CENTRAL HARDWOOD NOTES

Estimating Yellow-Poplar Growth And Yield

Yellow-poplar grows in essentially pure, even-aged stands, so you can make growth and yield estimates from relatively few stand characteristics. The tables and models described here require only measures of stand age, stand basal area in trees 4.5 inches and larger, and site index. They were developed by remeasuring (at 5-year intervals over a 20-year period) many stands having a wide range in age and site index and thinned to varying basal areas.

Pure yellow-poplar stand on an excellent site.

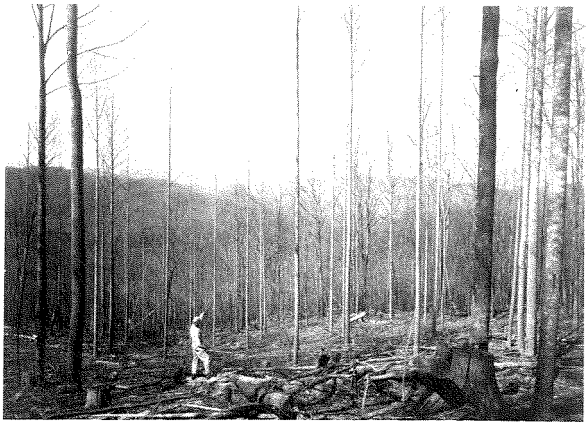
Table 1 shows yields for a range of sites and ages that you can expect in unthinned fully-stocked stands. The large influence of site quality on yield is particularly striking. Increases with stand age are also very significant. You should note that the yields shown are near the maximum expected. If your particular stand has areas that are unstocked, for example, you must reduce yield estimates accordingly. Simply reduce yield estimates proportional to stocking reduction. Consider a stand on site 100 at age 40 that averages only 100 square feet of basal area per acre, which is 80 percent of expected stocking. Yields might be expected to be only 80 percent of those shown in table 1.

Table 2 shows yields for stands thinned under one of the many possible combinations of residual basal area and age at thinning. In this example, the stands were thinned at ages 40 and 60 to the residual basal areas shown and then projected to age 80. The thinning regime shown was picked to keep board-foot yields near the maximum possible while increasing growth of individual trees moderately. Heavier thinnings would increase individual tree size more rapidly and shorten rotation length, but total yields could be reduced.

Table *1 --Unthinned stand yields*

Age and site index[1]	Basal area	Volume	Volume	Average tree diameter
	Square feet	*Cubic feet* [2]	*Board feet* [3]	*Inches* [4]
		40 years		
Site 80	105	3,138	2,354	8.0
Site 100	125	4,544	9,769	9.5
Site 120	145	6,286	20,804	11.2
		60 years		
Site 80	145	5,106	11,430	10.1
Site 100	170	7,400	25,879	12.1
Site 120	200	10,405	46,225	14.5
		80 years		
Site 80	170	6,575	19,579	11.5
Site 100	200	9,569	38,935	13.8
Site 120	220	12,466	60,661	16.2

'Estimated height of dominant and codominant trees at age 50.
[2]Volume in trees 4.5 inches d.b.h. and larger.
[3]International 1/4-inch rule for trees 11 .O inches d.b.h. and larger.
Quadratic mean stand diameter.



A thinned stand can provide early income.

Table 2.-Stand yields with sequential thinnings at ages 40 and 60, and final harvest at age 80

Age, site index, and time of tally[1]	Stand characteristics			Average tree diameter[4]
	Basal area	Cubic volume[2]	Board volume[3]	
	Square feet	Cubic feet	Board feel	Inches
AGE 40				
Site 80				
Before harvest	105	3,138	2,362	8.0
After harvest	70	2,182	2,362	9.3
Harvested	35	956	0	6.5
Site 100				
Before harvest	125	4,544	9,769	9.5
After harvest	90	3,454	9,769	11.5
Harvested	35	1,090	0	7.0
Site 120				
Before harvest	145	6,284	20,786	11.2
After harvest	110	5,053	20,011	14.2
Harvested	35	1,231	775	7.6
AGE 60				
Site 80				
Before harvest	99	3,666	9,001	11.0
After harvest	80	3,037	8,796	11.9
Harvested	19	629	205	8.7
Site 100				
Before harvest	128	5,948	22,606	13.7
After harvest	100	4,773	19,681	15.0
Harvested	28	1,175	2,925	11.1
Site 120				
Before harvest	160	9,062	41,918	17.1
After harvest	120	6,989	33,770	18.7
Harvested	40	2.073	8.148	14.1
AGE 80				
Site 80	118	4,949	19,190	14.5
Site 100	139	7,358	34,133	17.6
Site 120	160	10,185	53,093	21.6
TOTAL YIELD[5]				
Site 80	172	6,534	19,395	
Site 100	202	9,623	37,058	
Site 120	235	13,489	62,016	

[1]Estimated height of dominant and codominant trees at age 50.
[2]Volume in trees 4.5 inches d.b.h. and larger.
[3]International 1/4-inch rule for trees 11 .O inches d.b.h. and larger.
[4]Quadratic mean stand diameter.
[5]Total of harvests at ages 40, 60, and 80 years.

Board-foot yields are not likely to be increased substantially by any thinning regime, but board-foot growth is near maximum over a wide range of densities. So you have considerable leeway to reduce stocking to accelerate diameter growth and achieve quality goals with shorter rotations without sacrificing volume yield. As a rule of thumb, after about age 40, basal areas that approximate stand site index will maximize board-foot volume growth while producing trees that will be fifty percent larger than trees in unthinned stands.

Another advantage of thinning is that it allows early income. For example, on site index 120 an unthinned stand yields 60,661 board feet at rotation age 80. A thinned stand has a total yield of 62,016 board feet over the rotation, but produces income from about 8,000 board feet by age 60. The tables and models given under References allow you to examine the results of many thinning regimes. In addition to stand-level yields, the models allow you to generate tree diameter distributions, so you can predict thinning effects on yields by size class. The yield models can help you decide when to begin thinning, as well as the frequency, intensity, and timing of subsequent thinnings. The models can help you set the proper rotation length and to see how this varies with site quality. By comparing many thinning regimes, you can select the one that best suits your needs.

References

Beck, Donald E.; Della-Bianca, Lino. 1981. Yellow-poplar: characteristics and management. Agric. Handb. 583. Washington, DC: U.S. Department of Agriculture, Forest Service. 92 p.

Knoebel, Bruce R.; Burkhart, Harold E.; Beck, Donald E. 1986. A growth and yield model for thinned stands of yellow-poplar. Forest Science Monograph 27. 62 p.

Donald E. Beck
Southeastern Forest Experiment Station
USDA, Forest Service
Asheville, North Carolina