.894	.873	.852	.832	.811	.790	.769
26.0	.938	.917	.896	.875	.854	.834	.813
28.0	.981	.961	.940	.919	.898	.877	.857
30.0	1.025	1.004	.983	.963	.942	.921	.900
32.0	1.069	1.048	1.027	1.006	.985	.965	.944
			BUTT-LOG GRADE 3				
12.0	0.491	0.483	0.475	0.467	0.459	0.451	0.443
14.0	.538	.530	.522	.514	.506	.498	.490
16.0	.584	.576	.568	.560	.552	.544	.536
18.0	.631	.623	.615	.607	.599	.591	.583
20.0	.677	.669	.661	.653	.645	.637	.629
22.0	.724	.716	.708	.700	.692	.684	.676
24.0	.770	.762	.754	.746	.738	.730	.722
26.0	.817	.809	.801	.793	.785	.777	.769
28.0	.863	.855	.847	.839	.831	.823	.815
30.0	.909	.901	.893	.885	.877	.869	.861
32.0	.956	.948	.940	.932	.924	.916	.908

Table 11.—Tree quality index, white ash

Tree d.b.h. (inches)	Merchantable height to an 8-inch d.i.b. top, in feet						
	16	24	32	40	48	56	64
	BUTT-LOG GRADE 1						
14.0	0.868	0.863	0.858	0.853	0.847	0.842	0.837
16.0	.919	.914	.909	.904	.899	.894	.888
18.0	.970	.965	.960	.955	.950	.945	.940
20.0	1.021	1.016	1.011	1.006	1.001	.996	.991
22.0	1.072	1.067	1.062	1.057	1.052	1.047	1.042
24.0	1.123	1.118	1.113	1.108	1.103	1.098	1.093
26.0	1.174	1.169	1.164	1.159	1.154	1.149	1.144
28.0	1.225	1.220	1.215	1.210	1.205	1.200	1.195
30.0	1.276	1.271	1.266	1.261	1.256	1.251	1.246
32.0	1.327	1.322	1.317	1.312	1.307	1.302	1.297
	BUTT-LOG GRADE 2						
12.0	0.729	0.717	0.705	0.692	0.680	0.668	0.656
14.0	.785	.773	.760	.748	.736	.724	.711
16.0	.840	.828	.816	.804	.791	.779	.767
18.0	.896	.884	.871	.859	.847	.835	.822
20.0	.951	.939	.927	.915	.903	.890	.878
22.0	1.007	.995	.983	.970	.958	.946	.934
24.0	1.063	1.050	1.038	1.026	1.014	1.001	.989
26.0	1.118	1.106	1.094	1.082	1.069	1.057	1.045
28.0	1.174	1.162	1.149	1.137	1.125	1.113	1.100
30.0	1.229	1.217	1.205	1.193	1.180	1.168	1.156
32.0	1.285	1.273	1.260	1.248	1.236	1.224	1.212
	BUTT-LOG GRADE 3						
12.0	0.473	0.527	0.580	0.633	0.687	0.740	0.793
14.0	.503	.556	.609	.662	.716	.769	.822
16.0	.532	.585	.638	.692	.745	.798	.851
18.0	.561	.614	.667	.721	.774	.827	.881
20.0	.590	.643	.697	.750	.803	.856	.910
22.0	.619	.673	.726	.779	.832	.886	.939
24.0	.648	.702	.755	.808	.862	.915	.968
26.0	.678	.731	.784	.837	.891	.944	.997
28.0	.707	.760	.813	.867	.920	.973	1.026
30.0	.736	.789	.842	.896	.949	1.002	1.056
32.0	.765	.818	.872	.925	.978	1.031	1.085

DIAMETER GROWTH RATES

Table 12.—Ten-year d.b.h. growth for black cherry, in inches

D.b.h.	Vigor 1	Vigor 2	Vigor 3
12	2.7	1.9	1.1
14	2.7	1.9	1.2
16	2.6	1.9	1.2
18	2.6	1.9	1.3
20	2.6	1.9	1.4
22	2.6	1.9	1.5
24	2.5	1.9	1.6
26	2.5	1.9	1.7
28	2.5	1.9	1.8
30	2.4	1.9	1.8

Table 13.—Ten-year d.b.h. growth rate for red maple, in inches

D.b.h.	Vigor 1	Vigor 2	Vigor 3
12	2.5	2.0	1.7
14	2.5	2.0	1.6
16	2.4	2.0	1.5
18	2.4	2.0	1.3
20	2.4	2.0	1.2
22	2.3	2.0	1.1
24	2.3	1.9	.9
26	2.2	1.9	.8
28	2.2	1.9	.7
30	2.2	1.9	.5

Table 14.—Ten-year d.b.h. growth rate for white ash, in inches

D.b.h.	Vigor 1	Vigor 2	Vigor 3
12	2.0	1.7	1.1
14	2.1	1.7	1.1
16	2.2	1.7	1.1
18	2.2	1.7	1.1
20	2.3	1.7	1.1
22	2.3	1.7	1.2
24	2.4	1.7	1.2
26	2.4	1.7	1.2
28	2.5	1.7	1.2
30	2.5	1.7	1.2

VIGOR CLASSES

Vigor 1.—A tree with a large, healthy, full crown in a dominant or codominant position. Half or more of the crown is exposed to direct sunlight. The crown is dense, with no evidence of disease or injury. Crown condition and position are more important than total length.

Vigor 2.—A tree with a fair-sized crown in a codominant position. Less than half the crown is exposed to direct sunlight. The crown is less dense and not so perfect as that of a Vigor 1 tree. This class may also include large-crowned trees that fail to meet the requirements of Vigor 1 because of mechanical injury or dying limbs.

Vigor 3.—A tree with a medium to small crown, usually in an intermediate position. Only the tip is exposed to direct sunlight. The crown may be open, with some dead or broken limbs, or thinly foliated. This class also includes trees with fair to large crowns in a codominant position that cannot meet the requirements for a Vigor 2 tree.

Vigor 4.—Usually a tree with a small crown in an overtopped position. This class includes all living trees that fail to meet the requirements of higher vigor classes.

Table 15.—Ten-year value increase for black cherry, in dollars

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
12	2	16	3.52	4.09	6.00	7.56	5.12	8.05	10.94	2.62	4.06	—	3.56	5.88	—	1.38	2.58	—	2.22	4.23	—
		24	4.25	5.27	6.82	7.64	7.31	10.21	12.56	3.33	4.58	—	5.14	7.61	—	1.84	2.71	—	3.49	5.40	—
		32	4.77	6.30	7.12	7.70	9.69	12.04	14.45	4.06	4.54	—	7.09	8.57	—	2.19	2.53	—	4.88	6.39	—
		40	4.86	7.03	7.61	7.36	11.95	14.36	15.87	4.45	4.73	—	8.78	10.63	—	2.44	2.51	—	6.30	7.72	—
		48	4.78	7.68	7.44	7.03	14.44	15.95	17.54	4.81	4.52	—	10.71	11.96	—	2.59	2.21	—	7.79	8.73	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	3	16	1.39	2.73	3.84	4.79	6.22	8.13	9.69	1.72	2.49	—	4.75	6.19	—	.89	1.46	—	3.51	4.71	—
		24	1.66	3.57	4.52	5.09	7.86	9.42	10.23	2.22	2.92	—	5.92	7.17	—	1.19	1.61	—	4.44	5.30	—
		32	1.83	4.34	4.92	5.40	9.24	10.06	10.63	2.74	3.06	—	7.00	7.47	—	1.44	1.62	—	5.13	5.46	—
		40	1.83	4.92	5.40	5.43	10.06	10.63	10.39	3.06	3.30	—	7.47	7.76	—	1.62	1.69	—	5.46	5.54	—
		48	1.76	5.47	5.51	5.49	10.71	10.46	10.06	3.37	3.32	—	7.83	7.55	—	1.76	1.62	—	5.61	5.24	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	4	16	.07	.61	.84	1.08	4.05	5.16	6.11	.37	.52	—	3.04	3.81	—	.19	.28	—	2.21	2.78	—
		24	.09	.82	1.05	1.24	5.14	6.08	6.66	.50	.66	—	3.79	4.48	—	.26	.35	—	2.76	3.18	—
		32	.12	1.03	1.22	1.42	6.06	6.64	7.12	.63	.75	—	4.46	4.78	—	.33	.40	—	3.16	3.34	—
		40	.13	1.20	1.40	1.53	6.62	7.10	7.13	.73	.86	—	4.76	5.00	—	.38	.45	—	3.32	3.39	—
		48	.15	1.38	1.51	1.65	7.08	7.12	7.10	.84	.92	—	4.98	4.93	—	.43	.48	—	3.37	3.23	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	2	16	6.28	5.74	9.05	11.88	6.97	11.60	16.20	3.81	6.51	—	4.96	8.85	—	2.28	4.52	—	3.36	6.68	—
		24	7.80	7.53	10.36	12.22	10.08	14.68	18.63	4.99	7.25	—	7.33	11.19	—	2.99	4.84	—	5.16	8.45	—
		32	9.07	9.09	10.96	12.33	13.41	17.36	21.18	5.98	7.45	—	9.92	13.27	—	3.57	4.62	—	7.19	9.90	—
		40	9.60	10.42	11.79	12.07	16.83	20.65	23.41	6.91	7.79	—	12.73	15.76	—	4.08	4.80	—	9.36	12.06	—
		48	9.89	11.51	11.79	11.83	20.36	23.13	25.98	7.51	7.61	—	15.47	17.80	—	4.51	4.40	—	11.77	13.62	—
		56	9.60	12.08	12.12	—	23.42	26.27	—	7.90	7.74	—	18.09	20.40	—	4.70	4.41	—	13.91	15.83	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	3	16	3.21	4.11	6.29	8.25	8.81	12.12	14.95	2.69	4.39	—	6.88	9.58	—	1.59	2.94	—	5.35	7.59	—
		24	4.03	5.47	7.43	8.88	11.30	14.13	16.00	3.57	5.08	—	8.76	11.02	—	2.11	3.29	—	6.76	8.61	—
		32	4.75	6.72	8.16	9.37	13.42	15.28	16.65	4.36	5.46	—	10.30	11.77	—	2.57	3.33	—	7.89	8.94	—
		40	5.10	7.80	9.01	9.59	14.93	16.30	16.58	5.10	5.90	—	11.41	12.29	—	2.98	3.59	—	8.58	9.30	—
		48	5.35	8.77	9.34	9.82	16.05	16.33	16.37	5.65	6.03	—	12.05	12.15	—	3.35	3.51	—	9.05	8.95	—
		56	5.31	9.38	9.86	—	16.37	16.41	—	6.06	6.31	—	12.20	12.03	—	3.55	3.65	—	8.99	8.70	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	4	16	0.47	0.99	1.51	2.03	6.85	9.03	10.99	0.64	1.03	—	5.43	7.13	—	0.38	0.67	—	4.33	5.68	—
		24	.63	1.35	1.87	2.31	8.87	10.83	12.28	.87	1.26	—	6.97	8.48	—	.51	.81	—	5.52	6.69	—
		32	.79	1.70	2.15	2.59	10.67	12.12	13.33	1.10	1.44	—	8.32	9.41	—	.64	.89	—	6.53	7.29	—
		40	.92	2.02	2.46	2.78	11.99	13.20	13.77	1.31	1.62	—	9.28	10.08	—	.76	1.01	—	7.16	7.78	—
		48	1.05	2.33	2.65	2.99	13.07	13.64	14.12	1.49	1.74	—	9.96	10.32	—	.88	1.05	—	7.65	7.82	—
		56	1.13	2.57	2.90	—	13.56	14.04	—	1.65	1.89	—	10.23	10.48	—	.96	1.14	—	7.73	7.82	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
16	1	16	11.42	7.31	14.19	20.91	—	—	—	5.05	11.06	—	—	—	—	3.14	8.36	—	—	—	—
		24	15.44	10.17	16.89	22.51	—	—	—	7.06	12.93	—	—	—	—	4.35	9.43	—	—	—	—
		32	19.42	12.90	18.53	24.12	—	—	—	8.94	13.88	—	—	—	—	5.44	9.74	—	—	—	—
		40	22.69	15.26	20.85	25.01	—	—	—	10.61	15.41	—	—	—	—	6.46	10.73	—	—	—	—
		48	25.94	17.60	21.76	26.01	—	—	—	12.16	15.82	—	—	—	—	7.49	10.66	—	—	—	—
		56	28.29	19.42	23.67	—	—	—	—	13.47	17.11	—	—	—	—	8.32	11.48	—	—	—	—
		64	30.71	21.25	—	—	—	—	—	14.68	—	—	—	—	—	9.05	—	—	—	—	—
16	2	16	10.26	7.08	12.33	16.84	8.47	15.35	22.06	4.88	9.39	—	6.21	12.23	—	3.02	6.84	—	4.30	9.52	—
		24	13.07	9.52	14.03	17.07	12.54	19.25	24.88	6.59	10.42	—	9.42	15.29	—	4.04	7.23	—	6.71	11.79	—
		32	15.43	11.67	14.71	17.21	16.89	22.52	28.11	8.06	10.61	—	12.93	17.87	—	4.87	6.97	—	9.43	13.73	—
		40	16.83	13.31	15.81	16.80	21.12	26.70	30.87	9.20	11.18	—	16.47	21.27	—	5.57	7.22	—	12.32	16.59	—
		48	17.87	14.78	15.76	16.42	25.67	29.84	34.09	10.15	10.88	—	20.24	23.89	—	6.19	6.68	—	15.56	18.74	—
		56	17.97	15.66	16.32	—	29.73	33.99	—	10.78	11.14	—	23.79	27.42	—	6.58	6.73	—	18.63	21.79	—
		64	17.86	16.43	—	—	34.10	—	—	11.26	—	—	27.53	—	—	6.84	—	—	21.90	—	—

CONTINUED

Table 15—Continued

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	6.04	5.33	9.03	12.38	11.31	16.56	21.07	3.66	6.76	—	9.11	13.62	—	2.24	4.80	—	7.25	11.07	—
		24	7.81	7.25	10.60	13.09	14.78	19.29	22.33	4.98	7.77	—	11.85	15.67	—	3.02	5.29	—	9.29	12.49	—
		32	9.39	9.02	11.51	13.76	17.71	20.75	23.25	6.18	8.24	—	14.09	16.65	—	3.71	5.37	—	10.91	13.01	—
16	3	40	10.46	10.44	12.69	14.00	19.68	22.18	23.17	7.17	8.96	—	15.58	17.56	—	4.30	5.77	—	11.94	13.59	—
		48	11.36	11.79	13.10	14.28	21.28	22.27	22.93	8.05	9.08	—	16.65	17.39	—	4.86	5.64	—	12.69	13.18	—
		56	11.74	12.72	13.90	—	21.89	22.55	—	8.70	9.57	—	17.01	17.37	—	5.26	5.89	—	12.81	12.96	—
		64	12.03	13.61	—	—	22.26	—	—	9.28	—	—	17.08	—	—	5.59	—	—	12.67	—	—
		16	16.80	9.34	18.88	28.51	—	—	—	6.45	15.00	—	—	—	—	4.31	12.10	—	—	—	—
		24	22.86	12.82	22.45	30.58	—	—	—	8.94	17.57	—	—	—	—	6.04	13.77	—	—	—	—
		32	28.89	16.42	24.55	32.64	—	—	—	11.55	18.62	—	—	—	—	7.75	14.09	—	—	—	—
18	1	40	33.86	19.58	27.67	33.63	—	—	—	13.65	20.68	—	—	—	—	9.12	15.43	—	—	—	—
		48	38.80	22.73	28.69	34.74	—	—	—	15.74	21.10	—	—	—	—	10.49	15.31	—	—	—	—
		56	42.48	25.01	31.06	—	—	—	—	17.42	22.63	—	—	—	—	11.63	16.42	—	—	—	—
		64	46.24	27.30	—	—	—	—	—	18.86	—	—	—	—	—	12.66	—	—	—	—	—
		16	15.47	9.15	16.75	23.67	10.67	20.22	29.84	6.31	13.03	—	7.79	16.34	—	4.22	10.25	—	5.66	13.43	—
		24	20.01	12.21	19.12	24.04	15.68	25.30	33.43	8.49	14.58	—	11.80	20.43	—	5.71	11.05	—	8.89	16.62	—
		32	23.96	15.17	20.09	24.32	21.35	29.48	37.56	10.63	14.74	—	16.47	23.54	—	7.10	10.66	—	12.67	19.02	—
18	2	40	26.53	17.52	21.76	23.75	26.91	35.00	40.95	12.17	15.65	—	20.97	28.00	—	8.09	11.07	—	16.45	22.76	—
		48	28.61	19.68	21.67	23.24	32.92	38.87	44.93	13.57	15.24	—	25.93	31.29	—	9.00	10.35	—	20.68	25.50	—
		56	29.35	20.93	22.50	—	38.14	44.19	—	14.50	15.60	—	30.55	35.75	—	9.62	10.53	—	24.76	29.55	—
		64	29.79	22.06	—	—	43.75	—	—	15.16	—	—	35.31	—	—	10.09	—	—	29.11	—	—
		16	9.93	7.12	12.75	18.12	14.69	22.29	29.20	4.89	9.80	—	11.85	18.57	—	3.25	7.59	—	9.75	15.79	—
		24	13.97	9.61	14.98	19.12	19.15	26.06	30.98	6.66	11.31	—	15.43	21.52	—	4.45	8.48	—	12.65	17.99	—
		32	15.95	12.10	16.24	20.08	23.18	28.10	32.34	8.43	11.87	—	18.64	22.75	—	5.60	8.56	—	15.11	18.67	—
18	3	40	18.03	14.16	18.00	20.36	26.02	30.25	32.25	9.79	12.96	—	20.66	24.15	—	6.48	9.18	—	16.59	19.57	—
		48	19.90	16.14	18.49	20.69	28.39	30.38	31.95	11.09	13.08	—	22.28	23.95	—	7.31	8.99	—	17.71	19.07	—
		56	20.94	17.45	19.65	—	29.34	30.91	—	12.04	13.76	—	22.91	24.01	—	7.95	9.43	—	18.02	18.93	—
		64	21.87	18.71	—	—	29.98	—	—	12.82	—	—	23.08	—	—	8.49	—	—	18.00	—	—
		16	23.64	11.62	24.67	37.95	—	—	—	8.15	19.92	—	—	—	—	5.84	16.89	—	—	—	—
		24	32.37	15.94	29.22	40.26	—	—	—	11.19	23.03	—	—	—	—	8.16	19.02	—	—	—	—
		32	41.05	20.55	31.58	42.85	—	—	—	14.35	24.45	—	—	—	—	10.34	19.64	—	—	—	—
20	1	40	48.28	24.34	35.62	43.94	—	—	—	17.22	27.12	—	—	—	—	12.40	21.65	—	—	—	—
		48	55.48	28.42	36.75	45.03	—	—	—	19.93	27.41	—	—	—	—	14.46	21.35	—	—	—	—
		56	60.87	31.35	39.64	—	—	—	—	22.02	29.61	—	—	—	—	15.96	22.95	—	—	—	—
		64	66.23	34.28	—	—	—	—	—	24.25	—	—	—	—	—	17.59	—	—	—	—	—
		16	22.16	11.49	22.26	32.29	13.10	26.15	39.43	8.05	17.65	—	9.64	21.40	—	5.76	14.71	—	7.32	18.37	—
		24	29.04	15.38	25.41	32.60	19.27	32.55	43.59	10.77	19.57	—	14.52	26.36	—	7.84	15.79	—	11.49	22.35	—
		32	35.16	19.29	26.47	33.05	26.43	37.46	48.73	13.44	19.90	—	20.23	30.33	—	9.66	15.49	—	16.22	25.52	—
20	2	40	39.40	22.24	28.82	32.29	33.23	44.50	52.82	15.66	21.21	—	26.10	36.01	—	11.25	16.33	—	21.29	30.54	—
		48	43.00	25.21	28.68	31.51	40.90	49.22	57.50	17.61	20.56	—	32.40	39.89	—	12.72	15.29	—	26.93	33.82	—
		56	44.68	27.00	29.83	—	47.55	55.83	—	18.88	21.33	—	38.21	45.80	—	13.61	15.71	—	32.15	39.14	—
		64	45.87	28.64	—	—	54.63	—	—	20.13	—	—	44.61	—	—	14.52	—	—	37.94	—	—
		16	15.12	9.16	17.44	25.47	18.53	29.29	39.33	6.40	13.69	—	15.09	24.69	—	4.56	11.30	—	12.80	21.75	—
		24	20.15	12.41	20.44	26.63	24.26	34.30	41.48	8.66	15.63	—	19.66	28.46	—	6.27	12.53	—	16.72	24.68	—
		32	24.85	15.74	21.93	27.93	29.60	36.79	43.37	10.94	16.45	—	23.76	30.21	—	7.83	12.78	—	19.98	25.80	—
20	3	40	28.40	18.38	24.39	28.23	33.24	39.82	43.29	12.90	17.97	—	26.67	32.22	—	9.23	13.85	—	22.25	27.33	—
		48	31.67	21.12	24.96	28.53	36.55	40.02	42.84	14.70	18.01	—	28.95	31.89	—	10.58	13.51	—	24.06	26.62	—
		56	33.68	22.95	26.51	—	38.00	40.83	—	15.99	19.12	—	29.88	32.32	—	11.49	14.25	—	24.61	26.71	—
		64	35.49	24.71	—	—	39.02	—	—	17.31	—	—	30.52	—	—	12.45	—	—	24.90	—	—
		16	32.24	13.52	—	—	—	—	—	9.55	—	—	—	—	—	7.51	—	—	—	—	—
		24	44.20	18.90	36.32	51.13	—	—	—	13.40	29.14	—	—	—	—	10.50	25.53	—	—	—	—
		32	56.24	24.27	39.09	53.84	—	—	—	17.10	30.61	—	—	—	—	13.49	26.18	—	—	—	—
22	1	40	66.39	28.94	43.69	54.75	—	—	—	20.46	33.76	—	—	—	—	16.03	28.81	—	—	—	—
		48	76.49	33.59	44.65	55.67	—	—	—	23.66	33.53	—	—	—	—	18.71	27.97	—	—	—	—
		56	84.16	36.99	48.01	—	—	—	—	25.87	35.54	—	—	—	—	20.31	29.68	—	—	—	—
		64	91.78	40.38	—	—	—	—	—	27.92	—	—	—	—	—	22.05	—	—	—	—	—

		16	30.65	13.48	—	—	15.11	—	—	9.52	—	—	11.14	—	—	7.47	—	—	9.09	—	—
		24	40.43	18.39	32.02	42.24	22.67	40.09	54.90	13.03	25.20	—	17.17	32.91	—	10.19	21.75	—	14.27	29.30	—
		32	49.40	23.04	33.27	42.46	31.11	45.93	60.68	16.22	25.41	—	23.94	37.45	—	12.77	21.29	—	20.33	33.02	—
22	2	40	55.90	26.78	35.97	41.22	39.44	54.18	65.25	18.92	27.01	—	30.96	44.26	—	14.80	22.51	—	26.53	39.31	—
		48	61.59	30.27	35.53	40.00	48.49	59.56	70.57	21.31	25.77	—	38.57	48.44	—	16.81	20.86	—	33.62	42.88	—
		56	64.66	32.46	36.93	—	56.49	67.51	—	22.70	26.32	—	45.37	55.04	—	17.79	21.26	—	39.81	49.18	—
		64	67.11	34.47	—	—	65.05	—	—	23.87	—	—	52.59	—	—	18.80	—	—	46.72	—	—
		16	21.87	10.38	—	—	22.26	—	—	7.69	—	—	18.30	—	—	6.03	—	—	16.25	—	—
		24	29.32	14.99	26.13	35.03	29.50	43.13	53.36	10.63	20.52	—	24.15	36.31	—	8.31	17.66	—	21.31	32.86	—
		32	36.44	19.00	27.90	36.35	36.01	46.23	55.42	13.39	21.35	—	29.19	38.37	—	10.53	17.90	—	25.74	34.25	—
22	3	40	41.99	22.35	30.79	36.44	40.68	49.87	55.12	15.80	23.24	—	32.82	40.91	—	12.35	19.41	—	28.70	36.41	—
		48	47.20	25.59	31.24	36.54	44.67	49.92	54.39	18.03	22.90	—	35.71	40.16	—	14.21	18.67	—	31.21	35.25	—
		56	50.62	27.82	33.12	—	46.50	50.97	—	19.48	23.94	—	36.75	40.37	—	15.26	19.51	—	31.83	35.30	—
		64	53.77	29.97	—	—	47.82	—	—	20.79	—	—	37.22	—	—	16.36	—	—	32.15	—	—
		16	42.27	14.89	—	—	—	—	—	11.02	—	—	—	—	—	9.35	—	—	—	—	—
		24	58.30	20.85	—	—	—	—	—	15.59	—	—	—	—	—	13.07	—	—	—	—	—
		32	74.26	26.79	45.74	64.61	—	—	—	19.97	37.59	—	—	—	—	16.76	33.72	—	—	—	—
24	1	40	87.98	32.02	50.89	65.49	—	—	—	23.86	41.40	—	—	—	—	20.00	36.88	—	—	—	—
		48	101.49	37.38	51.99	66.36	—	—	—	27.90	41.42	—	—	—	—	23.38	36.44	—	—	—	—
		56	111.40	42.08	56.45	—	—	—	—	31.51	44.97	—	—	—	—	26.53	39.38	—	—	—	—
		64	121.26	46.59	—	—	—	—	—	35.11	—	—	—	—	—	29.52	—	—	—	—	—
		16	40.65	14.93	—	—	16.51	—	—	11.04	—	—	12.64	—	—	9.36	—	—	10.97	—	—
		24	54.15	20.43	—	—	25.01	—	—	15.25	—	—	19.74	—	—	12.77	—	—	17.22	—	—
		32	66.50	25.62	39.23	51.60	34.55	53.50	72.37	19.07	31.58	—	27.73	45.34	—	15.99	27.96	—	24.52	41.48	—
24	2	40	75.86	29.87	42.24	49.93	44.14	63.01	77.61	22.23	33.56	—	35.98	53.52	—	18.60	29.43	—	32.12	49.00	—
		48	84.11	33.99	41.68	48.27	54.76	69.37	83.74	25.31	32.26	—	45.27	58.80	—	21.18	27.83	—	40.75	53.82	—
		56	88.58	37.21	43.80	—	64.90	79.27	—	27.79	33.82	—	54.33	67.79	—	23.36	28.98	—	49.35	62.20	—
		64	92.33	40.04	—	—	75.52	—	—	30.07	—	—	64.04	—	—	25.23	—	—	58.45	—	—
		16	29.96	12.07	—	—	25.63	—	—	8.92	—	—	21.74	—	—	7.55	—	—	20.06	—	—
		24	40.51	16.68	—	—	34.06	—	—	12.44	—	—	28.88	—	—	10.41	—	—	26.41	—	—
		32	50.56	21.16	33.07	44.44	41.56	55.17	67.54	15.73	26.67	—	35.01	47.53	—	13.18	23.63	—	31.93	43.91	—
24	3	40	58.67	24.96	36.32	44.33	47.06	59.42	67.12	18.56	28.97	—	39.41	50.75	—	15.52	25.47	—	35.79	46.62	—
		48	66.25	28.74	36.75	44.23	51.85	59.54	66.12	21.39	28.67	—	43.17	50.12	—	17.89	24.86	—	39.04	45.69	—
		56	71.15	31.86	39.33	—	54.64	61.23	—	23.78	30.65	—	45.22	51.25	—	19.97	26.44	—	40.79	46.41	—
		64	75.73	34.75	—	—	56.65	—	—	26.07	—	—	46.68	—	—	21.86	—	—	41.83	—	—
		16	53.96	16.31	—	—	—	—	—	12.13	—	—	—	—	—	10.87	—	—	—	—	—
		24	74.79	22.90	—	—	—	—	—	17.02	—	—	—	—	—	15.27	—	—	—	—	—
		32	95.36	29.63	—	—	—	—	—	22.07	—	—	—	—	—	19.65	—	—	—	—	—
26	1	40	113.20	35.61	59.33	77.27	—	—	—	26.60	48.70	—	—	—	—	23.70	45.33	—	—	—	—
		48	130.96	41.56	59.51	77.38	—	—	—	30.94	47.71	—	—	—	—	27.57	44.07	—	—	—	—
		56	144.69	45.78	63.65	—	—	—	—	33.98	50.86	—	—	—	—	30.34	46.78	—	—	—	—
		64	158.36	49.98	—	—	—	—	—	37.19	—	—	—	—	—	33.11	—	—	—	—	—
		16	52.37	16.48	—	—	17.91	—	—	12.24	—	—	13.72	—	—	10.97	—	—	12.47	—	—
		24	70.28	22.63	—	—	27.41	—	—	16.81	—	—	21.54	—	—	15.06	—	—	19.79	—	—
		32	86.66	28.64	—	—	38.34	—	—	21.30	—	—	30.78	—	—	18.95	—	—	28.35	—	—
26	2	40	99.36	33.62	49.83	59.81	49.45	73.17	91.11	25.07	39.97	—	40.44	62.54	—	22.32	36.85	—	37.55	59.17	—
		48	110.86	38.32	48.31	57.17	61.66	79.61	97.48	28.47	37.62	—	51.03	67.81	—	25.34	34.33	—	47.67	64.17	—
		56	117.96	41.21	50.08	—	72.51	90.38	—	30.53	38.76	—	60.72	77.59	—	27.23	35.16	—	57.08	73.52	—
		64	124.12	43.91	—	—	84.22	—	—	32.59	—	—	71.43	—	—	28.99	—	—	67.35	—	—
		16	39.42	13.45	—	—	29.42	—	—	9.97	—	—	25.19	—	—	8.93	—	—	23.92	—	—
		24	53.67	18.65	—	—	39.24	—	—	13.83	—	—	33.42	—	—	12.39	—	—	31.68	—	—
		32	67.20	23.84	—	—	48.10	—	—	17.71	—	—	40.76	—	—	15.75	—	—	38.42	—	—
26	3	40	78.29	28.30	43.21	53.53	54.68	70.89	80.88	21.07	34.79	—	46.13	61.04	—	18.75	32.12	—	43.39	57.92	—
		48	88.87	32.63	42.96	52.79	60.32	70.30	79.17	24.21	33.72	—	50.46	59.62	—	21.55	30.87	—	47.34	56.32	—
		56	96.28	35.54	45.37	—	62.89	71.75	—	26.30	35.46	—	52.20	60.43	—	23.45	32.31	—	48.91	56.83	—
		64	103.29	38.36	—	—	64.74	—	—	28.45	—	—	53.42	—	—	25.30	—	—	49.82	—	—
		16	66.81	18.56	—	—	—	—	—	13.66	—	—	—	—	—	12.89	—	—	—	—	—
		24	92.78	26.06	—	—	—	—	—	19.33	—	—	—	—	—	18.29	—	—	—	—	—
		32	118.65	33.73	—	—	—	—	—	24.99	—	—	—	—	—	23.49	—	—	—	—	—
28	1	40	141.26	40.39	—	—	—	—	—	29.90	—	—	—	—	—	28.15	—	—	—	—	—
		48	163.59	47.03	—	—	—	—	—	34.78	—	—	—	—	—	32.78	—	—	—	—	—
		56	180.59	52.33	—	—	—	—	—	38.44	—	—	—	—	—	36.38	—	—	—	—	—
		64	197.51	57.61	—	—	—	—	—	42.10	—	—	—	—	—	39.80	—	—	—	—	—

CONTINUED

Table 15—Continued

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	65.33	18.85	—	—	—	—	—	13.87	—	—	—	—	—	13.09	—	—	—	—	—
		24	88.05	25.94	—	—	—	—	—	19.23	—	—	—	—	—	18.19	—	—	—	—	—
		32	109.14	32.87	—	—	—	—	—	24.33	—	—	—	—	—	22.87	—	—	—	—	—
28	2	40	125.81	38.53	—	—	—	—	—	28.49	—	—	—	—	—	26.82	—	—	—	—	—
		48	140.90	43.89	—	—	—	—	—	32.42	—	—	—	—	—	30.55	—	—	—	—	—
		56	150.22	47.74	—	—	—	—	—	35.04	—	—	—	—	—	33.15	—	—	—	—	—
		64	158.46	51.35	—	—	—	—	—	37.49	—	—	—	—	—	35.43	—	—	—	—	—
		16	49.99	15.53	—	—	—	—	—	11.42	—	—	—	—	—	10.77	—	—	—	—	—
		24	68.29	21.57	—	—	—	—	—	15.97	—	—	—	—	—	15.10	—	—	—	—	—
		32	85.89	27.60	—	—	—	—	—	20.41	—	—	—	—	—	19.19	—	—	—	—	—
28	3	40	100.53	32.70	—	—	—	—	—	24.15	—	—	—	—	—	22.74	—	—	—	—	—
		48	114.42	37.66	—	—	—	—	—	27.79	—	—	—	—	—	26.19	—	—	—	—	—
		56	124.08	41.43	—	—	—	—	—	30.39	—	—	—	—	—	28.74	—	—	—	—	—
		64	133.27	45.09	—	—	—	—	—	32.92	—	—	—	—	—	31.10	—	—	—	—	—
		16	81.25	20.13	—	—	—	—	—	15.71	—	—	—	—	—	14.88	—	—	—	—	—
		24	113.17	28.32	—	—	—	—	—	22.03	—	—	—	—	—	20.71	—	—	—	—	—
		32	144.96	36.49	—	—	—	—	—	28.33	—	—	—	—	—	26.91	—	—	—	—	—
30	1	40	172.73	44.38	—	—	—	—	—	34.41	—	—	—	—	—	32.52	—	—	—	—	—
		48	200.21	52.44	—	—	—	—	—	40.85	—	—	—	—	—	38.49	—	—	—	—	—
		56	221.11	59.07	—	—	—	—	—	46.36	—	—	—	—	—	43.74	—	—	—	—	—
		64	241.93	65.68	—	—	—	—	—	51.47	—	—	—	—	—	48.79	—	—	—	—	—
		16	80.00	20.54	—	—	—	—	—	16.02	—	—	—	—	—	15.17	—	—	—	—	—
		24	108.32	28.35	—	—	—	—	—	22.04	—	—	—	—	—	20.72	—	—	—	—	—
		32	134.76	35.82	—	—	—	—	—	27.79	—	—	—	—	—	26.39	—	—	—	—	—
30	2	40	155.81	42.67	—	—	—	—	—	33.06	—	—	—	—	—	31.24	—	—	—	—	—
		48	175.05	49.35	—	—	—	—	—	38.40	—	—	—	—	—	36.18	—	—	—	—	—
		56	187.17	54.37	—	—	—	—	—	42.59	—	—	—	—	—	40.17	—	—	—	—	—
		64	198.04	59.09	—	—	—	—	—	46.21	—	—	—	—	—	43.77	—	—	—	—	—
		16	62.06	17.06	—	—	—	—	—	13.29	—	—	—	—	—	12.58	—	—	—	—	—
		24	85.14	23.75	—	—	—	—	—	18.45	—	—	—	—	—	17.34	—	—	—	—	—
		32	107.40	30.30	—	—	—	—	—	23.49	—	—	—	—	—	22.30	—	—	—	—	—
30	3	40	125.98	36.44	—	—	—	—	—	28.21	—	—	—	—	—	26.65	—	—	—	—	—
		48	143.71	42.56	—	—	—	—	—	33.09	—	—	—	—	—	31.17	—	—	—	—	—
		56	156.14	47.38	—	—	—	—	—	37.08	—	—	—	—	—	34.97	—	—	—	—	—
		64	168.03	52.07	—	—	—	—	—	40.68	—	—	—	—	—	38.53	—	—	—	—	—

Table 16.—Ten-year value increase for red maple, in dollars

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	2.10	2.58	3.71	4.61	3.48	5.17	6.74	1.91	2.85	3.61	2.74	4.19	5.58	1.57	2.44	—	2.37	3.72	—
		24	2.50	3.32	4.22	4.64	4.77	6.34	7.47	2.45	3.22	3.50	3.79	5.18	6.10	2.04	2.69	—	3.32	4.57	—
		32	2.75	3.97	4.39	4.62	6.09	7.22	8.26	2.97	3.25	3.37	4.93	5.86	6.70	2.44	2.68	—	4.32	5.16	—
12	2	40	2.73	4.41	4.64	4.43	7.24	8.28	8.82	3.27	3.39	3.13	5.87	6.71	7.13	2.69	2.76	—	5.18	5.95	—
		48	2.60	4.77	4.56	4.21	8.41	8.95	9.42	3.52	3.26	2.86	6.24	7.26	7.58	2.90	2.62	—	6.08	6.44	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	.58	1.80	2.43	2.98	4.10	5.24	6.14	1.32	1.80	2.22	3.43	4.37	5.14	1.08	1.49	—	3.10	3.96	—
		24	.65	2.36	2.90	3.23	5.16	6.06	6.49	1.73	2.14	2.35	4.30	5.06	5.35	1.41	1.75	—	3.88	4.53	—
		32	.67	2.88	3.21	3.46	6.04	6.47	6.70	2.13	2.33	2.47	5.04	5.33	5.44	1.73	1.89	—	4.51	4.75	—
12	3	40	.61	3.27	3.52	3.55	6.53	6.76	6.55	2.40	2.54	2.50	5.39	5.51	5.25	1.95	2.04	—	4.81	4.89	—
		48	.50	3.63	3.66	3.64	6.87	6.66	6.31	2.64	2.61	2.52	5.62	5.36	4.96	2.15	2.09	—	4.99	4.72	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	.00	.00	.00	.00	2.37	3.01	3.55	.00	.00	.00	1.90	2.38	2.80	.00	.00	—	1.65	2.07	—
		24	.00	.00	.00	.00	3.01	3.55	3.88	.00	.00	.00	2.38	2.80	3.00	.00	.00	—	2.07	2.40	—
		32	.00	.00	.00	.00	3.55	3.88	4.13	.00	.00	.00	2.80	3.00	3.14	.00	.00	—	2.40	2.56	—
12	4	40	.00	.00	.00	.00	3.88	4.13	4.16	.00	.00	.00	3.00	3.14	3.11	.00	.00	—	2.56	2.65	—
		48	.00	.00	.00	.00	4.13	4.16	4.13	.00	.00	.00	3.14	3.11	3.02	.00	.00	—	2.65	2.59	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	4.01	3.74	5.87	7.66	4.89	7.75	10.44	2.83	4.68	6.23	3.91	6.45	8.84	2.21	3.87	—	3.24	5.56	—
		24	4.95	4.93	6.72	7.82	6.81	9.50	11.57	3.74	5.29	6.19	5.51	7.90	9.69	2.93	4.26	—	4.62	6.74	—
		32	5.71	5.96	7.06	7.89	8.74	10.81	12.74	4.53	5.43	6.08	7.13	8.93	10.60	3.50	4.27	—	5.98	7.59	—
14	2	40	6.00	6.77	7.60	7.71	10.52	12.46	13.63	5.14	5.79	5.81	8.64	10.32	11.33	3.98	4.51	—	7.30	8.80	—
		48	6.11	7.48	7.60	7.55	12.34	13.52	14.65	5.67	5.70	5.58	10.20	11.22	12.20	4.39	4.34	—	8.69	9.55	—
		56	5.86	7.85	7.80	—	13.77	14.91	—	5.96	5.83	—	11.47	12.45	—	4.59	4.40	—	9.81	10.65	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	1.90	2.85	4.30	5.61	5.86	7.98	9.77	2.14	3.36	4.45	4.94	6.80	8.34	1.65	2.71	—	4.32	5.99	—
		24	2.38	3.81	5.13	6.08	7.50	9.29	10.39	2.87	3.97	4.73	6.31	7.86	8.76	2.23	3.14	—	5.50	6.83	—
		32	2.80	4.71	5.67	6.51	8.87	9.97	10.80	3.55	4.32	4.98	7.44	8.34	8.99	2.72	3.36	—	6.41	7.18	—
14	3	40	3.00	5.46	6.30	6.73	9.77	10.59	10.71	4.11	4.78	5.09	8.14	8.78	8.81	3.15	3.70	—	6.98	7.50	—
		48	3.14	6.16	6.59	6.97	10.45	10.57	10.52	4.64	4.95	5.22	8.64	8.67	8.55	3.56	3.78	—	7.36	7.31	—
		56	3.11	6.62	7.00	—	10.60	10.55	—	4.98	5.25	—	8.70	8.58	—	3.81	3.99	—	7.34	7.15	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	0.00	0.00	0.00	0.00	4.75	6.19	7.51	0.00	0.00	0.00	4.04	5.25	6.35	0.00	0.00	—	3.55	4.61	—
		24	.00	.00	.00	.00	6.19	7.51	8.46	.00	.00	.00	5.25	6.35	7.11	.00	.00	—	4.61	5.52	—
		32	.00	.00	.00	.00	7.51	8.46	9.31	.00	.00	.00	6.35	7.11	7.78	.00	.00	—	5.52	6.16	—
14	4	40	.00	.00	.00	.00	8.46	9.31	9.73	.00	.00	.00	7.11	7.78	8.09	.00	.00	—	6.16	6.70	—
		48	.00	.00	.00	.00	9.31	9.73	10.11	.00	.00	.00	7.78	8.09	8.36	.00	.00	—	6.70	6.92	—
		56	.00	.00	.00	.00	9.73	10.11	—	.00	.00	.00	8.09	8.36	—	.00	.00	—	6.92	7.10	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	7.91	4.95	9.29	13.51	—	—	—	4.02	8.00	11.79	—	—	—	2.96	6.57	—	—	—	—
		24	10.45	6.75	10.97	14.12	—	—	—	5.46	9.25	12.17	—	—	—	4.03	7.39	—	—	—	—
		32	12.84	8.58	11.73	14.72	—	—	—	6.86	9.78	12.54	—	—	—	5.00	7.67	—	—	—	—
16	1	40	14.64	9.94	12.92	14.99	—	—	—	7.98	10.74	12.54	—	—	—	5.87	8.31	—	—	—	—
		48	16.31	11.25	13.32	15.19	—	—	—	9.06	10.87	12.62	—	—	—	6.64	8.24	—	—	—	—
		56	17.33	12.31	14.17	—	—	—	—	9.86	11.61	—	—	—	—	7.23	8.78	—	—	—	—
		64	18.31	13.19	—	—	—	—	—	10.63	—	—	—	—	—	7.80	—	—	—	—	—

CONTINUED

Table 16—Continued

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	6.84	4.65	8.08	11.15	6.02	10.37	14.59	3.77	6.88	9.59	5.09	9.08	12.87	2.77	5.55	—	4.04	7.65	—
		24	8.69	6.23	9.30	11.24	8.52	12.73	15.89	5.03	7.74	9.50	7.23	11.02	13.93	3.70	6.04	—	5.80	9.15	—
		32	10.24	7.75	9.69	11.29	11.19	14.34	17.32	6.19	7.95	9.37	9.47	12.39	15.14	4.49	6.06	—	7.61	10.28	—
16	2	40	11.14	8.79	10.39	11.07	13.44	16.42	18.50	7.05	8.47	8.98	11.49	14.24	16.04	5.16	6.35	—	9.37	11.82	—
		48	11.79	9.74	10.42	10.78	15.77	17.85	19.72	7.83	8.33	8.63	13.59	15.40	17.15	5.70	6.08	—	11.17	12.77	—
		56	11.81	10.40	10.76	—	17.82	19.69	—	8.30	8.60	—	15.37	17.12	—	6.05	6.23	—	12.75	14.30	—
		64	11.69	10.88	—	—	19.81	—	—	8.73	—	—	17.21	—	—	6.36	—	—	14.42	—	—
		16	4.04	3.77	6.34	8.79	7.45	10.88	13.95	3.04	5.33	7.47	6.57	9.68	12.39	2.21	4.22	—	5.57	8.35	—
		24	5.25	5.12	7.57	9.35	9.66	12.73	14.68	4.12	6.25	7.84	8.47	11.17	12.94	3.00	4.81	—	7.14	9.48	—
		32	6.35	6.47	8.25	9.89	11.64	13.58	15.17	5.16	6.75	8.20	10.08	11.84	13.26	3.72	5.11	—	8.38	9.95	—
16	3	40	7.11	7.49	9.13	10.20	12.82	14.41	15.10	5.98	7.44	8.32	11.08	12.50	13.00	4.34	5.57	—	9.18	10.37	—
		48	7.78	8.46	9.54	10.46	13.75	14.43	14.79	6.78	7.66	8.48	11.83	12.34	12.64	4.90	5.63	—	9.71	10.08	—
		56	8.09	9.22	10.14	—	14.12	14.47	—	7.34	8.17	—	12.02	12.32	— —	5.31	5.99	—	9.77	9.95	—
		64	8.36	9.87	—	—	14.20	—	—	7.90	—	—	12.05	—	—	5.72	—	—	9.68	—	—
		16	11.93	6.35	12.79	18.87	—	—	—	5.16	11.08	16.74	—	—	—	3.25	8.48	—	—	—	—
		24	15.92	8.80	14.88	19.71	—	—	—	7.09	12.75	17.21	—	—	—	4.49	9.48	—	—	—	—
		32	19.71	11.09	15.92	20.53	—	—	—	8.96	13.42	17.67	—	—	—	5.69	9.53	—	—	—	—
18	1	40	22.62	13.00	17.62	20.81	—	—	—	10.50	14.75	17.62	—	—	—	6.62	10.27	—	—	—	—
		48	25.38	14.86	18.05	20.99	—	—	—	11.99	14.86	17.57	—	—	—	7.52	10.03	—	—	—	—
		56	27.18	16.25	19.19	—	—	—	—	13.06	15.77	—	—	—	—	8.22	10.58	—	—	—	—
		64	28.93	17.44	—	—	—	—	—	14.02	—	—	—	—	—	8.83	—	—	—	—	—
		16	10.61	6.05	11.35	16.03	7.68	14.11	20.19	4.91	9.74	14.06	6.49	12.40	18.06	3.09	7.30	—	4.58	9.80	—
		24	13.72	8.24	12.92	16.23	11.00	17.08	21.91	6.63	10.95	13.95	9.29	14.95	19.41	4.18	7.92	—	6.69	11.68	—
		32	16.43	10.21	13.52	16.38	14.37	19.20	23.81	8.24	11.24	13.81	12.24	16.70	20.95	5.21	7.71	—	8.97	12.81	—
18	2	40	18.19	11.76	14.62	16.07	17.44	22.05	25.24	9.48	12.05	13.28	14.94	19.19	22.06	5.95	8.05	—	11.05	14.71	—
		48	19.61	13.19	14.65	15.69	20.63	23.82	26.76	10.63	11.85	12.75	17.76	20.63	23.34	6.63	7.60	—	13.28	15.79	—
		56	20.12	14.14	15.18	—	23.32	26.25	—	11.35	12.24	—	20.13	22.84	—	7.10	7.77	—	15.29	17.65	—
		64	20.42	14.88	—	—	25.95	—	—	11.94	—	—	22.54	—	—	7.47	—	—	17.35	—	—
		16	7.08	5.09	9.32	13.27	9.58	14.88	19.56	4.12	7.93	11.55	8.44	13.27	17.59	2.57	5.82	—	6.61	10.82	—
		24	9.37	7.02	10.97	14.07	12.59	17.27	20.58	5.64	9.25	12.05	10.98	15.30	18.30	3.53	6.60	—	8.53	12.27	—
		32	11.51	8.84	11.94	14.86	15.13	18.44	21.30	7.12	9.91	12.54	13.16	16.17	18.74	4.46	6.77	—	10.13	12.63	—
18	3	40	13.09	10.35	13.27	15.23	16.86	19.71	21.17	8.32	10.95	12.67	14.58	17.15	18.37	5.18	7.34	—	11.04	13.14	—
		48	14.55	11.81	13.77	15.55	18.25	19.71	20.74	9.49	11.21	12.80	15.69	16.91	17.80	5.88	7.30	—	11.68	12.66	—
		56	15.44	12.89	14.66	—	18.82	19.86	—	10.32	11.91	—	16.03	16.92	—	6.42	7.72	—	11.78	12.45	—
		64	16.26	13.84	—	—	19.04	—	—	11.09	—	—	16.10	—	—	6.90	—	—	11.62	—	—
		16	17.09	7.70	16.44	24.86	—	—	—	6.56	14.84	22.93	—	—	—	3.79	11.12	—	—	—	—
		24	23.01	10.53	18.95	25.84	—	—	—	8.93	17.01	23.50	—	—	—	5.21	12.25	—	—	—	—
		32	28.67	13.28	20.18	26.70	—	—	—	11.35	17.83	24.05	—	—	—	6.59	12.22	—	—	—	—
20	1	40	33.13	15.72	22.24	26.84	—	—	—	13.37	19.60	23.93	—	—	—	7.76	13.15	—	—	—	—
		48	37.37	17.99	22.59	26.89	—	—	—	15.35	19.69	23.82	—	—	—	8.90	12.69	—	—	—	—
		56	40.24	19.72	24.02	—	—	—	—	16.82	20.95	—	—	—	—	9.82	13.33	—	—	—	—
		64	42.95	21.31	—	—	—	—	—	18.24	—	—	—	—	—	10.62	—	—	—	—	—
		16	15.51	7.40	14.81	21.56	9.28	18.02	26.44	6.29	13.29	19.74	8.13	16.42	24.50	3.63	9.75	—	5.37	12.70	—
		24	20.35	9.97	16.72	21.77	13.18	21.60	28.50	8.45	14.90	19.61	11.59	19.67	26.15	4.91	10.44	—	7.86	14.91	—
		32	24.67	12.40	17.45	21.85	17.28	24.18	30.70	10.59	15.29	19.45	15.35	21.83	28.05	6.12	10.10	—	10.59	16.22	—
20	2	40	27.67	14.45	18.85	21.34	21.17	27.69	32.30	12.29	16.44	18.74	18.83	25.05	29.39	7.10	10.58	—	13.22	18.60	—
		48	30.24	16.28	18.78	20.76	25.13	29.73	34.02	13.87	16.17	18.04	22.48	26.82	30.96	8.01	9.89	—	16.04	19.82	—
		56	31.46	17.55	19.54	—	28.50	32.80	—	14.94	16.82	—	25.60	29.73	—	8.67	10.10	—	18.60	22.11	—
		64	32.36	18.64	—	—	31.91	—	—	15.93	—	—	28.84	—	—	9.21	—	—	21.22	—	—
		16	11.20	6.39	12.54	18.44	11.71	19.12	25.87	5.42	11.21	16.81	10.61	17.61	24.06	3.11	8.08	—	7.95	14.07	—
		24	15.01	8.73	14.63	19.42	15.31	22.06	27.11	7.39	13.00	17.46	13.79	20.24	24.95	4.27	9.01	—	10.25	15.78	—
		32	18.62	11.01	15.81	20.31	18.45	23.50	27.90	9.38	13.84	18.09	16.63	21.33	25.49	5.39	9.14	—	12.17	16.15	—
20	3	40	21.42	13.01	17.52	20.65	20.71	25.11	27.60	11.05	15.30	18.21	18.54	22.70	24.99	6.35	9.90	—	13.35	16.83	—
		48	24.05	14.89	18.02	20.92	22.48	24.97	26.95	12.67	15.58	18.34	20.07	22.36	24.24	7.27	9.72	—	14.20	16.09	—
		56	25.76	16.31	19.21	—	23.25	25.24	—	13.87	16.62	—	20.65	22.52	—	8.00	10.24	—	14.37	15.80	—
		64	27.35	17.62	—	—	23.65	—	—	15.03	—	—	20.93	—	—	8.65	—	—	14.22	—	—

		16	23.65	8.97	—	—	—	—	—	7.66	—	—	—	—	—	4.22	—	—	—	—	—
		24	31.94	12.44	23.81	33.24	—	—	—	10.66	21.57	30.57	—	—	—	5.81	15.45	—	—	—	—
		32	40.02	15.73	25.16	34.14	—	—	—	13.49	22.49	31.06	—	—	—	7.37	15.19	—	—	—	—
22	1	40	46.50	18.67	27.66	33.83	—	—	—	16.01	24.57	30.37	—	—	—	8.70	16.33	—	—	—	—
		48	52.72	21.44	27.61	33.54	—	—	—	18.35	24.15	29.72	—	—	—	10.11	15.20	—	—	—	—
		56	57.06	23.28	29.20	—	—	—	—	19.82	25.38	—	—	—	—	10.86	15.82	—	—	—	—
		64	61.20	25.07	—	—	—	—	—	21.24	—	—	—	—	—	11.69	—	—	—	—	—
		16	21.81	8.67	—	—	10.81	—	—	7.41	—	—	9.50	—	—	4.08	—	—	6.06	—	—
		24	28.81	11.87	21.27	28.50	15.57	26.94	36.37	10.18	19.16	26.02	13.79	24.71	33.70	5.54	13.38	—	8.94	18.58	—
		32	35.25	14.82	22.05	28.49	20.49	29.92	38.90	12.71	19.57	25.67	18.26	27.25	35.82	6.93	12.78	—	12.13	19.95	—
22	2	40	39.96	17.34	23.78	27.46	25.22	34.20	40.38	14.87	20.97	24.35	22.55	31.12	36.92	8.07	13.39	—	15.25	22.87	—
		48	44.11	19.63	23.30	26.46	30.04	36.22	42.15	16.81	20.20	23.09	26.96	32.76	38.33	9.23	12.08	—	18.71	23.80	—
		56	46.41	21.01	24.17	—	33.93	39.86	—	17.90	20.79	—	30.47	36.03	—	9.79	12.26	—	21.51	26.48	—
		64	48.28	22.29	—	—	37.98	—	—	18.92	—	—	34.16	—	—	10.38	—	—	24.60	—	—
		16	16.63	7.63	—	—	13.85	—	—	6.52	—	—	12.59	—	—	3.58	—	—	9.26	—	—
		24	22.40	10.56	18.96	25.90	18.27	27.67	34.90	9.06	17.07	23.65	16.58	25.56	32.42	4.92	11.84	—	11.94	19.78	—
		32	28.01	13.36	20.30	26.89	22.07	29.30	35.73	11.46	18.04	24.29	19.96	26.82	32.92	6.24	11.82	—	14.18	20.02	—
22	3	40	32.47	15.84	22.44	26.94	24.84	31.28	34.95	13.59	19.83	24.02	22.36	28.46	31.84	7.36	12.78	—	15.56	20.88	—
		48	36.71	18.19	22.69	26.99	27.03	30.70	33.86	15.58	19.77	23.78	24.21	27.60	30.49	8.53	12.11	—	16.63	19.48	—
		56	39.63	19.77	24.08	—	27.79	30.95	—	16.86	20.86	—	24.68	27.57	—	9.19	12.67	—	16.57	19.04	—
		64	42.38	21.32	—	—	28.19	—	—	18.11	—	—	24.82	—	—	9.91	—	—	16.28	—	—
		16	31.31	9.80	—	—	—	—	—	8.30	—	—	—	—	—	3.86	—	—	—	—	—
		24	42.60	13.63	—	—	—	—	—	11.62	—	—	—	—	—	5.42	—	—	—	—	—
		32	53.51	17.24	29.41	41.17	—	—	—	14.75	26.45	—	—	—	—	6.94	17.14	—	—	—	—
24	1	40	62.51	20.41	32.17	40.64	—	—	—	17.45	28.76	—	—	—	—	8.14	17.99	—	—	—	—
		48	71.07	23.60	32.07	40.34	—	—	—	20.20	28.38	—	—	—	—	9.42	16.38	—	—	—	—
		56	76.88	26.27	34.54	—	—	—	—	22.57	30.44	—	—	—	—	10.58	17.15	—	—	—	—
		64	82.44	28.98	—	—	—	—	—	24.88	—	—	—	—	—	11.59	—	—	—	—	—
		16	29.22	9.51	—	—	11.89	—	—	8.05	—	—	10.39	—	—	3.74	—	—	5.95	—	—
		24	38.98	13.05	—	—	17.24	—	—	11.13	—	—	15.24	—	—	5.18	—	—	9.03	—	—
		32	47.97	16.30	25.89	34.65	22.79	34.95	46.71	13.94	23.13	—	20.29	31.99	—	6.54	14.43	—	12.48	22.68	—
24	2	40	54.83	19.03	27.79	33.25	28.09	39.85	48.32	16.27	24.65	—	25.13	36.44	—	7.57	14.73	—	15.82	25.67	—
		48	60.92	21.70	27.16	32.07	33.75	42.22	50.49	18.56	23.79	—	30.35	38.53	—	8.63	12.92	—	19.57	26.53	—
		56	64.31	23.77	28.68	—	38.84	47.11	—	20.41	25.01	—	35.14	43.01	—	9.53	13.16	—	23.14	29.72	—
		64	67.20	25.79	—	—	44.21	—	—	22.12	—	—	40.12	—	—	10.27	—	—	26.82	—	—
		16	23.15	8.40	—	—	15.58	—	—	7.11	—	—	14.12	—	—	3.29	—	—	9.81	—	—
		24	31.46	11.67	—	—	20.57	—	—	9.94	—	—	18.65	—	—	4.61	—	—	12.70	—	—
		32	39.47	14.77	24.06	33.03	24.80	34.39	43.15	12.62	21.51	—	22.43	31.63	—	5.90	13.51	—	15.04	22.92	—
24	3	40	46.05	17.48	26.45	32.89	27.81	36.57	42.03	14.93	23.51	—	25.05	33.43	—	6.93	14.25	—	16.35	23.51	—
		48	52.29	20.21	26.65	32.93	30.33	35.79	40.70	17.27	23.46	—	27.19	32.42	—	8.01	13.16	—	17.26	21.55	—
		56	56.49	22.46	28.74	—	31.59	36.51	—	19.26	25.20	—	28.23	32.84	—	8.97	13.82	—	17.35	20.99	—
		64	60.49	24.73	—	—	32.50	—	—	21.20	—	—	28.84	—	—	9.81	—	—	16.98	—	—
		16	40.11	10.69	—	—	—	—	—	9.07	—	—	—	—	—	3.81	—	—	—	—	—
		24	54.89	14.78	—	—	—	—	—	12.62	—	—	—	—	—	5.16	—	—	—	—	—
		32	69.09	18.91	—	—	—	—	—	16.21	—	—	—	—	—	6.61	—	—	—	—	—
26	1	40	80.95	22.56	37.58	48.18	—	—	—	19.36	33.77	—	—	—	—	7.97	20.65	—	—	—	—
		48	92.41	26.12	36.72	47.08	—	—	—	22.31	32.59	—	—	—	—	9.19	18.37	—	—	—	—
		56	100.73	28.41	38.77	—	—	—	—	24.28	34.33	—	—	—	—	10.06	18.80	—	—	—	—
		64	108.73	30.76	—	—	—	—	—	26.32	—	—	—	—	—	10.79	—	—	—	—	—
		16	37.76	10.43	—	—	13.04	—	—	8.85	—	—	11.42	—	—	3.71	—	—	6.16	—	—
		24	50.75	14.26	—	—	18.92	—	—	12.17	—	—	16.76	—	—	4.97	—	—	9.30	—	—
		32	62.70	18.01	—	—	25.31	—	—	15.44	—	—	22.61	—	—	6.28	—	—	13.01	—	—
26	2	40	72.02	21.21	32.74	39.87	31.48	46.51	57.11	18.19	29.19	—	28.29	42.70	—	7.47	17.00	—	16.90	29.58	—
		48	80.53	24.24	31.36	37.84	38.00	48.60	58.96	20.69	27.56	—	34.19	44.47	—	8.49	14.51	—	21.07	30.25	—
		56	85.88	26.02	32.50	—	43.26	53.62	—	22.22	28.46	—	39.13	49.18	—	9.17	14.41	—	24.91	33.65	—
		64	90.58	27.79	—	—	48.91	—	—	23.76	—	—	44.47	—	—	9.70	—	—	28.94	—	—
		16	30.69	9.34	—	—	17.50	—	—	7.92	—	—	15.91	—	—	3.30	—	—	10.77	—	—
		24	41.98	12.92	—	—	23.03	—	—	11.02	—	—	20.94	—	—	4.48	—	—	13.74	—	—
		32	52.81	16.52	—	—	27.90	—	—	14.14	—	—	25.32	—	—	5.73	—	—	16.17	—	—
26	3	40	61.84	19.70	31.53	39.87	31.40	42.93	50.06	16.88	28.17	—	28.38	39.38	—	6.91	16.67	—	17.66	27.18	—
		48	70.55	22.81	31.15	39.30	34.22	41.34	47.83	19.46	27.51	—	30.67	37.55	—	7.96	15.02	—	18.47	24.49	—
		56	76.85	24.86	33.00	—	35.05	41.53	—	21.21	29.07	—	31.25	37.49	—	8.72	15.43	—	18.20	23.44	—
		64	82.90	26.95	—	—	35.48	—	—	23.02	—	—	31.44	—	—	9.38	—	—	17.39	—	—

CONTINUED

Table 16—Continued

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	49.72	11.96	—	—	—	—	—	10.21	—	—	—	—	—	3.69	—	—	—	—	—
		24	68.23	16.81	—	—	—	—	—	14.33	—	—	—	—	—	5.11	—	—	—	—	—
		32	86.20	21.42	—	—	—	—	—	18.36	—	—	—	—	—	6.50	—	—	—	—	—
28	1	40	101.37	25.52	—	—	—	—	—	21.79	—	—	—	—	—	7.68	—	—	—	—	—
		48	115.94	29.39	—	—	—	—	—	25.13	—	—	—	—	—	8.97	—	—	—	—	—
		56	126.37	32.41	—	—	—	—	—	27.53	—	—	—	—	—	9.89	—	—	—	—	—
		64	136.45	35.23	—	—	—	—	—	29.88	—	—	—	—	—	10.67	—	—	—	—	—
		16	47.13	11.74	—	—	—	—	—	10.02	—	—	—	—	—	3.62	—	—	—	—	—
		24	63.61	16.31	—	—	—	—	—	13.90	—	—	—	—	—	4.95	—	—	—	—	—
		32	78.99	20.55	—	—	—	—	—	17.60	—	—	—	—	—	6.22	—	—	—	—	—
28	2	40	91.22	24.19	—	—	—	—	—	20.64	—	—	—	—	—	7.27	—	—	—	—	—
		48	102.36	27.53	—	—	—	—	—	23.52	—	—	—	—	—	8.37	—	—	—	—	—
		56	109.35	29.97	—	—	—	—	—	25.45	—	—	—	—	—	9.11	—	—	—	—	—
		64	115.61	32.16	—	—	—	—	—	27.27	—	—	—	—	—	9.70	—	—	—	—	—
		16	39.08	10.64	—	—	—	—	—	9.08	—	—	—	—	—	3.26	—	—	—	—	—
		24	53.62	14.94	—	—	—	—	—	12.73	—	—	—	—	—	4.51	—	—	—	—	—
		32	67.74	19.05	—	—	—	—	—	16.31	—	—	—	—	—	5.75	—	—	—	—	—
28	3	40	79.65	22.70	—	—	—	—	—	19.36	—	—	—	—	—	6.80	—	—	—	—	—
		48	91.09	26.17	—	—	—	—	—	22.34	—	—	—	—	—	7.93	—	—	—	—	—
		56	99.27	28.87	—	—	—	—	—	24.51	—	—	—	—	—	8.75	—	—	—	—	—
		64	107.16	31.41	—	—	—	—	—	26.63	—	—	—	—	—	9.45	—	—	—	—	—
		16	60.51	13.78	—	—	—	—	—	11.75	—	—	—	—	—	3.08	—	—	—	—	—
		24	83.34	19.16	—	—	—	—	—	16.34	—	—	—	—	—	4.21	—	—	—	—	—
		32	105.54	24.44	—	—	—	—	—	20.84	—	—	—	—	—	5.45	—	—	—	—	—
30	1	40	124.31	29.44	—	—	—	—	—	25.11	—	—	—	—	—	6.50	—	—	—	—	—
		48	142.40	34.47	—	—	—	—	—	29.56	—	—	—	—	—	7.52	—	—	—	—	—
		56	155.40	38.69	—	—	—	—	—	33.26	—	—	—	—	—	8.46	—	—	—	—	—
		64	167.97	42.68	—	—	—	—	—	36.60	—	—	—	—	—	9.37	—	—	—	—	—
		16	57.72	13.57	—	—	—	—	—	11.56	—	—	—	—	—	3.02	—	—	—	—	—
		24	78.27	18.68	—	—	—	—	—	15.92	—	—	—	—	—	4.09	—	—	—	—	—
		32	97.53	23.57	—	—	—	—	—	20.10	—	—	—	—	—	5.24	—	—	—	—	—
30	2	40	112.96	28.07	—	—	—	—	—	23.93	—	—	—	—	—	6.18	—	—	—	—	—
		48	127.13	32.48	—	—	—	—	—	27.84	—	—	—	—	—	7.06	—	—	—	—	—
		56	136.19	36.00	—	—	—	—	—	30.91	—	—	—	—	—	7.83	—	—	—	—	—
		64	144.39	39.20	—	—	—	—	—	33.58	—	—	—	—	—	8.56	—	—	—	—	—
		16	48.68	12.42	—	—	—	—	—	10.58	—	—	—	—	—	2.75	—	—	—	—	—
		24	67.05	17.28	—	—	—	—	—	14.72	—	—	—	—	—	3.76	—	—	—	—	—
		32	84.93	22.05	—	—	—	—	—	18.79	—	—	—	—	—	4.88	—	—	—	—	—
30	3	40	100.05	26.55	—	—	—	—	—	22.63	—	—	—	—	—	5.81	—	—	—	—	—
		48	114.63	31.08	—	—	—	—	—	26.62	—	—	—	—	—	6.73	—	—	—	—	—
		56	125.12	34.85	—	—	—	—	—	29.91	—	—	—	—	—	7.55	—	—	—	—	—
		64	135.27	38.44	—	—	—	—	—	32.91	—	—	—	—	—	8.36	—	—	—	—	—

Table 17.—Ten-year value increase for white ash, in dollars

D.b.h. (inches)	Butt-log grade	Mer-chant-able height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	1.13	1.47	2.18	2.81	2.42	3.55	4.68	1.21	1.84	—	2.12	3.16	—	0.72	1.22	—	1.47	2.31	—
		24	1.38	1.93	2.56	2.92	3.31	4.44	5.26	1.59	2.13	—	2.92	3.93	—	0.97	1.36	—	2.07	2.87	—
		32	1.56	2.38	2.74	3.02	4.26	5.08	5.86	1.95	2.25	—	3.75	4.49	—	1.18	1.39	—	2.69	3.26	—
12	2	40	1.60	2.70	2.98	3.02	5.03	5.82	6.30	2.21	2.44	—	4.45	5.16	—	1.34	1.46	—	3.21	3.76	—
		48	1.60	2.98	3.03	3.00	5.82	6.31	6.74	2.44	2.46	—	5.17	.60	—	1.47	1.42	—	3.76	4.27	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	.00	.00	.00	1.03	2.61	3.31	3.94	.00	.00	—	2.34	2.97	—	.00	.00	—	1.85	2.35	—
		24	.00	.00	1.03	2.38	3.31	3.94	4.30	.00	.81	—	2.97	3.51	—	.00	.43	—	2.35	2.74	—
		32	.00	1.03	2.38	4.07	3.94	4.30	4.58	.81	2.07	—	3.51	3.81	—	.43	1.52	—	2.74	2.94	—
12	3	40	.69	1.69	3.38	5.19	3.61	3.89	3.93	1.38	2.96	—	3.12	3.35	—	.83	2.20	—	2.25	2.37	—
		48	1.70	2.36	4.17	6.18	2.87	2.92	2.89	1.94	3.64	—	2.33	2.36	—	1.18	2.66	—	1.36	1.31	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	.00	.00	.00	.00	.00	.00	1.03	.00	.00	—	.00	.00	—	.00	.00	—	.00	.00	—
		24	.00	.00	.00	.00	.00	1.03	2.38	.00	.00	—	.00	.81	—	.00	.00	—	.00	.42	—
		32	.00	.00	.00	.00	1.03	2.38	4.07	.00	.00	—	.81	2.07	—	.00	.00	—	.42	1.52	—
12	4	40	.00	.00	.00	.00	2.38	4.07	5.88	.00	.00	—	2.07	3.65	—	.00	.00	—	1.52	2.89	—
		48	.00	.00	.00	.00	4.07	5.88	7.89	.00	.00	—	3.65	5.35	—	.00	.00	—	2.89	4.37	—
		56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	3.55	2.45	4.62	6.64	—	—	—	2.15	4.05	—	—	—	—	1.35	2.93	—	—	—	—
		24	4.68	3.49	5.51	7.11	—	—	—	2.92	4.77	—	—	—	—	1.80	3.39	—	—	—	—
		32	5.82	4.37	5.97	7.52	—	—	—	3.63	5.09	—	—	—	—	2.25	3.47	—	—	—	—
14	1	40	6.64	5.42	6.97	8.04	—	—	—	4.54	5.99	—	—	—	—	2.92	4.14	—	—	—	—
		48	7.42	5.92	6.99	8.07	—	—	—	4.94	5.87	—	—	—	—	3.09	3.82	—	—	—	—
		56	7.91	6.50	7.58	—	—	—	—	5.38	6.38	—	—	—	—	3.33	4.09	—	—	—	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	2.61	2.44	3.95	5.37	3.67	5.76	7.85	1.92	3.26	—	3.10	5.00	—	1.19	2.27	—	2.29	3.88	—
		24	3.31	3.25	4.67	5.67	5.06	7.15	8.82	2.56	3.78	—	4.30	6.15	—	1.57	2.56	—	3.18	4.76	—
		32	3.94	4.03	5.04	5.90	6.51	8.18	9.76	3.14	3.98	—	5.51	6.96	—	1.93	2.58	—	4.13	5.34	—
14	2	40	4.30	4.69	5.54	6.01	7.83	9.40	10.52	3.63	4.39	—	6.61	8.06	—	2.23	2.82	—	4.99	6.21	—
		48	4.58	5.26	5.73	6.11	9.12	10.24	11.33	4.11	4.45	—	7.78	8.72	—	2.54	2.74	—	5.93	6.67	—
		56	4.63	5.68	6.07	—	10.20	11.29	—	4.40	4.72	—	8.67	9.66	—	2.69	2.85	—	6.62	7.37	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	0.00	.14	1.30	3.05	5.05	6.56	7.97	.00	1.06	—	4.53	5.87	—	.00	.63	—	3.80	4.87	—
		24	.00	1.30	3.05	5.23	6.56	7.97	8.98	1.06	2.69	—	5.87	7.09	—	.63	2.03	—	4.87	5.87	—
		32	1.03	2.15	4.39	7.09	6.95	7.96	8.82	1.66	3.70	—	6.06	6.90	—	1.01	2.79	—	4.85	5.50	—
14	3	40	2.38	3.03	5.74	8.63	6.60	7.46	7.93	2.34	4.86	—	5.54	6.31	—	1.43	3.66	—	4.14	4.73	—
		48	4.07	4.05	6.94	10.20	5.77	6.24	6.62	3.18	5.81	—	4.62	4.96	—	1.97	4.29	—	3.05	3.25	—
		56	5.88	5.13	8.39	—	4.43	4.81	—	4.00	7.04	—	3.14	3.46	—	2.48	5.12	—	1.43	1.59	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	.00	.00	.00	.00	.19	1.38	3.18	—	—	—	—	—	—	.00	.00	—	.00	.63	—
		24	.00	.00	.00	.00	1.38	3.18	5.41	—	—	—	—	—	—	.00	.00	—	.63	2.03	—
		32	.00	.00	.00	.00	3.18	5.41	8.12	—	—	—	—	—	—	.00	.00	—	2.03	3.81	—
14	4	40	.00	.00	.00	.00	5.41	8.12	11.01	—	—	—	—	—	—	.00	.00	—	3.81	6.04	—
		48	.00	.00	.00	.00	8.12	11.01	14.27	—	—	—	—	—	—	.00	.00	—	6.04	8.36	—
		56	.00	.00	.00	.00	11.01	14.27	—	—	—	—	—	—	—	.00	.00	—	8.36	11.00	—
		64	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		16	6.10	3.84	7.29	10.74	—	—	—	2.85	5.97	—	—	—	—	1.84	4.50	—	—	—	—
		24	8.17	5.22	8.67	11.40	—	—	—	3.90	6.95	—	—	—	—	2.43	5.08	—	—	—	—
		32	10.19	6.65	9.39	12.06	—	—	—	4.94	7.43	—	—	—	—	3.06	5.26	—	—	—	—
16	1	40	11.79	7.79	10.46	12.39	—	—	—	5.83	8.21	—	—	—	—	3.66	5.74	—	—	—	—
		48	13.34	8.91	10.84	12.78	—	—	—	6.65	8.38	—	—	—	—	4.18	5.65	—	—	—	—
		56	14.41	9.77	11.72	—	—	—	—	7.32	9.00	—	—	—	—	4.58	6.06	—	—	—	—
		64	15.49	10.64	—	—	—	—	—	7.92	—	—	—	—	—	4.99	—	—	—	—	—

CONTINUED

Table 17—Continued

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	4.89	3.55	6.26	8.85	5.04	8.50	11.95	2.63	5.04	—	4.05	7.18	—	1.68	3.69	—	3.04	5.71	—
		24	6.38	4.77	7.36	9.26	7.01	10.46	13.19	3.55	5.80	—	5.69	8.74	—	2.20	4.10	—	4.22	6.87	—
		32	7.74	6.01	7.90	9.65	9.10	11.84	14.51	4.44	6.13	—	7.39	9.88	—	2.75	4.18	—	5.52	7.71	—
16	2	40	8.69	6.95	8.69	9.77	10.88	13.56	15.49	5.18	6.68	—	8.93	11.30	—	3.22	4.48	—	6.75	8.83	—
		48	9.54	7.85	8.92	9.93	12.71	14.64	16.59	5.83	6.75	—	10.46	12.19	—	3.64	4.35	—	7.99	9.45	—
		56	9.96	8.50	9.50	—	14.22	16.16	—	6.33	7.14	—	11.76	13.45	—	3.93	4.59	—	9.03	10.51	—
		64	10.34	9.13	—	—	15.79	—	—	6.76	—	—	13.07	—	—	4.21	—	—	10.13	—	—
		16	.14	1.43	3.47	6.32	8.30	11.02	13.60	1.04	2.86	—	7.38	9.80	—	0.63	2.20	—	6.44	8.44	—
		24	1.30	2.31	5.16	8.50	9.85	12.44	14.34	1.69	4.26	—	8.63	10.88	—	1.03	3.29	—	7.28	9.18	—
		32	3.05	3.41	6.75	10.74	10.69	12.59	14.34	2.51	5.58	—	9.13	10.82	—	1.54	4.29	—	7.43	8.87	—
16	3	40	5.23	4.57	8.57	12.71	10.41	12.16	13.23	3.40	7.06	—	8.64	10.15	—	2.11	5.41	—	6.69	7.95	—
		48	7.89	5.91	10.05	14.75	9.50	10.57	11.58	4.40	8.23	—	7.48	8.40	—	2.75	6.21	—	5.29	6.00	—
		56	10.70	7.23	11.93	—	7.76	8.76	—	5.41	9.72	—	5.59	6.40	—	3.40	7.33	—	3.19	3.85	—
		64	13.92	8.72	—	—	5.55	—	—	6.51	—	—	3.18	—	—	4.11	—	—	.63	—	—
		16	9.51	4.96	10.22	15.31	—	—	—	3.70	8.47	—	—	—	—	2.32	6.60	—	—	—	—
		24	12.84	6.89	11.98	16.23	—	—	—	5.14	9.82	—	—	—	—	3.27	7.40	—	—	—	—
		32	16.10	8.72	12.97	17.13	—	—	—	6.56	10.37	—	—	—	—	4.14	7.50	—	—	—	—
18	1	40	18.73	10.34	14.51	17.50	—	—	—	7.74	11.47	—	—	—	—	4.87	8.16	—	—	—	—
		48	21.30	11.94	14.93	17.86	—	—	—	8.91	11.65	—	—	—	—	5.59	8.00	—	—	—	—
		56	23.13	13.09	16.02	—	—	—	—	9.81	12.42	—	—	—	—	6.17	8.53	—	—	—	—
		64	24.98	14.17	—	—	—	—	—	10.57	—	—	—	—	—	6.68	—	—	—	—	—
		16	8.04	4.68	9.02	13.09	6.43	11.69	16.78	3.48	7.39	—	5.16	9.94	—	2.18	5.64	—	3.79	8.07	—
		24	10.65	6.43	10.49	13.69	9.08	14.17	18.42	4.79	8.48	—	7.33	12.02	—	3.03	6.22	—	5.47	9.59	—
		32	13.07	8.06	11.26	14.27	11.75	15.99	20.16	6.05	8.87	—	9.59	13.40	—	3.80	6.22	—	7.17	10.52	—
18	2	40	14.88	9.46	12.46	14.39	14.19	18.36	21.35	7.06	9.70	—	11.60	15.33	—	4.42	6.68	—	8.72	12.01	—
		48	16.54	10.81	12.73	14.51	16.70	19.69	22.62	8.04	9.76	—	13.67	16.41	—	5.02	6.48	—	10.35	12.77	—
		56	17.54	11.73	13.50	—	18.69	21.62	—	8.76	10.28	—	15.41	18.02	—	5.47	6.80	—	11.76	14.12	—
		64	18.47	12.57	—	—	20.68	—	—	9.34	—	—	17.08	—	—	5.86	—	—	13.19	—	—
		16	1.40	2.10	5.28	9.43	11.32	15.68	19.73	1.55	4.41	—	10.12	14.03	—	0.96	3.49	—	8.23	12.28	—
		24	3.35	3.32	7.48	12.23	13.72	17.78	20.98	2.46	6.28	—	12.08	15.77	—	1.53	4.94	—	10.33	13.52	—
		32	6.08	4.75	9.51	15.12	15.06	18.26	21.27	3.55	7.91	—	13.05	15.86	—	2.21	6.15	—	10.79	13.22	—
18	3	40	9.30	6.29	11.90	17.55	15.04	18.05	19.97	4.69	9.85	—	12.65	15.28	—	2.93	7.61	—	10.00	12.26	—
		48	13.16	8.04	13.69	19.99	14.19	16.11	17.89	5.99	11.27	—	11.42	13.14	—	3.75	8.57	—	8.40	9.86	—
		56	17.16	9.69	15.98	—	12.11	13.88	—	7.26	13.09	—	9.13	10.66	—	4.57	9.96	—	5.85	7.17	—
		64	21.70	11.44	—	—	9.34	—	—	8.55	—	—	6.11	—	—	5.42	—	—	2.63	—	—
		16	13.96	6.71	14.27	21.70	—	—	—	4.82	11.58	—	—	—	—	3.01	9.18	—	—	—	—
		24	18.99	9.23	16.67	22.95	—	—	—	6.54	13.36	—	—	—	—	4.14	10.21	—	—	—	—
		32	23.93	11.73	18.01	24.10	—	—	—	8.42	14.05	—	—	—	—	5.27	10.36	—	—	—	—
20	1	40	27.97	13.97	20.06	24.61	—	—	—	10.01	15.46	—	—	—	—	6.32	11.23	—	—	—	—
		48	31.94	16.10	20.65	25.04	—	—	—	11.49	15.62	—	—	—	—	7.27	10.92	—	—	—	—
		56	34.81	17.78	22.16	—	—	—	—	12.75	16.73	—	—	—	—	8.05	11.55	—	—	—	—
		64	37.63	19.35	—	—	—	—	—	13.91	—	—	—	—	—	8.74	—	—	—	—	—
		16	12.24	6.42	12.91	19.10	8.43	15.99	23.42	4.60	10.34	—	6.54	13.30	—	2.87	8.06	—	4.73	10.90	—
		24	16.39	8.76	14.96	19.97	11.84	19.28	25.56	6.20	11.82	—	9.15	15.97	—	3.91	8.85	—	6.75	12.82	—
		32	20.31	11.04	16.05	20.74	15.35	21.64	27.73	7.90	12.33	—	12.05	17.68	—	4.93	8.87	—	8.90	13.98	—
20	2	40	23.33	13.03	17.72	20.94	18.62	24.71	29.26	9.30	13.43	—	14.65	20.10	—	5.85	9.50	—	10.96	15.88	—
		48	26.16	14.89	18.11	21.08	21.88	26.43	30.81	10.59	13.47	—	17.27	21.40	—	6.67	9.14	—	13.04	16.70	—
		56	27.99	16.28	19.25	—	24.60	28.98	—	11.64	14.26	—	19.57	23.55	—	7.31	9.55	—	14.87	18.37	—
		64	29.67	17.57	—	—	27.30	—	—	12.58	—	—	21.86	—	—	7.86	—	—	16.69	—	—
		16	3.28	3.09	7.79	13.74	15.38	21.86	28.06	2.19	6.38	—	13.56	19.30	—	1.35	5.12	—	11.83	17.02	—
		24	6.31	4.75	10.70	17.33	18.83	25.02	30.04	3.34	8.78	—	16.27	21.89	—	2.08	6.98	—	13.98	18.92	—
		32	10.34	6.68	13.30	20.96	21.01	26.02	30.71	4.76	10.80	—	17.87	22.30	—	2.96	8.48	—	14.90	18.84	—
20	3	40	14.91	8.73	16.38	24.04	21.44	26.13	29.36	6.22	13.23	—	17.72	21.84	—	3.90	10.33	—	14.26	17.92	—
		48	20.32	10.98	18.63	27.05	20.73	23.96	26.92	7.82	14.91	—	16.44	19.31	—	4.93	11.43	—	12.51	14.98	—
		56	25.80	13.15	21.56	—	18.47	21.44	—	9.43	17.24	—	13.83	16.45	—	5.95	13.11	—	9.50	11.74	—
		64	31.91	15.45	—	—	15.33	—	—	11.13	—	—	10.34	—	—	7.00	—	—	5.63	—	—

		16	19.67	7.85	—	—	—	—	—	5.66	—	—	—	—	—	4.01	—	—	—	—	—
		24	26.82	10.95	21.05	29.67	—	—	—	7.91	17.27	—	—	—	—	5.57	14.24	—	—	—	—
		32	33.95	13.93	22.55	30.94	—	—	—	10.15	17.97	—	—	—	—	7.11	14.38	—	—	—	—
22	1	40	39.85	16.64	25.03	31.12	—	—	—	12.06	19.77	—	—	—	—	8.47	15.63	—	—	—	—
		48	45.66	19.22	25.31	31.31	—	—	—	13.96	19.42	—	—	—	—	9.82	14.97	—	—	—	—
		56	49.96	21.02	27.01	—	—	—	—	15.13	20.60	—	—	—	—	10.68	15.75	—	—	—	—
		64	54.18	22.79	—	—	—	—	—	16.38	—	—	—	—	—	11.53	—	—	—	—	—
		16	17.69	7.58	—	—	9.82	—	—	5.46	—	—	7.63	—	—	3.86	—	—	5.98	—	—
		24	23.81	10.49	19.16	26.29	13.96	24.07	32.68	7.58	15.55	—	10.92	20.29	—	5.32	12.67	—	8.58	17.25	—
		32	29.72	13.25	20.38	27.12	18.16	26.77	35.17	9.64	16.05	—	14.38	22.20	—	6.76	12.66	—	11.34	18.61	—
22	2	40	34.40	15.70	22.44	26.99	22.10	30.49	36.58	11.37	17.50	—	17.52	25.23	—	7.98	13.61	—	13.93	21.09	—
		48	38.83	18.00	22.55	26.87	26.05	32.14	38.14	13.06	17.07	—	20.79	26.25	—	9.17	12.92	—	16.65	21.80	—
		56	41.85	19.53	23.86	—	29.13	35.12	—	14.06	17.94	—	23.24	28.71	—	9.91	13.45	—	18.79	23.86	—
		64	44.68	21.03	—	—	32.29	—	—	15.11	—	—	25.88	—	—	10.62	—	—	21.03	—	—
		16	5.90	3.69	—	—	19.30	—	—	2.69	—	—	17.26	—	—	1.92	—	—	15.66	—	—
		24	10.33	5.67	13.63	22.33	23.96	32.64	39.76	4.14	11.52	—	21.05	29.03	—	2.94	9.81	—	18.80	26.14	—
		32	16.02	7.94	16.64	26.61	26.95	34.07	40.81	5.83	13.85	—	23.34	29.75	—	4.12	11.64	—	20.45	26.35	—
22	3	40	22.32	10.34	20.30	29.98	27.77	34.51	39.06	7.55	16.82	—	23.45	29.57	—	5.34	14.05	—	20.05	25.68	—
		48	29.67	12.96	22.63	33.29	27.17	31.71	36.04	9.47	18.42	—	22.22	26.24	—	6.71	15.21	—	18.34	22.09	—
		56	37.01	15.29	25.95	—	24.38	28.70	—	11.08	21.01	—	18.90	22.78	—	7.87	17.25	—	14.75	18.30	—
		64	45.14	17.81	—	—	20.56	—	—	12.87	—	—	14.65	—	—	9.11	—	—	10.16	—	—
		16	26.38	9.31	—	—	—	—	—	6.46	—	—	—	—	—	4.53	—	—	—	—	—
		24	36.21	13.01	—	—	—	—	—	9.12	—	—	—	—	—	6.35	—	—	—	—	—
		32	45.91	16.68	28.08	39.34	—	—	—	11.64	22.07	—	—	—	—	8.16	17.89	—	—	—	—
24	1	40	54.13	19.86	31.12	39.64	—	—	—	13.85	24.13	—	—	—	—	9.67	19.27	—	—	—	—
		48	62.13	23.11	31.63	40.04	—	—	—	16.12	23.84	—	—	—	—	11.27	18.46	—	—	—	—
		56	67.87	25.90	34.30	—	—	—	—	18.11	25.72	—	—	—	—	12.73	19.72	—	—	—	—
		64	73.51	28.66	—	—	—	—	—	20.08	—	—	—	—	—	14.08	—	—	—	—	—
		16	24.18	9.04	—	—	11.51	—	—	6.27	—	—	8.66	—	—	4.39	—	—	6.73	—	—
		24	32.81	12.54	—	—	16.42	—	—	8.77	—	—	12.52	—	—	6.11	—	—	9.76	—	—
		32	41.10	15.95	25.63	34.93	21.49	32.89	44.15	11.12	19.89	—	16.45	26.88	—	7.78	15.93	—	12.97	22.70	—
24	2	40	47.87	18.86	28.16	34.82	26.12	37.38	45.90	13.12	21.55	—	20.11	30.39	—	9.15	16.97	—	15.93	25.53	—
		48	54.26	21.77	28.43	34.80	30.99	39.51	47.91	15.15	21.11	—	24.00	31.72	—	10.58	16.08	—	19.14	26.34	—
		56	58.50	24.18	30.55	—	35.26	43.67	—	16.87	22.56	—	27.47	35.09	—	11.83	17.00	—	22.09	29.08	—
		64	62.53	26.52	—	—	39.64	—	—	18.53	—	—	31.06	—	—	12.97	—	—	25.06	—	—
		16	9.08	4.12	—	—	24.14	—	—	2.88	—	—	21.37	—	—	2.03	—	—	19.49	—	—
		24	15.24	6.41	—	—	30.11	—	—	4.51	—	—	26.34	—	—	3.16	—	—	23.68	—	—
		32	22.88	9.06	20.18	32.92	34.17	43.84	53.15	6.36	16.64	—	29.34	38.11	—	4.48	14.18	—	26.00	34.14	—
24	3	40	31.24	11.82	24.56	37.03	35.48	44.79	51.45	8.29	20.08	—	29.75	38.17	—	5.81	16.96	—	25.78	33.60	—
		48	40.82	14.98	27.45	41.17	35.21	41.86	48.23	10.50	22.05	—	28.59	34.55	—	7.38	18.30	—	24.01	29.52	—
		56	50.09	18.18	31.91	—	32.60	38.97	—	12.79	25.51	—	25.29	30.98	—	9.03	20.99	—	20.25	25.42	—
		64	60.29	21.70	—	—	28.76	—	—	15.30	—	—	20.77	—	—	10.78	—	—	15.21	—	—
		16	34.05	10.16	—	—	—	—	—	7.09	—	—	—	—	—	4.90	—	—	—	—	—
		24	46.98	14.24	—	—	—	—	—	9.92	—	—	—	—	—	6.95	—	—	—	—	—
		32	59.65	18.39	—	—	—	—	—	12.73	—	—	—	—	—	8.86	—	—	—	—	—
26	1	40	70.49	22.03	36.23	46.83	—	—	—	15.30	28.43	—	—	—	—	10.69	23.09	—	—	—	—
		48	81.19	25.53	36.13	46.70	—	—	—	17.74	27.58	—	—	—	—	12.39	21.66	—	—	—	—
		56	89.30	28.02	38.59	—	—	—	—	19.47	29.18	—	—	—	—	13.55	22.80	—	—	—	—
		64	97.29	30.59	—	—	—	—	—	21.18	—	—	—	—	—	14.81	—	—	—	—	—
		16	31.62	9.95	—	—	12.58	—	—	6.93	—	—	9.51	—	—	4.79	—	—	7.33	—	—
		24	43.18	13.86	—	—	18.05	—	—	9.64	—	—	13.73	—	—	6.74	—	—	10.75	—	—
		32	54.23	17.77	—	—	23.81	—	—	12.27	—	—	18.14	—	—	8.54	—	—	14.28	—	—
26	2	40	63.39	21.13	33.11	41.60	29.14	43.33	53.93	14.64	25.65	—	22.40	35.54	—	10.22	20.56	—	17.79	30.19	—
		48	72.19	24.31	32.80	41.04	34.53	45.13	55.70	16.85	24.67	—	26.73	36.57	—	11.76	19.07	—	21.39	30.66	—
		56	78.49	26.50	34.75	—	38.83	49.40	—	18.37	25.87	—	30.28	39.99	—	12.77	19.87	—	24.36	33.61	—
		64	84.51	28.73	—	—	43.38	—	—	19.85	—	—	33.97	—	—	13.85	—	—	27.59	—	—
		16	12.49	4.46	—	—	29.08	—	—	3.10	—	—	26.06	—	—	2.15	—	—	23.92	—	—
		24	20.56	6.93	—	—	36.48	—	—	4.82	—	—	32.26	—	—	3.37	—	—	29.36	—	—
		32	30.37	9.83	—	—	41.62	—	—	6.80	—	—	36.13	—	—	4.74	—	—	32.39	—	—
26	3	40	41.01	12.86	28.38	43.33	43.50	55.48	63.97	8.94	23.46	—	37.01	48.03	—	6.26	20.08	—	32.59	42.93	—
		48	53.21	16.18	31.13	47.63	43.29	51.77	60.02	11.26	25.32	—	35.83	43.64	—	7.89	21.29	—	30.74	38.05	—
		56	65.18	19.16	35.66	—	39.80	48.05	—	13.35	28.80	—	31.67	39.17	—	9.32	24.13	—	26.07	33.17	—
		64	78.37	22.47	—	—	34.86	—	—	15.61	—	—	25.98	—	—	10.95	—	—	19.99	—	—

CONTINUED

*U.S. GOVERNMENT PRINTING OFFICE: 1972-707-480/356

Table 17—Continued

D.b.h. (inches)	Butt-log grade	Merchantable height (feet)	Initial value (dollars)	Vigor 1						Vigor 2						Vigor 3					
				No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—			No change in butt-log grade with height increase (feet) of—			Increase in butt-log grade with height increase (feet) of—		
				0	8	16	0	8	16	0	8	16	0	8	16	0	8	16	0	8	16
		16	42.42	12.13	—	—	—	—	—	7.92	—	—	—	—	—	5.55	—	—	—	—	—
		24	58.68	16.98	—	—	—	—	—	11.24	—	—	—	—	—	7.77	—	—	—	—	—
		32	74.73	21.92	—	—	—	—	—	14.41	—	—	—	—	—	10.09	—	—	—	—	—
28	1	40	88.60	26.17	—	—	—	—	—	17.21	—	—	—	—	—	11.97	—	—	—	—	—
		48	102.19	30.38	—	—	—	—	—	19.98	—	—	—	—	—	13.94	—	—	—	—	—
		56	112.33	33.71	—	—	—	—	—	21.98	—	—	—	—	—	15.32	—	—	—	—	—
		64	122.35	37.00	—	—	—	—	—	24.07	—	—	—	—	—	16.80	—	—	—	—	—
		16	39.82	11.97	—	—	—	—	—	7.81	—	—	—	—	—	5.47	—	—	—	—	—
		24	54.55	16.65	—	—	—	—	—	11.00	—	—	—	—	—	7.61	—	—	—	—	—
		32	68.79	21.34	—	—	—	—	—	14.01	—	—	—	—	—	9.80	—	—	—	—	—
28	2	40	80.74	25.33	—	—	—	—	—	16.63	—	—	—	—	—	11.56	—	—	—	—	—
		48	92.16	29.21	—	—	—	—	—	19.18	—	—	—	—	—	13.37	—	—	—	—	—
		56	100.25	32.19	—	—	—	—	—	20.96	—	—	—	—	—	14.59	—	—	—	—	—
		64	108.01	35.09	—	—	—	—	—	22.80	—	—	—	—	—	15.87	—	—	—	—	—
		16	16.16	5.40	—	—	—	—	—	3.52	—	—	—	—	—	2.46	—	—	—	—	—
		24	26.24	8.32	—	—	—	—	—	5.50	—	—	—	—	—	3.80	—	—	—	—	—
		32	38.44	11.73	—	—	—	—	—	7.71	—	—	—	—	—	5.40	—	—	—	—	—
28	3	40	51.59	15.22	—	—	—	—	—	10.01	—	—	—	—	—	6.97	—	—	—	—	—
		48	66.53	19.08	—	—	—	—	—	12.57	—	—	—	—	—	8.78	—	—	—	—	—
		56	80.96	22.76	—	—	—	—	—	14.86	—	—	—	—	—	10.38	—	—	—	—	—
		64	96.80	26.76	—	—	—	—	—	17.44	—	—	—	—	—	12.20	—	—	—	—	—
		16	51.86	13.88	—	—	—	—	—	9.20	—	—	—	—	—	6.38	—	—	—	—	—
		24	71.96	19.40	—	—	—	—	—	12.80	—	—	—	—	—	9.04	—	—	—	—	—
		32	91.82	24.99	—	—	—	—	—	16.49	—	—	—	—	—	11.55	—	—	—	—	—
30	1	40	108.99	30.11	—	—	—	—	—	19.90	—	—	—	—	—	13.96	—	—	—	—	—
		48	125.84	35.55	—	—	—	—	—	23.52	—	—	—	—	—	16.46	—	—	—	—	—
		56	138.43	39.89	—	—	—	—	—	26.66	—	—	—	—	—	18.55	—	—	—	—	—
		64	150.87	44.20	—	—	—	—	—	29.53	—	—	—	—	—	20.63	—	—	—	—	—
		16	49.13	13.77	—	—	—	—	—	9.12	—	—	—	—	—	6.32	—	—	—	—	—
		24	67.56	19.13	—	—	—	—	—	12.61	—	—	—	—	—	8.89	—	—	—	—	—
		32	85.42	24.50	—	—	—	—	—	16.15	—	—	—	—	—	11.30	—	—	—	—	—
30	2	40	100.46	29.33	—	—	—	—	—	19.36	—	—	—	—	—	13.56	—	—	—	—	—
		48	114.89	34.40	—	—	—	—	—	22.73	—	—	—	—	—	15.88	—	—	—	—	—
		56	125.16	38.34	—	—	—	—	—	25.57	—	—	—	—	—	17.77	—	—	—	—	—
		64	135.06	42.19	—	—	—	—	—	28.12	—	—	—	—	—	19.62	—	—	—	—	—
		16	20.36	6.28	—	—	—	—	—	4.15	—	—	—	—	—	2.87	—	—	—	—	—
		24	32.75	9.59	—	—	—	—	—	6.32	—	—	—	—	—	4.45	—	—	—	—	—
		32	47.59	13.42	—	—	—	—	—	8.85	—	—	—	—	—	6.20	—	—	—	—	—
30	3	40	63.45	17.48	—	—	—	—	—	11.55	—	—	—	—	—	8.11	—	—	—	—	—
		48	81.40	22.21	—	—	—	—	—	14.71	—	—	—	—	—	10.31	—	—	—	—	—
		56	98.59	26.73	—	—	—	—	—	17.91	—	—	—	—	—	12.48	—	—	—	—	—
		64	117.43	31.65	—	—	—	—	—	21.22	—	—	—	—	—	14.85	—	—	—	—	—