

RESEARCH NOTES



Research Note No. 7

SAWMILL OVERRUN IN
NORTHERN HARDWOODS

by

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and

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FOREWORD

The results reported here are but one segment of the large-scale sawmilling studies which have been carried on at the Ford Forestry Center. These studies are aimed toward practical interpretation of important log and tree characteristics which may relate to lumber yield in both volume and value. It is hoped this work will provide standard data for tree and log yield and lumber grade recovery for forest industry and landowner alike.

The logs have all been cut from the research forest at the Center and they consist of species from the Northern Hardwood forest.

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INTRODUCTION

The relationship of lumber yields in board feet to the scale volumes of the logs from which the boards are sawn is an important consideration to the hardwood sawmill industry. The difference in values is usually expressed in percent yield or in percent overrun, where a yield of 123% means the lumber sawed "over-ran" the net log scale by 23%.

The tables in this report are compiled for both the Scribner Decimal C and International 1/4-inch rules. These data were collected over a span of several years involving the processing of logs from Forestry Center management studies. Since these logs developed from studies of new management on previously unmanaged stands, a large proportion of the logs are grade No. 3. Cull logs are excluded, so all logs are ^{2/}No. 3 or better by the Northern Hardwood and Pine Association Log Grade Rules⁻.

PROCEDURES

Log scaling and grading was performed under the supervision of James A. Johnson, who functions as the Forestry Center specialist in this field. Logs were scaled by the International 1/4-Inch rule. Lumber was tallied rough-green at the time of grading. No allowance was made for expected shrinkage. All data were entered on punch-cards for computer processing and the logs were re-scaled in Scribner Decimal C by computer. In the process, all records were computer-checked for errors in scale, for improbable codes, and obvious errors; which so often occur in hand-transcribed data.

The Ford Forestry Center Sawmill is a 5 band mill which was formerly operated as an industrial mill by the Ford Motor Company. Sawing was done by Jack Sawyer who, upon retirement as a long time Head Sawyer in industrial mills, has been sawyer and instructor in sawyer training at the Center. Mr. Sawyer is also a qualified and experienced hardwood lumber inspector. Operations at the sawmill are performed by experienced mill workers and the operation is designed

^{1/}Respectively, Associate Prof. and Assistant Prof., Ford Forestry Center, School of Forestry and Wood Products, Michigan Technological Univ.

^{2/}Northern Hardwood and Pine Manufacturers' Assn. - Official Grading Rules for Northern Hardwood and Softwood Logs and Tie cuts. Green Bay, Wis. October 1, 1968.

to follow industrial practices. The object is to "saw for grade". Slabs are cut thin and logs are turned on the carriage as required to produce maximum grade yield.

RESULTS

Results are compiled here for 4685 log records of which over 80% are sugar maple. Average Scribner overrun for the sugar maple is 23%; but no diameter over 14" yields higher than 10% over scale. Yellow birch averaged a 26% overrun. Only elm and basswood yielded below 120%. For the International 1/4-Inch log rule, there is no appreciable overrun for sugar maple. Other species vary a little, with elm, red maple, and basswood actually sawing out under log scale.

ABOUT OVERRUN

There will be differences in overrun from different sawmills because of variations in saw kerf and differences in sawmilling practices which affect lumber yield. The saws in the Center sawmill are 16 gauge bands. Actual saw kerf is 5/32 inch.

In order to provide a common basis of comparison, many hardwood sawing studies have expressed lumber yield as board feet converted to "4/4-equivalent thickness". Since similar studies were the object of the forestry Center sawing operations, all lumber was sawed 4/4 except the dog-board. This is the only important departure from commercial practice.

Sometimes overlooked in the comparison of overrun data from different mills is the matter of local log scaling practice. Log scaling here is performed "by the book". That is, net scale is calculated after subtracting scaling deductions for such items as interior defect, butt-off, seam, sweep, crook, saprot, etc. as specified in the Northern Hardwood and Pine Association handbook²⁷. Where local procedures are different, the overrun figures will be directly affected.

OVER RUN STUDIES
 FFC SAWING STUDIES - SCRIBNER DEC C SCALE

----- SUGAR MAPLE -----

Log Scaling Dia.	/ - - - BOARD FEET - - - /BD FT 4/4 /				
	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	388	12900	11807	15875	134
10	699	26390	24221	31128	129
11	821	37760	33225	44380	134
12	727	44260	37976	46514	122
13	495	37550	32151	38339	119
14	346	31690	24850	29748	120
15	186	20500	16090	17635	110
16	91	11660	9109	10058	110
17	42	6130	4489	4881	109
18	29	5120	3597	3723	104
19	15	2970	2102	2271	108
20	4	940	775	828	107
21	2	340	255	249	98
22	3	910	630	463	73
23	1	280	150	146	97
TOTAL	3849	239400	201427	246238	122

Average Scale Deduction = 16%

FFC SAWING STUDIES - INTERNATIONAL 1/4 SCALE

----- SUGAR MAPLE -----

Log Scaling Dia.	/ - - - BOARD FEET - - - /Bd Ft 4/4 /				
	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	388	15985	14892	15875	107
10	699	32485	30316	31128	103
11	821	47060	42525	44380	104
12	727	51640	45356	46514	103
13	495	44430	39031	38339	98
14	346	36820	29980	29748	99
15	186	22450	18040	17635	98
16	91	12860	10309	10058	98
17	42	6775	5134	4881	95
18	29	5500	3977	3723	94
19	15	3180	2312	2271	98
20	4	965	800	828	103
21	2	350	265	249	94
22	3	970	690	463	67
23	1	285	155	146	94
TOTAL	3849	281755	243782	246238	101

Average Scale Deduction = 14-1/2%

OVER RUN STUDIES

FFC SAWING STUDIES - SCRIBNER DEC C SCALE

----- YELLOW BIRCH -----

Log Scaling Dia.	No. Logs	/- - BOARD FEET - - / BD FT 4/4 /			
		Gr. Scale	Net Scale	Lbr. Yield	Pct Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	28	910	855	1073	125
10	52	1930	1695	2162	128
11	65	2820	2383	3266	137
12	49	2710	2128	2686	126
13	37	2560	2043	2421	119
14	38	3100	2208	2914	132
15	25	2770	1947	2360	121
16	17	2280	1493	1978	132
17	11	1690	1090	1342	123
18	9	1560	1155	1510	131
19	4	870	460	575	125
20	4	980	613	702	115
21	2	500	330	321	97
22	2	580	375	496	132
23	1	280	180	215	119
24	1	300	200	233	116
25	0	0	0	0	0
26	1	310	155	122	79
TOTAL	346	26150	19310	24376	126

Average Scale Deduction = 26%

FFC SAWING STUDIES - INTERNATIONAL 1/4 SCALE

----- YELLOW BIRCH -----

Log Scaling Dia.	No. Logs	/- - BOARD FEET - - / BD.FT. 4/4 /			
		Gr. Scale	Net Scale	Lbr. Yield	Pct Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	28	1090	1035	1073	104
10	52	2345	2110	2162	102
11	65	3475	3038	3266	108
12	49	3150	2568	2686	105
13	37	2980	2463	2421	98
14	38	3530	2638	2914	110
15	25	3030	2207	2360	107
16	17	2520	1733	1978	114
17	11	1875	1275	1342	105
18	9	1680	1275	1510	118
19	4	935	525	575	110
20	4	1000	633	702	111
21	2	515	345	321	93
22	2	615	410	496	121
23	1	285	185	215	116
24	1	310	210	233	111
25	0	0	0	0	0
26	1	305	150	122	81
TOTAL	346	29640	22800	24376	107

Average Scale Deduction = 23%

OVER RUN STUDIES

FFC SAWING STUDIES - SCRIBNER DEC C SCALE

----- AMERICAN (GREY) ELM -----

Log Scaling Dia.	<u>/ - - BOARD FEET - - / BD.FT. 4/4 /</u>				
	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	18	590	551	768	139
10	30	1240	1158	1388	120
11	29	1410	1321	1637	124
12	45	2950	2667	3243	122
13	35	2680	2325	2771	119
14	24	2290	2140	2484	116
15	23	2950	2762	3110	113
16	13	1760	1580	1890	120
17	5	840	760	770	101
18	6	1080	1010	911	90
19	4	840	735	738	100
20	3	700	605	509	84
21	0	0	0	0	0
22	1	290	290	205	71
23	0	0	0	0	0
24	2	750	600	682	114
25	1	230	85	45	53
Total	239	20600	18589	21151	114

Average Scale Deduction = 10%

FFC SAWING STUDIES - INTERNATIONAL 1/4 SCALE

----- AMERICAN (GREY) ELM -----

Log Scaling Dia.	<u>/ - - BOARD FEET - - / BD.FT. 4/4 /</u>				
	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	18	750	711	768	108
10	30	1465	1383	1388	100
11	29	1775	1686	1637	97
12	45	3460	3177	3243	102
13	35	3140	2785	2771	99
14	24	2670	2520	2484	99
15	23	3320	3132	3110	99
16	13	1955	1775	1890	106
17	5	945	865	770	89
18	6	1170	1100	911	83
19	4	900	795	738	93
20	3	715	620	509	82
21	0	0	0	0	0
22	1	305	305	205	67
23	0	0	0	0	0
24	2	795	645	682	106
25	1	220	75	45	60
TOTAL	239	23585	21574	21151	98

Average Scale Deduction = 9%

OVER RUN STUDIES

FFC SAWING STUDIES - SCRIBNER DEC C SCALE

----- BASSWOOD -----

Log Scaling Dia.	/ - - -BOARD FEET - - - / BD. FT. 4/4 /				
	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	6	210	185	202	109
10	23	860	825	935	113
11	21	930	860	1,047	122
12	18	1,020	895	1,031	115
13	15	1,140	1,022	1,200	117
14	10	890	700	799	114
15	9	950	705	670	95
16	3	360	330	327	99
17	1	140	110	102	93
18	1	160	160	142	89
19	0	0	0	0	0
20	0	0	0	0	0
TOTAL	107	6,660	5,792	6,455	111

Average Scale Deduction = 13%

FFC SAWING STUDIES - INTERNATIONAL 1/4 SCALE

----- BASSWOOD -----

Log Scaling Dia.	/ - - -BOARD FEET - - - / BD. FT. 4/4 /				
	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	6	245	220	202	92
10	23	1,000	965	935	97
11	21	1,130	1,060	1,047	99
12	18	1,175	1,050	1,031	98
13	15	1,380	1,262	1,200	95
14	10	1,010	820	799	97
15	9	1,045	800	670	84
16	3	395	365	327	90
17	1	150	120	102	85
18	1	170	170	142	84
19	0	0	0	0	0
20	0	0	0	0	0
TOTAL	107	7,700	6,832	6,455	94

Average Scale Deduction = 11%

OVER RUN STUDIES

FFC SAWING STUDIES - SCRIBNER DEC C SCALE

----- SOFT MAPLE -----

/ - - - BOARD FEET - - /Bd. Ft. 4/4 /

Log Scaling Dia.	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	15	480	410	488	119
10	14	500	433	546	126
11	22	950	790	1,002	127
12	15	860	610	717	118
13	15	920	600	727	121
14	4	380	180	276	153
15	6	680	385	423	110
16	7	1,000	541	602	111
17	4	660	330	376	114
18	1	210	200	243	121
19	0	0	0	0	0
20	0	0	0	0	0
TOTAL	103	6,640	4,479	5,400	121

Average Scale Deduction = 33%

FFC SAWING STUDIES - INTERNATIONAL 1/4 SCALE

----- SOFT MAPLE -----

/ - - - BOARD FEET - - /BD. FT. 4/4 /

Log Scaling Dia.	No. Logs	Gr. Scale	Net Scale	Lbr. Yield	Pct. Yield
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	15	605	535	488	91
10	14	595	528	546	103
11	22	1,180	1,020	1,002	98
12	15	995	745	717	96
13	15	1,080	760	727	96
14	4	435	235	276	117
15	6	755	460	423	92
16	7	1,110	651	602	92
17	4	740	410	376	92
18	1	230	220	243	110
19	0	0	0	0	0
20	0	0	0	0	0
TOTAL	103	7,725	5,564	5,400	97

Average Scale Deduction = 28%