

Forest Harvest Classification System for Maine

Report by

Maine Society of American Foresters Task Force

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BACKGROUND

The use of partial cutting in Maine's forest began increasing dramatically in 1990. The result has been a doubling of the total area harvested per year from about 250,000 acres in the late 1980s to over 500,000 acres since the year 2000 (McWilliams et al. 2005, Maine Forest Service 2005a). During this period, the total volume of wood harvested statewide has remained relatively constant at around 6.5 million cords per year (Maine Forest Service 2005b).

The Maine Forest Service reported that from 1999-2004, partial harvesting¹ and shelterwood² harvesting made up 61% and 36%, respectively, of the annual harvest, while clearcutting³ occurred on only 3% of harvested lands (Maine Forest Service 2005a). Thus, 97% of the half million acres a year of Maine's harvested forest involve some form of partial removal. The range of post-harvest conditions produced by partial harvesting and shelterwood cutting vary widely within each category, and in many cases are often indistinguishable from one another.

As professional foresters and others have been discussing the nature and extent of partial cutting in Maine's forests, it has become clear that the term "partial cutting" as well as other widely used silvicultural terms (e.g., shelterwood, selection, thinning, and improvement cutting), have become so ambiguous as to lack meaningful interpretation among professionals. This ambiguity is further complicated when professional foresters communicate with the public about forest harvesting. A better system of describing forest harvests is needed to facilitate communication about the nature and extent of partial cutting in Maine's forests.

¹ **Partial Harvest:** Harvest where trees are removed individually or in small (<5 acre) patches (Maine Forest Service 2005a).

² **Shelterwood:** Harvest of mature trees from a forest site in two or more stages. The first stage removes only a portion of the trees to allow establishment of regeneration before the remaining trees are removed in subsequent harvest (Maine Forest Service 2005a).

³ **Clearcut:** Harvest on a site larger than 5 acres that results in a residual basal area of acceptable growing stock trees >4.5" DBH of less than 30 square feet per acre, unless after harvesting the site has a well-distributed stand of acceptable growing stock 3 feet tall for softwood and 5 feet for hardwoods (Overstory Removal). Refer to the latest copy of the Maine Forest Practices Act, Maine Forest Service Rules Chapter 20 for additional information (Maine Forest Service 2005a).

TASK FORCE OBJECTIVE

At the fall 2005 Annual Meeting of the Maine Society of American Foresters (MESAF), members urged the Executive Committee to address the issue of classifying forest harvests. It was believed that such classification system would be helpful to the membership when communicating about this complex topic, as well as serve the Maine Forest Service in their legislatively mandated role of tracking trends in forest harvesting across the state of Maine.

A MESAF Forest Practices Task Force was formed during early 2006 to devise a system for describing and classifying all forest harvesting in Maine that would improve communications among forest resource professionals. The objective was to develop a harvest classification system (similar to a key for identifying plant species or soil types) that would allow professional foresters to clearly, consistently, and unambiguously describe any forest harvest. To the extent possible, this harvest classification system was to have the following attributes:

1. Relatively simple, quick, and easy to use.
2. Repeatable (i.e., different foresters could consistently classify a harvest in the same way).
3. Objective (i.e., does not include “values” or “predictions” of future stand conditions).
4. Descriptive of only what was harvested and left behind (i.e., does not include the intention of a harvest prescription).
5. Applied to the scale of a forest stand and focus on trees harvested >4 inches dbh.
6. Used shortly (several days, weeks, or months) after harvest while evidence is still visible.
7. Avoid use of classical silvicultural terminology, which include intentions and can generate public perceptions of “good” (e.g., selection) or “bad” (e.g., clearcutting) harvesting.

In May 2006, the MESAF Forest Practices Task Force released a draft Forest Harvest Classification System for review and comment. On June 8, 2006, MESAF conducted a field tour of six sites near Jackman, Maine that had been recently harvested. The purpose of the tour was to engage MESAF members in discussions about improving terminology related to partial harvesting in Maine’s forests. During the field tour, 82 foresters were asked to use the draft Forest Harvest Classification System to classify the harvests that had recently occurred on the six sites. At the conclusion of the field tour, each participant completed a survey consisting of a set of questions about the strengths and weaknesses of the system. Each of the sites was subsequently sampled by University of Maine staff using prism plots and stump measurements to quantify the actual harvest that had occurred on each site.

Results from the participant survey and sample data from the six sites were used as the basis for evaluating which aspects of the Harvest Classification System needed improvement. The field testing revealed that foresters picked up the system quickly and were able to implement it effectively with relatively little instruction. Two-thirds of MESAF members participating in the field tour thought that the Harvest Classification System was worth pursuing. However, 77% thought the system needed improvement before it was ready for use. Three of the six variables used in the system were estimated with reasonable accuracy and precision on the six sites.

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Based on these results, the Task Force met during fall 2006 to determine which modifications were needed to improve the classification system. The following Harvest Classification System is presented to the MESAF membership as a meaningful method for describing and classifying forest harvests in Maine for purposes of improving communications among forest resource professionals.

HARVEST CLASSIFICATION SYSTEM

A Harvest Classification System (HCS) using a 6-digit code system is proposed as a means to describe the most important characteristics of a forest harvest:

Table 1 – Six-digit code system used in Harvest Classification System.

Starting stand composition	Harvest Code		Harvest pattern	Diameter classes removed	Residual stand composition
	Residual basal area	% basal area removal			
<i>Softwood (S)</i>	<i>A</i>	<i>1</i>	<i>Entire (E)</i>	<i>Upper (U)</i>	<i>Softwood (S)</i>
<i>Mixedwood (M)</i>	<i>B</i>	<i>2</i>	<i>Portion (P)</i>	<i>Lower (L)</i>	<i>Mixedwood (M)</i>
<i>Hardwood (H)</i>	<i>C</i>	<i>3</i>		<i>Neither (N)</i>	<i>Hardwood (H)</i>
	<i>D</i>	<i>4</i>			<i>None (N)</i>
	<i>E</i>	<i>5</i>			

The 6-digit system can be combined into five categories that classify a forest harvest. Using these categories, the HCS is capable of identifying 1,440 unique post-harvest conditions. The HCS is **intended for use immediately after harvest, or no longer than six months after harvest**, while the effects of the harvest are clearly evident. Each category in the HCS is described as follows:

1) Starting stand composition – Code describing the dominant tree species (>4.5” dbh) that composed the stand before harvest. The starting stand composition can be determined by the stumps of trees that were cut and the composition of the residual stand.

S (Softwood) – Stand with >75% of basal area composed of softwood tree species.

M (Mixedwood) – Stand with 25 to 75% of basal area composed of softwood tree species and 75 to 25% hardwood tree species.

H (Hardwood) – Stand with >75% of basal area composed of hardwood tree species.

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2) Harvest code – The Harvest Code describes both the basal area remaining after harvest (residual basal area) and percentage of the initial basal area that was removed. The first letter (A to E) describes the residual basal area of trees >4.5” dbh remaining immediately after harvest in 30 ft²/A basal area classes (>120, 91 – 120, 61 – 90, 31 – 60, or 0 – 30 ft²/A). The second number (1 to 5) describes the percentage of the starting basal area that was removed (1 – 25%, 26 – 40%, 41 – 60%, 61 – 90%, or 91 – 100%). The letter describing the residual basal area and number describing the percentage basal area removed are combined to create the Harvest Code, and is selected from Table 2 below. The percentage of basal area removed can be quickly determined by estimating the relative proportion of the basal area (based on stumps) that was removed, and using a prism or trained eye to determine the basal area of the residual stand.

Table 2 - Harvest Codes.

Percentage of basal area removed	Residual basal area (ft ² /A)				
	>120	91 - 120	61 - 90	31 - 60	0 - 30
1 - 25%	A1	B1	C1	D1	E1
26 - 40%	A2	B2	C2	D2	E2
41 - 60%	A3	B3	C3	D3	E3
61 - 90%		B4	C4	D4	E4
91 - 100%					E5

The 20 Harvest Codes are capable of describing a wide range of harvests; from a low level of removal in stands with high initial basal area (A1) to the complete removal of all trees in a stand (E5). Some combinations of Harvest Codes are not possible (indicated by black boxes) in Table 2 (see Appendix A).

3) Harvest pattern – Code describing whether the entire area or only a portion of the area was covered in the harvest operation.

E (Entire) – Trees were removed from all (>90%) areas of the stand (i.e., 90% or more of the stand area has trails, or had some or all of the trees removed).

P (Portion) – Portions (≥10%) of the stand were left unharvested (i.e., 10% or more of the stand area has no trails or had no trees removed).

4) Diameter class – Code describing the relative size of trees removed in harvest (excluding forwarder or skidder trails).

U (Upper) – Majority of basal area removed from trees in larger or upper dbh classes.

L (Lower) – Majority of basal area removed from trees in smaller or lower dbh classes.

N (Neither) – No apparent discrimination among dbh classes that were harvested.

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5) Residual stand composition – Code describing dominant tree species (>4.5” dbh) remaining in stand after harvest.

S (Softwood) – Stand with >75% of basal area composed of softwood tree species.

M (Mixedwood) – Stand with 25 to 75% of basal area composed of softwood tree species and 75 to 25% hardwood tree species.

H (Hardwood) – Stand with >75% of basal area composed of hardwood tree species.

N (None) – No residual stand remaining.

A form for using the HCS in the field is provided in Appendix B.

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EXAMPLES OF USE

Using the 5-category HCS, it is possible to distinguish among common post-harvest stand conditions found in Maine.

Harvest scenario	Starting stand composition (>4.5" dbh)	Harvest code	Harvest pattern	Diameter class removed	Residual stand composition (>4.5" dbh)
First entry of shelterwood harvest in a mixedwood stand that removed 60% of the overstory basal area and left a softwood dominated stand	M	C3	E	N	S
Commercial thinning of spruce-fir stand that removed 33% of basal area from below	S	A2	E	L	S
Final overstory removal of shelterwood harvest in a hardwood stand	H	E5	E	N	N
Selection harvest of uneven-aged hardwood stand	H	C2	E	U	H
Clearcut harvest of mature softwood stand	S	E5	E	N	N
Harvest of a mixedwood stand where nearly all of the volume was removed only from trails	M	C2	P	N	M
Patch cut that created evenly-distributed gaps a half-acre in size throughout a mixedwood stand. Patches equal 35% of stand area.	M	B2	P	N	M

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REFERENCES

- Maine Forest Service. 2005a. 2004 Silvicultural Activities Report. Maine Department of Conservation, Augusta, ME. 6 p. (Web: <http://mainegov-images.informe.org/doc/mfs/pubs/pdf/silvi/04silvi.pdf>)
- Maine Forest Service. 2005b. 2004 Wood Processor Report. Maine Department of Conservation, Augusta, ME. 6 p. (Web: <http://mainegov-images.informe.org/doc/mfs/pubs/pdf/wdproc/04wdproc.pdf>)
- McWilliams, William H.; Butler, Brett J.; Caldwell, Laurence E.; Griffith, Douglas M.; Hoppus, Michael L.; Laustsen, Kenneth M.; Lister, Andrew J.; Lister, Tonya W.; Metzler, Jacob W.; Morin, Randall S.; Sader, Steven A.; Stewart, Lucretia B.; Steinman, James R.; Westfall, James, A.; Williams, David A.; Whitman, Andrew, Woodall, Christopher W. 2005. The forests of Maine: 2003 Resour. Bull. NE-164. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 188 p.

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Appendix A

Matrix showing percentage of basal area removal based on starting and ending basal areas (ft²/A) used to define the Harvest Codes (see Table 2).

Ending basal area (ft ² /A)	Starting basal area (ft ² /A)																														Residual Code	% Removal	Removal Code
	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300				
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%			
10	50%	67%	75%	80%	83%	86%	88%	89%	90%	91%	92%	92%	93%	93%	94%	94%	94%	95%	95%	95%	95%	96%	96%	96%	96%	96%	96%	97%	97%	97%			
20		33%	50%	60%	67%	71%	75%	78%	80%	82%	83%	85%	86%	87%	88%	88%	89%	89%	90%	90%	91%	91%	92%	92%	92%	93%	93%	93%	93%	93%			
30			25%	40%	50%	57%	63%	67%	70%	73%	75%	77%	79%	80%	81%	82%	83%	84%	85%	86%	86%	87%	88%	88%	88%	89%	89%	90%	90%	90%			
40				20%	33%	43%	50%	56%	60%	64%	67%	69%	71%	73%	75%	76%	78%	79%	80%	81%	82%	83%	83%	84%	85%	85%	86%	86%	87%	87%			
50					17%	29%	38%	44%	50%	55%	58%	62%	64%	67%	69%	71%	72%	74%	75%	76%	77%	78%	79%	80%	81%	81%	82%	83%	83%	83%			
60						14%	25%	33%	40%	45%	50%	54%	57%	60%	63%	65%	67%	68%	70%	71%	73%	74%	75%	76%	77%	78%	79%	79%	80%	80%			
70							13%	22%	30%	36%	42%	46%	50%	53%	56%	59%	61%	63%	65%	67%	68%	70%	71%	72%	73%	74%	75%	76%	77%	77%			
80								11%	20%	27%	33%	38%	43%	47%	50%	53%	56%	58%	60%	62%	64%	65%	67%	68%	69%	70%	71%	72%	73%	73%			
90									10%	18%	25%	31%	36%	40%	44%	47%	50%	53%	55%	57%	59%	61%	63%	64%	65%	67%	68%	69%	70%	70%			
100										9%	17%	23%	29%	33%	38%	41%	44%	47%	50%	52%	55%	57%	58%	60%	62%	63%	64%	66%	67%	67%			
110											8%	15%	21%	27%	31%	35%	39%	42%	45%	48%	50%	52%	54%	56%	58%	59%	61%	62%	63%	63%			
120												8%	14%	20%	25%	29%	33%	37%	40%	43%	45%	48%	50%	52%	54%	56%	57%	59%	60%	60%			
130													7%	13%	19%	24%	28%	32%	35%	38%	41%	43%	46%	48%	50%	52%	54%	55%	57%	57%			
140														7%	13%	18%	24%	28%	30%	33%	36%	39%	42%	44%	46%	48%	50%	52%	53%	53%			
150															6%	12%	17%	21%	25%	29%	32%	35%	38%	40%	42%	44%	46%	48%	50%	50%			
160																6%	11%	16%	20%	24%	27%	30%	33%	36%	38%	41%	43%	45%	47%	47%			
170																	6%	11%	15%	19%	23%	26%	29%	32%	35%	37%	39%	41%	43%	43%			
180																		5%	10%	14%	18%	22%	25%	28%	31%	33%	36%	38%	40%	40%			
190																			5%	10%	14%	17%	21%	24%	27%	30%	32%	34%	37%	37%			
200																				5%	9%	13%	17%	20%	23%	26%	29%	31%	33%	33%			
210																					5%	9%	13%	16%	19%	22%	25%	28%	30%	30%			
220																						4%	8%	12%	15%	19%	21%	24%	27%	27%			
230																							4%	8%	12%	15%	18%	21%	23%	23%			
240																								4%	8%	11%	14%	17%	20%	20%			
250																									4%	7%	11%	14%	17%	17%			
260																										4%	7%	10%	13%	13%			
270																											4%	7%	10%	10%			
280																												3%	7%	7%			
290																														3%	3%		
300																															3%	3%	

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Appendix B

Example field form for Maine Harvest Classification System.

Maine Harvest Classification Form

(Intended for use immediately after harvest or no longer than six months after harvest)

Stand Name / Location _____

Recorder Name _____

1) Starting stand composition – Dominant tree species (>4.5” dbh) that made up stand before harvest. **Circle one letter:**

S	M	H
<i>Softwood</i>	<i>Mixedwood</i>	<i>Hardwood</i>
<i>(>75% basal area)</i>		<i>(>75% basal area)</i>

2) Harvest Code – Code best describing basal area left after harvest (residual basal area) and % of basal area removed. Applies only to trees >4.5 inches dbh. **Circle only one code in table:**

<i>Percentage of basal area removed</i>	<i>Residual basal area (ft²/A)</i>				
	<i>>120</i>	<i>91 - 120</i>	<i>61 - 90</i>	<i>31 - 60</i>	<i>0 - 30</i>
<i>1 - 25%</i>	A1	B1	C1	D1	E1
<i>26 - 40%</i>	A2	B2	C2	D2	E2
<i>41 - 60%</i>	A3	B3	C3	D3	E3
<i>61 - 90%</i>		B4	C4	D4	E4
<i>91 - 100%</i>					E5

3) Harvest pattern – Entire area or only portion of area covered in harvest operation. **Circle one letter:**

E	P
<i>Entire (Trees removed from >90% of area)</i>	<i>Portion (≥10% of area unharvested)</i>

4) Diameter class – Relative size of trees removed in harvest (excluding forwarder or skidder trails). **Circle one letter:**

U	L	N
<i>(Upper dbh classes)</i>	<i>(Lower dbh classes)</i>	<i>(No apparent discrimination among dbh classes)</i>

5) Residual stand composition – Dominant tree species (>4.5” dbh) in stand after harvest. **Circle one letter:**

S	M	H	N
<i>Softwood</i>	<i>Mixedwood</i>	<i>Hardwood</i>	<i>No residual stand left</i>
<i>(>75% basal area)</i>		<i>(>75% basal area)</i>	