

# Grading Options for Western Hemlock Pulp Logs

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## Summary

In Southeast Alaska, large high quality logs of western hemlock (*Tsuga heterophylla*) have traditionally been cut into export cants and lower quality logs have generally been chipped for pulp. While pulp chips may still be exported, the demise of local pulping facilities has greatly reduced markets for these lower quality logs. Although product recovery studies were conducted in the 1970s and 1980s, these studies did not focus on the grading systems currently used for engineered wood products, such as wooden trusses, I-joists, and glued-laminated timbers. The objective of this study is to estimate the grade yield of structural dimension lumber that can be obtained from lower quality western hemlock "pulp logs." A complete discussion of the results of this study, including a discussion of the voluntary product code system and technical considerations in using results from a grade yield study, can be found in Research Paper FPL-RP-583 (Green et. al, 2000).

Four hundred and nine logs were selected at random from inventory at a mill in Southeast Alaska. Eighty nine percent of the logs graded as either No. 3 or No. 4 by the Puget Sound Log Scaling and Grading Bureau. Four percent of the logs graded as No. 2 and 7% as "cull" logs. The culls could not be processed in a commercial sawmill. Small-end diameter of the 32-ft-long logs ranged from 5 to 36 inches, with most less than 12 inches in diameter. The logs were sawn into nominal 2x4, 2x6, and 2x10 lumber and visually graded as structural lumber by a Quality Supervisor of the Western Wood Products Association. All lumber graded as at least No. 3 Structural Framing in the rough, green condition (72% of the total number of pieces of lumber produced) was dried, surfaced, and shipped to the Forest Products Laboratory in Madison, Wisconsin, for testing. For dried and planed lumber, the results of this research indicate the following:

- As Structural Framing, No. 2 and better lumber is suited for framing and truss production, and No. 3 for general construction. Approximately 50% of the dressed, dry lumber was graded as No. 2 and better, and 67% as No. 3 and better, Table 1.
- As lumber for the production of glued-laminated structural timbers (lamstock), about 28% of the pieces qualified as L1, 17% as L2, and 17% as L3, Table 2. For lamstock, the amount that qualifies as "Dense," is critical: 85% to 95% of the lumber qualified as Dense.
- Approximately 80% of machine-stress-rated lumber (MSR) is used in truss production and 20% for the production of wooden I-joists. Most trusses are made from 2x4 lumber. Two important grades for truss lumber are 1650f and 1800f. Approximately 33% of the 2x4 lumber could qualify for 1800f and 35% as 1650f, Table 3. For 2x4 lumber of the highest grades, the yield of MSR lumber was often much higher than with visually graded lumber with equivalent properties.

The results of this research demonstrate that a significant amount of high quality structural lumber can be produced from Alaskan hemlock logs once used primarily for production of pulp chips. This information helps establish the technical feasibility of producing high quality hemlock dimension lumber in Southeast Alaska. As is generally true with all the grading systems, markets are more easily found for the higher-grade lumber. The challenge is to find markets for the approximately 50% of the pieces that did not make at least No.2 Structural Light Framing, plus the sawdust, bark and slabs. This research did not evaluate potential markets for this lumber or address economic feasibility. The research also did not evaluate the yield of structural lumber from higher quality "sawlogs". It is unlikely that a modern production-oriented mill would be established just to process such logs. However, lumber obtained from pulpwood logs could significantly supplement lumber being produced from higher quality sawlogs.

### References

Green, D.W.; McDonald, K.A.; Kilborn, K.; Damm, J. 2000. Grading options for western hemlock "pulpwood" logs from Southeast Alaska. Research Paper FPL-RP-583. USDA Forest Service, Forest Products Laboratory, Madison, WI.

**Table 1**  
**Grade yield of Structural Framing from dressed, dry lumber**

Lumber grade	Number of pieces			Percentage of Lumber Volume			
	2x4	2x6	2x10	2x4	2x6	2x10	All
Sel.Str.	114	203	26	3.3	8.9	1.9	14.1
No.1	202	153	15	5.8	6.7	1.1	13.6
No.2	218	298	50	6.3	13.1	3.6	23.0
No.3	146	247	31	4.2	10.8	2.3	17.3
Economy	451	348	51	13.1	15.2	3.7	32.0
All	1,131	1,249	173	32.7	54.7	12.6	100

**Table 2**  
**Grade yield of Lamstock from dressed, dry lumber**

Lumber grade	Number of pieces			Percentage of Lumber Volume			
	2x4	2x6	2x10	2x4	2x6	2x10	All
L1	300	347	64	8.7	15.1	4.7	28.5
L2	169	225	28	4.9	9.9	2.0	16.8
L3	161	239	21	4.6	10.5	1.5	16.6
Economy	501	438	60	14.5	19.2	4.4	38.1
All	1,131	1,249	173	32.7	54.7	12.6	100

**Table 3**  
**Estimated percent grade yields of Alaskan hemlock sorted**  
**as MSR lumber**

<u>Size</u>	<u>MSR grade</u>	Yields from visual grades of MSR						
		<u>MSR<sup>a</sup></u>	<u>Sel.Str.</u>	<u>No.1</u>	<u>No.2</u>	<u>No.3</u>	<u>VQL 5</u>	<u>All</u>
<b>Sorting one MSR grade at a time</b>								
<b>2x4</b>	2400f-2.0E	9.4	6.7	13.7	16.3	4.2	49.7	100
	2100f-1.8E	18.8	0	14.5	13.0	4.0	49.7	100
	1800f-1.6E	33.4	0	5.3	8.2	3.4	49.7	100
	1650f-1.5E	35.2	0	4.3	7.6	3.2	49.7	100
	1450f-1.3E	41.8	0	0	6.0	2.5	49.7	100
<b>2x6</b>	2400f-2.0E	8.5	11.6	11.5	20.4	7.4	40.6	100
	2100f-1.8E	11.8	10.0	10.6	19.6	7.4	40.6	100
	1800f-1.6E	19.4	0	15.9	17.2	6.9	40.6	100
	1650f-1.5E	24.0	0	13.0	15.7	6.7	40.6	100
	1450f-1.3E	37.2	0	6.6	9.4	6.2	40.6	100
<b>Sorting two MSR grades at once</b>								
<b>2x4</b>	2100f-1.8E	18.8	0	0	0	0	0	—
	1650f-1.5E	15.3	0	4.7	8.0	3.5	49.7	100
<b>2x6</b>	2100f-1.8E	11.8	0	0	0	0	0	—
	1450f-1.3E	24.9	0	7.0	9.5	6.2	40.6	100

<sup>a</sup> Note that when grades are sorted one grade at a time, the number of pieces in lower MSR grades includes the pieces from a higher grade.

**Selected Addresses**

<p>American Lumber Standards Committee  Board of Review  P.O. Box 210  Germantown, MD 20875-0210  Phone: 301-972-1700</p> <p>USDA, Forest Service  Forest Products Laboratory  1 Gifford Pinchot Drive  Madison, WI 53705-2398  Phone: 608-231-9200</p> <p>West Coast Lumber Inspection Bureau  Box 23145  6980 SW Varns Road  Portland, OR 97223  Phone: 503-684-8928</p>	<p>Western Wood Products Association</p> <p>Executive Office  522 SW Fifth Avenue, Suite 500  Portland, OR 97204-2122  Phone: 503-224-3930</p> <p>Alaskan office  Michael J. McGuigan  Alaskan Regional Manager of Quality  Standards  P.O. Box 770590  Eagle River, AK 99577  Phone: 907-694-3544  Fax: 907-694-3543</p>
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