

# 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 harvesting<sup>1</sup> and shelterwood<sup>2</sup> harvesting made up 61% and 36%, respectively, of the annual harvest, while clearcutting<sup>3</sup> 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.

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

<sup>2</sup> **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).

<sup>3</sup> **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.

**PROPOSED HARVEST CLASSIFICATION SYSTEM**

A Harvest Classification System (HCS) that includes a 7-digit code system describing the stand harvested, amount of removal, condition of residual stand, and presence of regeneration is proposed:

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

Starting stand composition	Removal Pattern				Residual Stand	
	Harvest Code		Harvest pattern	Diameter classes removed	Composition	Presence of regeneration
	Residual basal area	% basal area removal				
<i>Softwood (S)</i>	<i>A</i>	<i>1</i>	<i>Uniform (U)</i>	<i>Upper (U)</i>	<i>Softwood (S)</i>	<i>None (N)</i>
<i>Mixedwood (M)</i>	<i>B</i>	<i>2</i>	<i>Patch (P)</i>	<i>Middle (M)</i>	<i>Mixedwood (M)</i>	<i>Seedling (R)</i>
<i>Hardwood (H)</i>	<i>C</i>	<i>3</i>		<i>Lower (L)</i>	<i>Hardwood (H)</i>	<i>Sapling (S)</i>
	<i>D</i>	<i>4</i>		<i>All (A)</i>	<i>None (N)</i>	
	<i>E</i>	<i>5</i>				

The 7-digit system can be combined into six categories that describe a forest harvest. Using these categories, the HCS is capable of identifying 5,760 unique post-harvest conditions. Each category in the HCS is described as follows:

**1) Starting stand composition** – Code describing the dominant tree species (>4” 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 >80% of basal area composed of softwood tree species.

**M (Mixedwood)** – Stand with 20 to 80% of basal area composed of softwood tree species and 80 to 20% hardwood tree species.

**H (Hardwood)** – Stand with >80% of basal area composed of hardwood tree species.

**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 >4.0 inches dbh remaining immediately after harvest in 30 ft<sup>2</sup>/A basal area classes (>120, 91 – 120, 61 – 90, 31 – 60, or 0 – 30 ft<sup>2</sup>/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

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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 <sup>2</sup> /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) Removal pattern** – Code describing whether the trees were removed uniformly throughout the stand or in patches across the stand. Forwarder or skidder trails used to remove logs are not considered to be part of the removal pattern.

**U** (Uniform) – Trees were removed uniformly across the stand.

**P** (Patch) – Trees were removed in distinct patches, groups, or gaps across the stand.

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

**U** (Upper) – Trees removed primarily from the larger or upper dbh classes.

**M** (Middle) – Trees removed primarily from the middle dbh classes.

**L** (Lower) – Trees removed primarily from the smaller or lower dbh classes.

**A** (All) – Trees removed across the full range of dbh classes.

**5) Residual stand composition** – Code describing dominant tree species (>4” dbh) remaining in stand after harvest.

**S** (Softwood) – Stand with >80% of basal area composed of softwood tree species.

**M** (Mixedwood) – Stand with 20 to 80% of basal area composed of softwood tree species and 80 to 20% hardwood tree species.

**H** (Hardwood) – Stand with >80% of basal area composed of hardwood tree species.

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**N** (None) – No residual stand remaining.

**6) Presence of regeneration** – Code describing the presence, size, and distribution of tree regeneration in stand at time of harvest.

**N** (None) – Tree seedlings and saplings not present or sparsely distributed across stand.

**R** (Seedlings) – Uniform distribution and relatively high abundance of tree seedling regeneration (<4.5 ft tall) distributed across stand.

**S** (Saplings) – Uniform distribution and relatively high abundance of tree saplings (>4.5 ft tall and <4.0” dbh) distributed across stand.

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

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**EXAMPLES OF USE**

Using the 6-category HCS, it is possible to distinguish among common post-harvest stand conditions found in Maine. If a simpler harvest classification is needed, an abbreviated form of the HCS (including only the Starting Stand Composition and Harvest Code) can be used to provide some information about the harvest.

Harvest scenario	Starting stand composition (>4" dbh)	Removal Pattern			Residual Stand	
		Harvest code	Harvest pattern	Diameter class removed	Residual stand composition (>4" dbh)	Presence of regeneration
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	U	A	S	N
Commercial thinning of spruce-fir stand that removed 33% of basal area from below	S	A2	U	L	S	N
Final overstory removal of a shelterwood harvest in a hardwood stand that has an abundance of well-distributed natural regeneration	H	E5	U	A	N	S
Selection harvest entry (15 yr cutting cycle) of an uneven-aged hardwood stand	H	C2	U	U	H	S
Clearcut harvest of a mature softwood stand with abundant natural regeneration of seedlings	S	E5	U	A	N	R
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	A	M	N

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### **REFERENCES**

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**Appendix A**

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

Ending basal area (ft <sup>2</sup> /A)	Starting basal area (ft <sup>2</sup> /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%	24%	26%	30%	33%	36%	39%	42%	44%	46%	48%	50%	52%	53%	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%			
300																														3%			



**Appendix B**

Example field form for Maine Harvest Classification System.

**Maine Harvest Classification Form**

Stand Name / Location \_\_\_\_\_

Recorder Name \_\_\_\_\_

1) **Starting stand composition** – Dominant tree species (>4” dbh) that made up stand before harvest.

Circle one letter:

**S**

*Softwood (>80% basal area)*

**M**

*Mixedwood*

**H**

*Hardwood (>80% basal area)*

2) **Harvest Code** – Code best describing basal area left after harvest (residual basal area) and % of basal area removed. Applies only to trees >4.0 inches dbh. **Circle only one code in table:**

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

3) **Removal pattern** – How trees were removed from stand? Forwarder or skidder trails not considered.

Circle one letter:

**U**

*Uniform (Evenly across the stand)*

**P**

*Patch (patches, groups, or gaps)*

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

Circle one letter:

**U**

*(Upper dbh classes)*

**M**

*(Middle dbh classes)*

**L**

*(Lower dbh classes)*

**A**

*(All dbh classes)*

5) **Residual stand composition** – Dominant tree species (>4” dbh) in stand after harvest. **Circle one letter:**

**S**

*Softwood (>80% basal area)*

**M**

*Mixedwood*

**H**

*Hardwood (>80% basal area)*

**N**

*No residual stand left*

6) **Presence of regeneration** – Presence of tree regeneration at harvest. **Circle one letter:**

**N**

*Sparsely distributed or no tree seedlings or saplings present across stand*

**R**

*Seedlings (<4.5 ft tall) well distributed across stand*

**S**

*Saplings (>4.5’ tall and <4.0” dbh) well distributed across stand*