

How fast do trees grow?

One of the greatest benefits trees have over other assets is that they grow. Trees don't care about a fiscal cliff; who is president; if stocks are up or down; or any of the other economic factors. They just grow! I've often been asked by landowners: "How fast do trees grow?" The answer to questions such as these can be vital to a landowner who is considering their management options. A variety of circumstances and who is answering the question (logger, timber buyer, state forester, or consulting forester) may result in a drastically different conclusion.

Biological Volume Growth

A simplistic approach would be to consider only the biological growth potential ("the average net growth attainable in a fully stocked, natural forest stand"¹). Table 1 shows the average annual growth rate for all species in the northeast is 3.92%.



Table 1. Growth Rates by species in the Northeast ²

Species	Annual Growth Rate
Red Oak	3.75%
White Oak	3.69%
Black Cherry	5.11%
White Ash	5.02%
Sugar Maple	2.22%
Red Maple	3.44%
Poplar	4.20%
Other Hardwoods	2.22%
Pine/Hemlock	5.62%
Composite Average	3.92%

¹ Society of American Foresters. The Dictionary of Forestry. http://dictionaryofforestry.org/dict/term/biological_growth_potential

² Alexander, Charles and Gifford, John. The Basics of Timberland Investing. Forecon Inc., June 2003.

Other estimates of growth can be broken down by various volumes per acre as shown in Table 2.

Table 2. Summary of Growth Rates and Yields of Common New Hampshire Forest Types³

Growth Measure	Northern Hardwood	Red Oak	White Pine	Hemlock	Spruce-fir
Annual Basal Area Growth/ acre (sq.ft.)	1.0-2.2	1.0-2.5	1.5-3.5	2.0-2.7	2.0-3.0
Annual Board-foot growth/ acre	100-275	150-400	300-1,200	150-250	150-250
Annual Diameter Growth (inches)	0.05-0.20	0.10-0.25	0.10-0.40	0.10-0.30	0.10-0.20
Financially Mature gross standing volume (board feet)*/acre	10,000-15,000	5,000-15,000	10,000-50,000	15,000-20,000	15,000-30,000

*Larger trees about 12-16 inches dbh (spruce-fir) and 18-24 inches dbh (other types).

While these numbers may be a good generalization, several factors can influence these growth rates both up or down including soil type, management, age of stand/tree, stocking, and environmental factors such as drought. Overall, most trees will grow best on nutrient rich medium-textured fertile soils types that are moist much of the year without being too dry or overly wet for long periods. Young trees grow at a faster rate than older trees. Most of the growth in young trees goes into height growth. As the tree gets older and the height growth is obtained, their energy will go into diameter growth. The growth of older trees is mostly in diameter.

The stocking (density of trees within a stand) level will also greatly influence the growth rate. Foresters often refer to stocking charts which display how stocked stand conditions are ranging overstocked (above the A-line) to understocked (below the B-line, with a fully stocked stand in the middle



³ Bennett, Karen P. editor. 2010. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition). University of New Hampshire Cooperative Extension, Durham, N.H. 224 p.

(between the A and B lines). The growth per acre of a stand that is understocked is low as it is not being utilized to its fullest, often resulting in lower quality timber due to excessive branching. A stand that has been allowed to grow into the overstocked category has become overcrowded and the growth is slow within the stand. Within a fully stocked stand the lower the stocking (closer to the B-line) the faster the growth rate will be. As the stand grows and approaches being overstocked it has a high stocking level and the rate of growth begins to slow. Table 3 depicts the growth rate calculations for investment grade forests of northern hardwood stands in the Northeast.

Table 3. Northern Hardwood Growth Rate Calculations⁴

	Low Stocking Level		Medium Stocking Level		High Stocking Level	
Cords/Acre/Year	0.25	0.50	0.25	0.50	0.25	0.50
Average Cords/Acre	15	15	15	15	15	15
Growth Rate	1.67%	3.33%	1.25%	2.50%	1.00%	2.00%

Stumpage value growth



Stumpage prices have historically outpaced inflation by about 2 percent annually. Long-term records show that stumpage prices have been increasing about 2 percent per year above and beyond the inflationary rise of other products.⁵ According to Rose et al, Northeastern regional stumpage prices from 1961 to 2002 found the real (adjusted for inflation) annual percentage change of prices to be 4.6% for Hardwood sawlogs and 1.4% for Softwood sawlogs.⁶

Grade Growth

Aside from biological and stumpage growth, trees can grow in value by moving up in grade. As their size increases, if they are free of defects or their quality is improved by growing clear wood over defects (clear wood grown over pruned branches, etc.) new product classes can be achieved adding a substantial jump in value. Trees can

⁴ Lutz, Jack. Forest Research Notes, Vol. 2, No. 3, 3rd Qtr, 2005 Page 2.

⁵ Rose, D.W., C.R. Blum, and G.J. Brand. 1988. A Guide to Forestry Investment Analysis. USDA Forest Service Research Paper NC-284.

⁶ Wagner, J.E. and Sendak P.E. The annual increase of Northeastern regional timber stumpage prices: 1961 to 2002. Forest Products Journal Vol. 55, No. 2. February 2005.

potentially increase in a grade every ten years.⁷ Grade growth alone can account for an additional 1-2 percent per year in value growth.⁸

Management

Management is the single most important contributing factor to tree growth value. Proper selection of which species are best suited for a specific site, what the ideal stocking for an individual stand should be, which trees have reached their maximum value, and which trees should be released to increase the rate of growth and/or grade are just a few examples of how management affects growth. Lots that have been high-graded (the best quality trees were removed leaving the lowest quality trees to grow) in the past will struggle to achieve normal returns due to less volume growing on smaller trees, low value species retained such as beech or red maple, low quality stems retained (broken tops, poor form, no chance of improving in grade, etc.), and less opportunity for frequent harvests. Management will also allow for targeted ingrowth (trees that grow into the smallest measured size class) within the stand. Well-managed stands may grow at twice the rate of total value increase for unmanaged stands, with exceptional stands and individual trees growing at even higher rates.⁹

In summary, trees are able to grow biologically in volume (2-6%), market value (2%), and grade (0-2%) for possible value growth rates of around 4 to 10 percent annually. Sound quality management could potentially bring that annual value growth rate up to between 8 and 20 percent. How fast do trees grow? Are you working with a forester?

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⁷ Godman, RM and JJ Mendel. 1978. Economic values for growth and grade changes of sugar maple in the Lake States. USDA Forest Service Research Paper NC-155.

⁸ Davies, K. Forest Investment Considerations for Planning Thinnings and Harvests. Northern Journal of Applied Forestry. V8 (3) 1991.

⁹ Davies, K. Forest Investment Considerations for Planning Thinnings and Harvests. Northern Journal of Applied Forestry. V8 (3) 1991.