FORESTRY FACTS

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When To Harvest Timber: Now or Later?

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For many timber stands, "when to harvest" is controlled more by economics than by other factors. If the trees are old enough to reproduce by either seeds or sprouts, it may not matter biologically whether you cut today or wait 10 years. One notable exception would be stands of mature aspen on poor to medium sites that may deteriorate if not harvested in a timely manner. But for all species the timing of a harvest may make a big difference to your financial picture.

When thinking about a harvest, the recommendation to wait is often heard. "Let the trees grow larger and they will be worth more." In addition to volume growth, trees may gain in value if quality (log grade) improves over time or if future prices rise with Increased product demand.

"will the increased size and value of the trees outweigh the cost of waiting several years for the growth to occur?"

Although large trees (particularly hardwood species) may indeed be worth more than smaller trees, there is a cost incurred by postponing the harvest. If you harvest today and receive the money now, you could invest the dollars elsewhere. If you postpone the harvest you forego these other investment opportunities. Therefore, what you need to know is: "will the increased size and value of the trees outweigh the cost of waiting several years for the growth to occur?"

To guide your decision, you need to estimate the rate of return you would earn if you let the trees grow and harvest them later. Then, compare this rate to the expected rate of return from an aftemative investment. What could you earn, if you harvest today and invest the income? If the rate of return for growing your stand another 5, 10 or more years is greater than your alternative rate you should postpone the harvest; if it is less, you should harvest now.

To estimate the rate of return from growing your trees another 5, 10 or more years, you will need several items of information, including: present and future volume, present and future price, and length of the growth period. The **Worksheet** on page 3 shows how to use the information to estimate your rate of return. An example is found on page 2, and instructions for the worksheet are found on pages 3-4. Values can be **per acre or for the entire stand**, but be consistent!

AN EXAMPLE PROBLEM:

A stand of mixed oak currently has 8,000 board feet per acre (8 MBF/A), and is valued at an average price of $250 per MBF. Should the owner harvest now, or wait 5 years?

1. **PRESENT VOLUME** (cords or MBF) 8

2. **PRESENT PRICE** ($/cord or $/MBF)……. $ 250

3. **PRESENT VALUE** (Line 1 X Line 2)…… $ 2,000

4. Years in **GROWTH PERIOD**…… 5

5. Annual growth…… 0.2

6. Total growth in period (Line 4 X Line 5)……..…… 1

7. **FUTURE VOLUME** (Add Lines 1 and 6)…… 9

8. Inflation rate (%)……. 0 %

9. Real price increase (%)……. 3 %

10. Add Lines 8 and 9…… 3%

11. Price adjustment factor (from Table 2, using Lines 4 and 10)…… 1.1593

12. **FUTURE PRICE** (Line 2 X Line 11)……..$ 290

13. **FUTURE VALUE** (Line 7 X Line 12)…… $ 2,610

14. **FV/PV** (Line 13 divided by Line 3)…… 1.3

15. **RATE OF RETURN** (from Table 3, using Lines 4 and 14)…… 5.4 %

Present value of the stand is $2,000 per acre (8 MBF x $250/MBF).

The owner expects volume growth to average 200 board feet (0.2 MBF) per acre per year over the 5 years. This 5-year growth of 1,000 board feet (1 MBF) is added to present volume to obtain the future volume of 9 MBF/acre.

The owner ignores inflation, but expects a real price increase of 3 percent per year over the 5 years. Using Table 2, an adjustment factor of 1.1593 is found and multiplied by the present price of $250 to obtain the future price of $290/MBF.

Future value of the stand is $2,610 per acre (9 MBF x $290/MBF).

Future value divided by present value (FV/PV) is 1.305 (2,610/2,000) and by using Table 3, a rate of return of 5.4 percent is found. This rate must be compared to the owner's best alternative rate to see whether the harvest should be postponed.

RATE OF RETURN WORKSHEET

1. **PRESENT VOLUME** (cords or MBF)…….._____

2. **PRESENT PRICE** ($/cord or $/MBF)……..$_____

3. **PRESENT VALUE** (Line 1 X Line 2).....$_____

4. Years in **GROWTH PERIOD** ....._____

5. Annual growth ....._____

6. Total growth in period (Line 4 X Line 5) ....._____

7. **FUTURE VOLUME** (Add Lines 1 and 6) ....._____

8. Inflation rate (%)…….._____%

9. Real price increase (%) ....._____%

10. Add Lines 8 and 9 ....._____%

11. Price adjustment factor (from Table 2, using Lines 4 and 10) …._____

12. **FUTURE PRICE** (Line 2 X Line 11).....$_____

13. **FUTURE VALUE** (Line 7 X Line 12)……..$_____

14. **FV/PV** (Line 13 divided by Line 3) ....._____

15. **RATE OF RETURN** (from Table 3, using Lines 4 and 14) ....._____%

LINE 1
Determine present stand volume in either cords or thousands of board feet (MBF). This may be per acre or for the entire stand. Volume should be from a timber inventory conducted by a forester (or by yourself if you have the skill). Volume may be for a single species or all species combined.

LINE 2
0btain present price for the product you have in either $/cord or $/MBF. This may be for a single species or all species combined. Price should be obtained by talking with mills, timber buyers, foresters, or county extension agents. Or, present price could be your high bid divided by your present volume, if you have three or more offers for the timber.

LINE 3
Compute present value of the stand by multiplying present volume by present price. Deducting sale expenses is probably unnecessary, since severance taxes, consultant's fees and other costs will likely be the same percentage of future sale income. Therefore, your estimate of rate of return will be the same with, or without, sale costs.

LINE 4
Enter the number of years in the proposed growth (investment) period. This should be either 5, 10, 15, 20, 25 or 30 years.

LINE 5
Estimate the annual volume growth for your woodland, in either cords/year or MBF/year. This may be per acre or for the entire stand. This is the difficult part, but there are a couple of options:

a) The best approach is to talk with your forester and get some advice about local growth rates. This information will be most relevant to your growing conditions. Your forester will probably want to know something about the site quality, stand density and age of trees in your woodland. The forester may also want to check past diameter growth by taking increment cores from several trees.

b) A second approach is to use average growth information from various regional studies. A summary of average growth rates for the Lake States is found in TABLE 1 on page 6. However, these should be used as guidelines only.

LINE 6
Estimate total volume growth for the growth period. Multiply annual growth by the number of years in the growth period.

LINE 7
Estimate future volume by adding total volume growth to present volume.

LINE 8
Choose an appropriate average inflation rate (annual basis) for the growth period. This is optional and you may leave it blank (zero) if you want to estimate a real rate of return.

LINE 9
Choose an appropriate average annual real price increase, to reflect any quality improvement, increased demand, etc. during the growth period. This is optional and you may leave it blank (zero) if you don't expect such changes in the future.

LINE 10
Determine the total rate of expected price increase by adding the inflation and real rates together. Note, this may be zero if you ignore inflation and assume no real price increase.

LINE 11
Determine the price adjustment factor from Table 2 on page 6. Use the values on Lines 4 and 10. Note, if Line 10 is zero, the adjustment factor is 1.

LINE 12
Estimate future price for the product you expect to sell, by multiplying the present price by the price adjustment factor. Note, if the adjustment factor (Line 11) is 1, future price will equal present price.

LINE 13
Compute future value of the stand by multiplying future volume by future price.

LINE 14
Divide the future stand value by the present stand value.

LINE 15
Determine the expected annual rate of return (percent) from Table 3 on page 7. Use the values on Lines 4 and 14. If you used a rate of inflation other than zero, the rate of return (Line 15) will be a nominal rate. If you used a rate of inflation of zero, the rate of return (Line 15) will be a real rate.

WHAT TO DO WITH YOUR RATE
Now that you have estimated a rate of return for postponing your harvest what does it mean? As mentioned on page 1, this rate should be compared to the rate you could eam if you harvest now and invest the money elsewhere.

Let's return to the example on page 2. Suppose the owner could invest money received today (the $2,000/acre) at a maximum real rate of 5 percent. This is less than the expected real rate of 5.4 percent if the harvest is postponed 5 years. Therefore, the best financial decision for the example landowner is to postpone the harvest.

Table 1. Average Annual Net Volume Growth Per Acre, For Several Wisconsin Tree Species

Red Pine 40-80 years old						
	Stand Density Basal Area (Square feet per acre)					
Site Index	60	120	180	60	120	180
	cords	cords	cords	MBF	MBF	MBF
75	1.7	2.2	2.3	0.92	1.17	1.18
65	1.3	1.7	1.8	0.70	0.90	0.92
55	0.9	1.3	1.4	0.49	0.68	0.68
45	0.6	0.9	1.0	0.32	0.47	0.47

Sugar Maple (North, Hardwoods)

Young stands (40-50 years old) of small sawtimber; Site Index 65 – 0.30 MBF
Older stands of larger sawtimber:

Site Index	Stand Density Basal Area (Square feet per acre)			
	30	50	70	90
	MBF	MBF	MBF	MBF
60-70	0.18	0.20	0.24	0.21

Aspen				
	Stand Age In Years			
Site Index	30	40	50	60
	cords	cords	cords	cords
50-80	2.5	2.0	1.5	1.0

Oak Basal Area of 60-100 sq.ft/acre					
	Stand Age In Years				
Site Index	70	80	90	100	110
	MBF	MBF	MBF	MBF	MBF
85	0.30	0.24	0.22	0.21	0.20
75	0.33	0.24	0.20	0.18	0.17
65	0.31	0.26	0.20	0.16	0.15
55	0.21	0.20	0.18	0.14	0.12

NOTE: Site index measures land productivity for growing trees. See UWEX Publ. G3361, Lake States Woodlands: Estimating and Interpreting Site Index.

Table 2. Price Adjustment Factors

Rate of Increase (Line 10)	Years in Growth Period (From Line 4)					
	5	**10**	**15**	**20**	**25**	**30**
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0253	1.0511	1.0777	1.1049	1.1328	1.1614
1	1.0510	1.1046	1.1610	1.2202	1.2824	1.3478
1.5	1.0773	1.1605	1.2502	1.3469	1.4509	1.5631
2	1.1041	1.2190	1.3459	1.4859	1.6406	1.8114
2.5	1.1314	1.2801	1.4483	1.6386	1.8539	2.0976
3	1.1593	1.3439	1.5580	1.8061	2.0938	2.4273
3.5	1.1877	1.4106	1.6753	1.9898	2.3632	2.8068
4	1.2167	1.4802	1.8009	2.1911	2.6658	3.2434
4.5	1.2462	1.5530	1.9353	2.4117	3.0054	3.7453
5	1.2763	1.6289	2.0789	2.6533	3.3864	4.3219
5.5	1.3070	1.7081	2.2325	2.9178	3.8134	4.9840
6	1.3382	1.7908	2.3966	3.2071	4.2919	5.7435
6.5	1.3701	1.8771	2.5718	3.5236	4.8277	6.6144
7	1.4026	1.9672	2.7590	3.8697	5.4274	7.6123
7.5	1.4356	2.0610	2.9589	4.2479	6.0983	8.7550
8	1.4693	2.1589	3.1722	4.6610	6.8485	10.0627
8.5	1.5037	2.2610	3.3997	5.1120	7.6868	11.5583
9	1.5386	2.3674	3.6425	5.6044	8.6231	13.2677
9.5	1.5742	2.4782	3.9013	6.1416	9.6684	15.2203
10	1.6105	2.5937	4.1772	6.7275	10.8347	17.4494
10.5	1.6474	2.7141	4.4713	7.3662	12.1355	19.9926
11	1.6851	2.8394	4.7846	8.0623	13.5855	22.8923
11.5	1.7234	2.9699	5.1183	8.8206	15.2010	26.1967
12	1.7623	3.1058	5.4736	9.6463	17.0001	29.9599
12.5	1.8020	3.2473	5.8518	10.5451	19.0026	34.2433
13	1.8424	3.3946	6.2543	11.5231	21.2305	39.1159
13.5	1.8836	3.5478	6.6825	12.5869	23.7081	44.6556
14	1.9254	3.7072	7.1379	13.7435	26.4619	50.9502
14.5	1.9680	3.8731	7.6222	15.0006	29.5214	58.0985
15	2.0114	4.0456	8.1371	16.3665	32.9190	66.2118

Table 3. Rates of Return (in percent)

FV/PV Line 14	Years in Growth Period (From Line 4)					
	5	**10**	**15**	**20**	**25**	**30**
1	0.0	0.0	0.0	0.0	0.0	0.0
1.1	1.9	1.0	0.6	0.5	0.4	0.3
1.2	3.7	1.8	1.2	0.9	0.7	0.6
1.3	5.4	2.7	1.8	1.3	1.1	0.9
1.4	7.0	3.4	2.3	1.7	1.4	1.1
1.5	8.4	4.1	2.7	2.0	1.6	1.4
1.6	9.9	4.8	3.2	2.4	1.9	1.6
1.7	11.2	5.4	3.6	2.7	2.1	1.8
1.8	12.5	6.1	4.0	3.0	2.4	2.0
1.9	13.7	6.6	4.4	3.3	2.6	2.2
2	14.9	7.2	4.7	3.5	2.8	2.3
2.1	16.0	7.7	5.1	3.8	3.0	2.5
2.2	17.1	8.2	5.4	4.0	3.2	2.7
2.3	18.1	8.7	5.7	4.3	3.4	2.8
2.4	19.1	9.1	6.0	4.5	3.6	3.0
2.5	20.1	9.6	6.3	4.7	3.7	3.1
2.6	21.1	10.0	6.6	4.9	3.9	3.2
2.7	22.0	10.4	6.8	5.1	4.1	3.4
2.8	22.9	10.8	7.1	5.3	4.2	3.5
2.9	23.7	11.2	7.4	5.5	4.4	3.6
3	24.6	11.6	7.6	5.6	4.5	3.7
3.1	25.4	12.0	7.8	5.8	4.6	3.8
3.2	26.2	12.3	8.1	6.0	4.8	4.0
3.3	27.0	12.7	8.3	6.2	4.9	4.1
3.4	27.7	13.0	8.5	6.3	5.0	4.2
3.5	28.5	13.3	8.7	6.5	5.1	4.3
3.6	29.2	13.7	8.9	6.6	5.3	4.4
3.7	29.9	14.0	9.1	6.8	5.4	4.5
3.8	30.6	14.3	9.3	6.9	5.5	4.6
3.9	31.3	14.6	9.5	7.0	5.6	4.6
4	32.0	14.9	9.7	7.2	5.7	4.7
4.2	33.2	15.4	10.0	7.4	5.9	4.9
4.4	34.5	16.0	10.4	7.7	6.1	5.1
4.6	35.7	16.5	10.7	7.9	6.3	5.2
4.8	36.9	17.0	11.0	8.2	6.5	5.4
5	38.0	17.5	11.3	8.4	6.6	5.5
5.5	40.6	18.6	12.0	8.9	7.1	5.8
6	43.1	19.6	12.7	9.4	7.4	6.2
6.5	45.4	20.6	13.3	9.8	7.8	6.4
7	47.6	21.5	13.9	10.2	8.1	6.7
7.5	49.6	22.3	14.4	10.6	8.4	6.9
8	51.6	23.1	14.9	11.0	8.7	7.2
8.5	53.4	23.9	15.3	11.3	8.9	7.4
9	55.2	24.6	15.8	11.6	9.2	7.6
9.5	56.9	25.2	16.2	11.9	9.4	7.8
10	58.5	25.9	16.6	12.2	9.6	8.0