



# FORESTRY EXTENSION NOTES

## WHEN TO HARVEST YOUR TREES

The time to cut a tree varies depending upon the objectives of the owner. If the owner uses a woodland only for recreation, then aesthetics and safety should be the primary concerns in deciding when to cut a tree. If a tree or stand is going to be used for economic gain, then time to cut should be determined by the present and future worth of the trees and the continuing proper growth of the remaining stand.

Maturity of a tree is hard to determine because a tree is both a production unit (a wood producing factory) and a final product (logs). Economically, a tree is ready to cut when it reaches financial maturity. Financial maturity occurs when the potential return from cutting the tree is equal to the costs of keeping it growing; the risk of the tree being damaged and the opportunity costs of alternative investments should certainly be considered.

Financial maturity is determined by comparing the growth in the tree's value during a year to the total tree value at the beginning of the year. This is then expressed as a percentage or rate of return that can be compared to alternative investment opportunities.

Financial maturity does not occur at the same time that biological maturity does. Biological maturity of a tree occurs when its volume is at a maximum, which is usually reached in old age; an old tree continues to grow even though growth is slow. Financial maturity is normally shorter in time span

than biological maturity. Financial maturity occurs when an individual tree's current rate of increase in value becomes equal to the rate of return from alternative investments such as savings accounts. The owner must decide what is the minimum annual rate of return to be accepted from a tree before it is cut and the money reinvested. When a

tree reaches the point where its annual rate of value increase has declined to or below an alternative rate of return, then the tree should be cut if the only objective is economic gain.

As the tree grows, changes also occur in log quality that can cause increases in value. As a tree grows, it passes through sawtimber size, then reaches veneer size. When veneer size is reached, the value increases significantly. Consideration must be given to these increases in value that occur at certain sizes because of the economic return that can be realized. The cutting of a mature tree should be timed to maximize the net return to the owner.

To provide land owners a "feel" of economic rate of return, a graph has been prepared. To find the annual rate of return at which a tree is producing, the tree must be evaluated on its diameter and growth rate. As a rough estimate of a tree's annual rate of return for a given product, follow the steps below and use the graph shown in Figure 1. Remember, this is but a guide and not a final decision-making mechanism.

### STEPS:

1. Measure the tree's diameter at breast height. (4.5 feet above the ground)
2. Estimate the tree's growth rate: fast = 4 growth rings per inch medium = 8 growth rings per inch slow = 12 growth rings per inch

NOTE: Increment coring can lower the value of wood. Growth rate on premium woods should be estimated by the tree's appearance, the last two years of shoot growth, and/or by a trained forester.

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### ...and justice for all

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- Go to Figure 1, and use your tree's measurements to find the annual rate of return in percent.

The graph in Figure 1 should be used in the following way. Find the tree's diameter at breast height (4.5' above the ground) along the bottom axis of the graph. Go straight upward on the graph until you intersect the tree's growth rate line. Then go directly left to read the annual rate of return at which the tree is producing. This graph is based on trees containing three eight-foot logs; trees having a different number of merchantable logs will have a slightly different rate of return. The graph gives relative earning rates, not dollar values. Values in the graph assume that the tree does not move from sawtimber to veneer size or grade and that there is no price increase in unit value over time.

For those interested in more accurately determining the rate of return for their specific tree at the same or changing product class, use the following formula:

$$i = \text{or } (1 + i)^n +$$

where:  $i$  = compound rate of return. (Multiply by 100 to obtain  $i$  as a percent)

$n$  = number of years between volume estimates

$v$  = current board foot volume of your tree (Table 1)  
 $v^1$  = future board foot volume of tree in  $n$  years  
 $p$  = price per board foot of current volume of your tree  
 $p^1$  = future price per board foot of volume in  $n$  years

If high value material is involved, such as walnut or veneer quality oak, obtain the services of a professional forester to assist in marketing the timber.

Care must be taken in comparing alternative rates of return. Inflation, interest rates, taxes and the general state of the economy can affect the annual rate of return that would be the optimum to use as a cut-off point for tree growth.

Predicting future volumes of trees is much more dependable than predicting future prices of tree volumes. Avoid predicting future prices by analyzing the situation in real terms. To make an analysis in real terms, simply use today's prices of sawlogs and veneer for the prices in the future. Then adjust the rates of return from alternative investments by the following formula to obtain rates of return comparable to the results of the analysis.

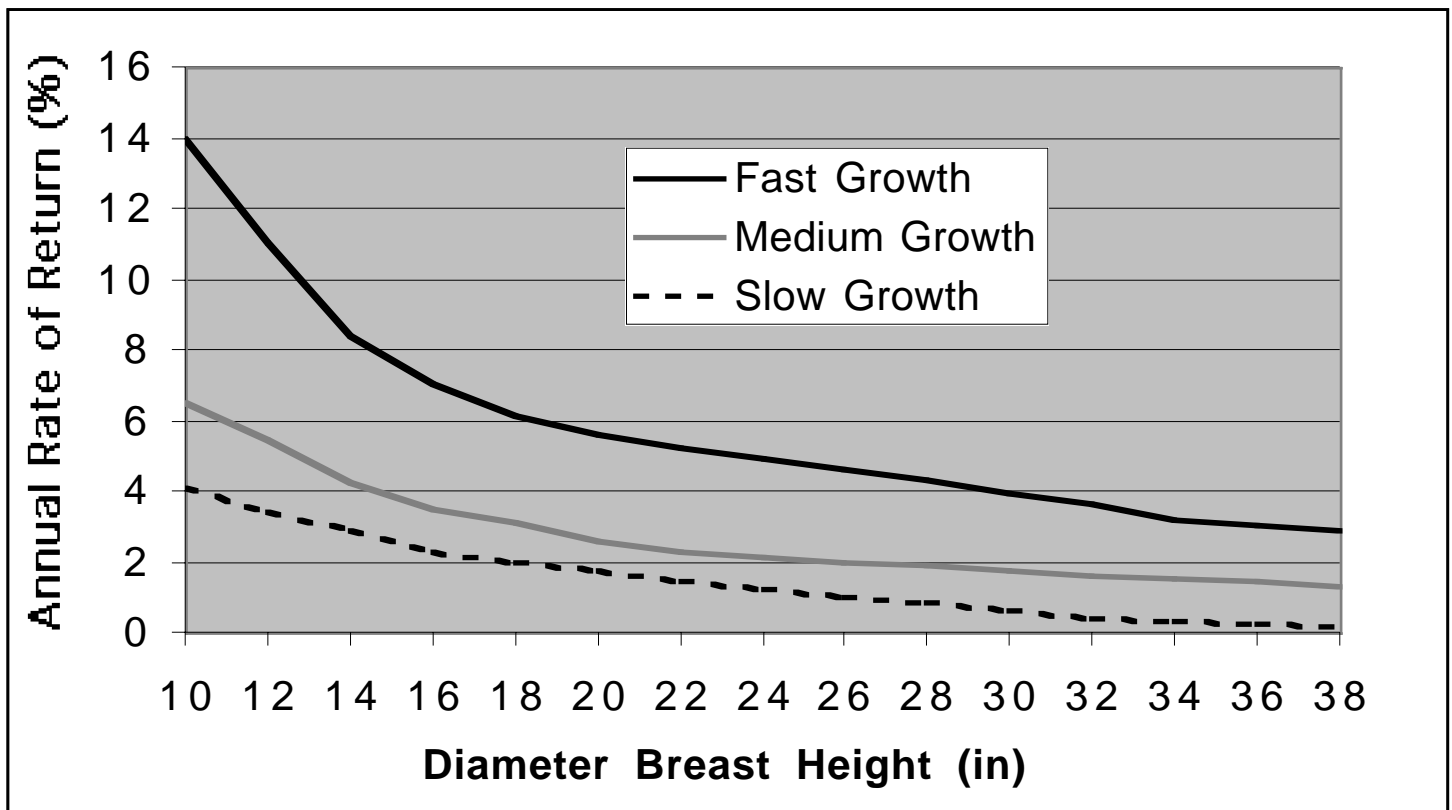


Figure 1. Annual rates of return for trees of different diameters and growth rates

$$(R/I) - 1 = \text{Real Rate of Return}$$

where:

$$R = 1 + \text{rate of return from alternative investment}$$

$$I = 1 + \text{expected long term rate of inflation}$$

For example, an alternative investment might have a rate of return of 9% during a time when expected inflation is 5%. The real rate of return would equal:

$$(1.09/1.05) - 1 = 0.0381 \text{ or } 3.81 \text{ percent}$$

This 3.81 percent is then comparable to the results from the above formula for compound rate of return when prices are held constant over time or the results from the graph in Figure 1.

Taxes can change the annual rate of return so alternatives should be compared on the basis of after tax revenues. If the capital gains tax is used, then the tree can be allowed to grow longer and increase in value. Good financial planning and sound counseling are required to maximize profit. In a stand, the trees that should be cut to maximize

economic return and provide for continued stand growth are: unusable trees; dead and dying trees; diseased trees; trees with decay; deformed trees; short-lived trees; and any tree with a rate of return below the chosen rate of return.

Management of forest lands for economic gain is not just cutting the big trees. The term "management" means an effort is being made to help the forest continue to produce quality trees as well as a given quantity of wood. Cutting only the large trees will "high-grade" the stand. High-grading is when only the best trees are taken in a harvest leaving a stand filled with sub-standard trees. After several cuts, the only trees left in the stand will be crooked, decayed, small trees that are slow growing and worthless to the land owner. To maintain a productive forest stand, overall forest management must be utilized. For assistance in woodland management, consult a District Forester of the Iowa Department of Natural Resources or a private forestry consultant.

Table 1. Tree Volume in Board Feet Based on the Scribner Rule

Diameter at 4.5 feet above ground (inches)	Merchantable height in feet					
	8	16	24	32	40	48
	Contents in Board Feet					
10	17	30	40	49	57	62
12	28	48	66	78	89	100
14	40	70	96	116	141	160
16	54	93	129	158	191	224
18	72	122	168	207	248	292
20	90	156	212	262	317	366
22	111	194	262	328	392	450
24	137	236	319	400	470	550
26	165	281	381	480	565	650
28	195	331	450	560	670	760
30	227	383	520	650	770	890
32	260	440	600	740	890	1020
34	294	500	680	840	1010	1160
36	330	565	770	960	1140	1310
38	365	630	860	1070	1270	1470
40	405	700	950	1180	1400	1630