

# Status of the Logging Sector in Wisconsin and Michigan's Upper Peninsula 2003



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## EXECUTIVE SUMMARY

Professional loggers are key players in the management of the region's forest resource. They are an integral part of a multi-billion dollar wood products industry. In addition, they shape the structure, composition, health, and future development of the forest resource and help various forest owners meet their myriad objectives. Through a comprehensive, random mail survey of logging firms in

Wisconsin and Michigan's Upper Peninsula, we offer the first-ever study of this critical link between the forests and the wood products industry. The following key findings relate to the business environment, timber production and supply, markets, and firm retention:

- The average firm has been in business for over 20 years and the average firm owner is 47 years old. There are relatively few new firms entering the sector. The majority (64%) of logging firms are fully mechanized. These are capital-intensive operations in which the median investment is \$300,000.
- Most logging firms (62%) are organized as one-person, owner-operator enterprises with no employees. The balance of firms (38%) employs approximately five full-time equivalent workers on average. Among firms with employees, over 85% reported difficulty finding skilled and reliable workers.
- The average logging firm harvested 5,900 cords in 2003; however, production varied considerably. Mechanized firms that used both cut-to-length and feller-buncher systems were the most productive (approximately 20,000 cords per year) whereas chainsaw-based firms were the least (approximately 2,300 cords per year).

### ACKNOWLEDGMENTS

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We wish to gratefully acknowledge Paul Gobster and Charles Michler, USDA Forest Service North Central Research Station; and Shorna Broussard, Purdue University who assisted with the study design. We appreciate the thoughtful comments of Bob Govett, University of Wisconsin-Stevens Point, and David Marcouiller, University of Wisconsin-Madison. We wish to recognize Karla Ortman, Kemp Natural Resources Station, for outstanding administrative support, particularly during the survey phase of the project.

Finally, special thanks are due to the professional loggers who completed the questionnaire. Their participation has enhanced our understanding of this vital forestry sector. As always, all remaining errors and omissions are our responsibility.



- Most firms focus their procurement efforts on large timber sales but this varied by harvest system. Private woodlands (i.e., nonindustrial private forestlands) are the primary source of stumpage for the region's logging sector, providing 60% of firm timber on average. Notably, one in four firms (26%) conducted terminal harvests (i.e., land clearing for residential or commercial development) in 2003.
- Pulpwood is the primary output of the region's logging sector, representing 68% of total firm production on average. Sawtimber accounts for 25% with veneer contributing another 5%. Markets are closely correlated with the products produced, with firms selling the majority (65%) of their wood to pulp and/or integrated pulp & paper mills. However, there are significant differences among sub-regions. Firms identified mill price as the single most important factor when deciding where to sell their wood. Timeliness of payment was cited as the second most important consideration.
- More than two-thirds (71%) of the region's logging firms reported their profitability as breaking even or better in 2003. However, more than one-in-four firms (28%) said they experienced poor profit margins. Twenty-three percent of the region's logging firms stated they did not expect to be in business in five years. If these exits occur, it would represent a loss of more than 600,000 cords of annual production.

Our findings suggest that the logging sector will see three major challenges in the near term. First, private woodlands, the dominant source of timber supply, will continue to be fragmented into parcels and that specialization of logging firms and aggregation of small sales may yield continued access to this important source of supply. Second, global market forces are reshaping the wood products industry that, in turn, will to some extent reshape the relationship of logging firms to others in the value chain. Third, the internal dynamics of the logging sector along with the first two points suggest the need for greater collaboration and information sharing among loggers, mills, and others to meet fiber demands.

## INTRODUCTION

The forests of Wisconsin and Michigan's Upper Peninsula cover more than 24 million acres or 55% of the land area (Miles 2005). The region's vast forest resource ranges from the oak-hickory forests of southern Wisconsin to boreal stands of fir, spruce, and pine in Michigan's Upper Peninsula. These forests provide critical wildlife habitat, vital ecological services, numerous amenities, and abundant recreational opportunities for residents and visitors alike. They also support a multi-billion dollar wood products industry which contributes strength and diversity to the regional economy. Collectively, lumber, veneer, wood panel, and pulp & paper mills directly employ more than 100,000 people and serve as the economic base for many communities.

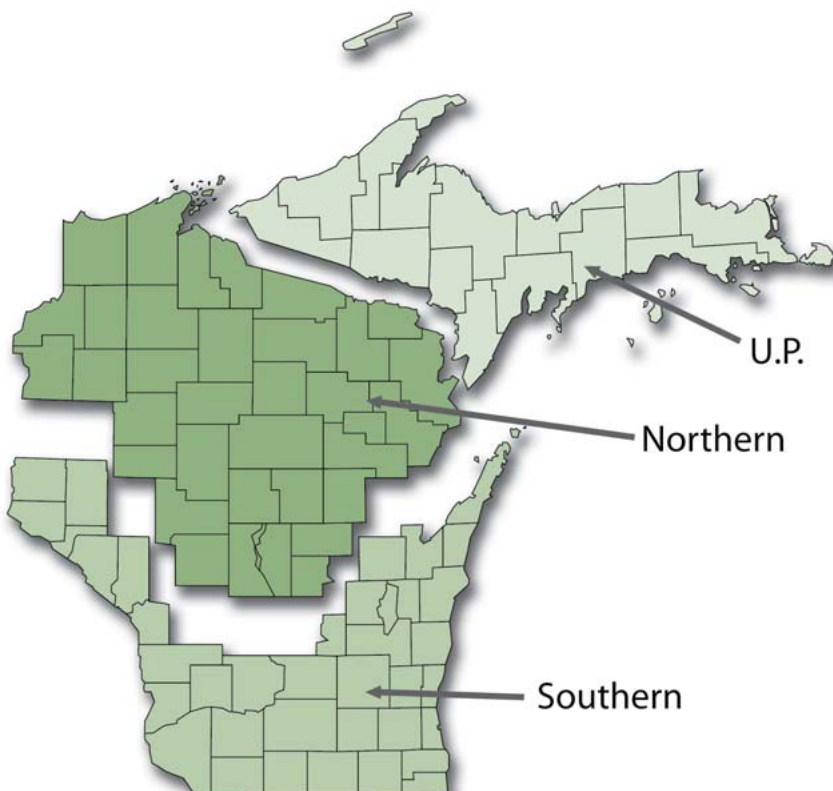
The management and use of these forests to benefit society and individuals depends on independent logging firms. These firms are responsible for nearly all commercial timber harvests that supply the region's extensive wood-based industries. In meeting this demand for fiber, logging firms alter the current condition and shape the future development of the forest resource. Despite its importance to forest productivity and the regional economy, relatively little is known about the logging sector. An extensive literature review found no reports that systematically examine the region's logging sector, its scope, or its outlook.

This report addresses that gap at a critical time. The last decade has seen significant changes in forest ownership. Parcelization, or the subdivision of large parcels into smaller ones, has resulted in an influx of woodland owners and a decrease in average ownership size in the region. This has created concern about both the operability of many small ownerships and the willingness of these new owners to harvest timber. In addition, industrial forest owner-

ship has changed, with several timber companies divesting their holdings to land investment and management organizations. Both developments have led to uncertainty about future land use, forest management decisions, and timber supply.

In this report, we review the structure, production, and demographics of the logging sector in Wisconsin and Michigan's Upper Peninsula; and we examine the business environment in which logging firms operate. Our intent is to provide natural resource professionals and decision-makers with a clear description of the logging sector, its impacts, and the challenges it faces. With this information, individuals can better assess how practices and policy decisions might affect logging firms and the important role they play in forest management and forest-based economies. In particular, we explore the potential impacts of continuing parcelization and emerging market opportunities.

**Figure 1. Location of the Wisconsin – Michigan Upper Peninsula study area and geographic sub-regions.**





## STUDY SAMPLE & METHODS

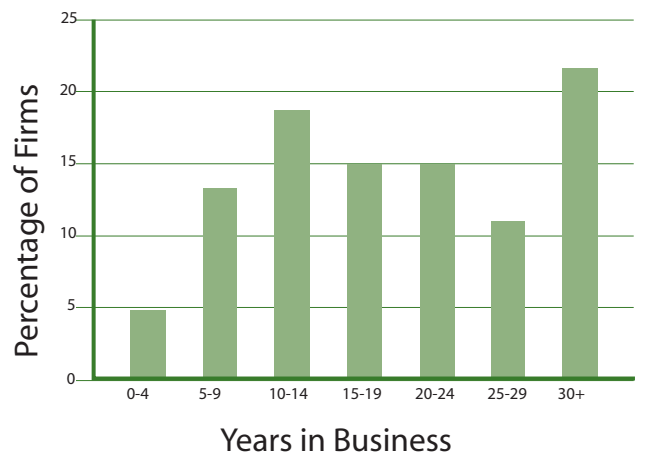
Data for this study came from a comprehensive random survey of more than 1,300 logging firms operating in Wisconsin and Michigan's Upper Peninsula. The survey was conducted during the spring of 2004 following standard mail survey procedures (Dillman 1978). This design included an initial full mailing (i.e., cover letter, questionnaire, business-reply envelope, and \$2 incentive) and follow-up reminder/thank you postcard to all firms in the sample. We then sent two subsequent full mailings (minus incentive) to those who had yet to respond. Survey questions focused on three main areas: timber supply, business characteristics, and firm characteristics. Respondents were asked to answer questions on these topics using 2003 as the reference year. A copy of the questionnaire is provided in Appendix A.

Of the 1,316 mailed questionnaires, 130 were removed from the sample because they were either undeliverable or because the firm was no longer in the logging business. Six hundred and ninety-four respondents returned the survey for an overall response rate of 59%. Surveys were screened and only those firms producing 100 cords or more per year were included in subsequent analyses. Given the diverse forest conditions, landownership patterns, and logging practices that occur across the region, survey responses were organized into one of three geographic sub-regions: Southern Wisconsin, Northern Wisconsin, and Michigan's Upper Peninsula (Figure 1). We conducted statistical tests to determine whether significant differences existed among sub-regions and, where appropriate, among different harvest systems. If such differences were found, sub-regional and harvest system results are presented and discussed; otherwise, aggregate findings for the entire Wisconsin – Michigan Upper Peninsula area are reported. All differences reported in this publication are statistically significant with the particulars of each test provided in footnotes.

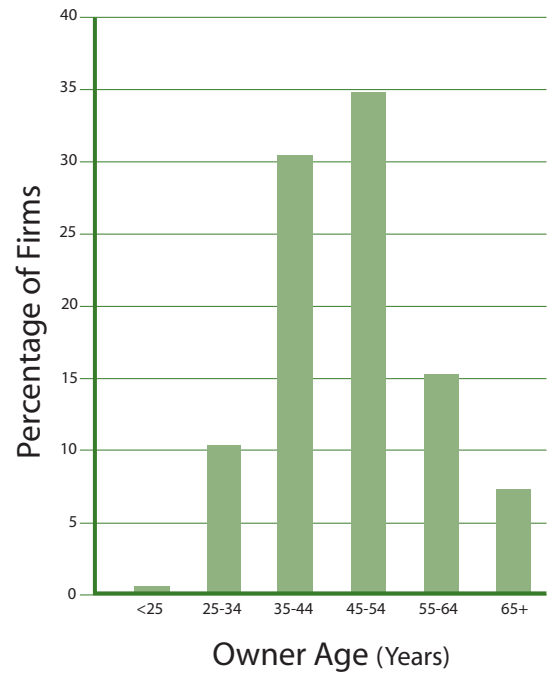


B. Armstrong

**Figure 2. Distribution of the regional logging sector by the number of years in business.**



**Figure 3. Distribution of the regional logging sector by firm owner age.**



# FINDINGS

## FIRM CHARACTERISTICS

### ► *Demographics*

The region's logging firms are long-established businesses. The average firm has been in operation for approximately 21 years and 22% of firms have been logging for 30 years or more (Figure 2). In contrast, there are relatively few new logging businesses in the region. Only 5% of the firms are less than 5 years old and just 18% are less than 10 years old. These findings challenge a commonly held perception that logging firms readily enter and exit the sector depending on market conditions. Instead, these results suggest that firms, in general, make a long-term commitment to the logging profession. As an example, the firm with the longest business tenure has been operating for 90 consecutive years.

Nearly one in four firm owners (23%) is at or within 10 years of retirement age (Figure 3). The average firm owner is slightly more than 47 years old with the eldest being 78 years and the youngest 22. As a group, there are relatively few young logging firm owners. Less than 11% of firm owners are under the age of 35. Our data do not provide insights into this age distribution, but it is not atypical. Greene et al. (2001) found the average logging firm owner in Georgia was 45 years old and the firm had been operating for 17 years. In a Minnesota study, Powers (2004) found that the average logging firm owner had been in business for 25 years. That firm owners are older makes sense for two reasons. First, it may take several years for young loggers to gain the experience, skills, and connections to start a business. Second, the high capital investment required to start a logging business may serve as a barrier to entry, particularly for young loggers who have not yet have acquired the necessary capital or who do not have ready access to capital markets.

More than one-third of respondents (38%) reported that theirs was a family-run business in which two or more family members played a central role in the leadership and daily workings of the firm. Family-run firms were asked to assess the likelihood that a future generation – son, daughter, nephew, and/or niece – of the owner's family would take over the business. Approximately one-half (53%) indicated that a family member was likely to take over future control of the business. The balance of respondents, 47%, reported either no heirs or that it was unlikely future generations would be substantially involved in running the firm.

### ► *Harvesting Systems & Capital Investment*

Most logging firms (64%) producing more than 100 cords a year in Wisconsin and Michigan's Upper Peninsula are fully-mechanized operations in which the entire production of timber, from stump to landing, is accomplished by mechanical means. We classified firms into one of four mechanized categories:

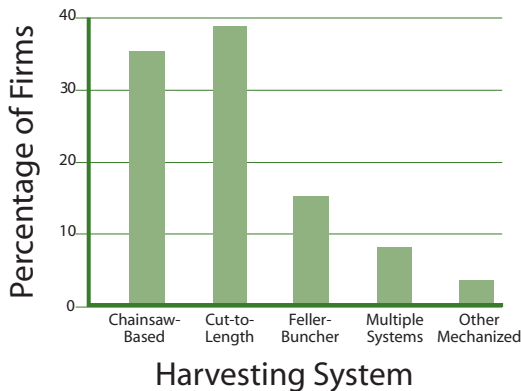
1. Cut-to-length operations that employ harvesters and forwarders – 39% of firms;
2. Feller-buncher operations that use one or more feller-bunchers in conjunction with grapple skidders, delimiters, and slashers – 15% of firms;
3. Multiple system firms that operate both cut-to-length and feller-buncher operations – 7% of firms; and

4. Other operations that utilize in-woods chipping or non-standard equipment configurations – 2% of firms.

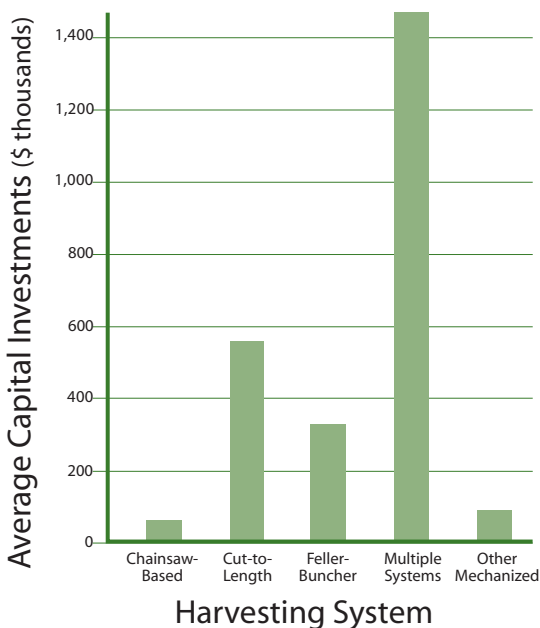
Approximately one-third of the firms surveyed (36%) reported they are exclusively chainsaw-based operations (Figure 4). In chainsaw operations, trees are manually felled and processed and skidders and/or forwarders are used for primary transport.

The distribution of harvesting systems varied significantly among the three sub-regions<sup>1</sup> (Table 1). Specifically, chainsaw-based firms were more prevalent in southern Wisconsin.

**Figure 4. Distribution of the regional logging sector by type of harvesting system employed.**



**Figure 5. Average firm capital investment by type of harvesting system.**



In general, this sub-region is characterized by a greater proportion of large-diameter hardwood sawtimber; a larger presence of private woodland (i.e., non-industrial private forest - NIPF) owners; and considerable topographic relief, particularly in its western portion. Together, these factors may explain the current prevalence of manual tree felling and processing. Cut-to-length operations were more common in Wisconsin than Michigan’s Upper Peninsula. Among harvesting systems, cut-to-length represents the newest and most technologically-advanced equipment in the woods today. These flexible systems process full-trees into logs and bolts (i.e., shortwood) at the stump. These systems can be used to implement a wide range of silvicultural prescriptions, from partial harvests to clearcuts. In contrast, feller-buncher systems are employed more often by logging firms operating in Michigan’s Upper Peninsula. These are large, highly productive, full-tree systems that are best suited to clearcut prescriptions over large harvest areas.

The region’s logging firms have considerable capital invested in their business with a sector-wide average investment of \$397,000. However, investment varied substantially among firms (median investment = \$165 thousand; maximum investment = \$8.0 million). Statistical analyses revealed that firm investment levels were similar across sub-regions but differed significantly depending on the type of harvesting system employed<sup>2</sup> (Figure 5). Mixed firms that employed both cut-to-length and feller-buncher systems had the highest mean capital investment – nearly \$1.5 million. Cut-to-length firms had, on average, \$538,000 invested in their business. This is \$200,000 more than feller-buncher operations and is indicative of the relatively high costs associated with cut-to-length systems. Chainsaw-based firms had the least amount of capital investment with, on average, \$93,000. This lower amount reflects the lower equipment requirements – namely, a chainsaw and a skidder at a minimum – that characterize this group.

<sup>1</sup> The null hypothesis that sub-regions had similar distributions of harvesting systems was rejected using a chi-squared test with  $\chi^2 = 16.2$ ,  $df = 8$ , and  $p\text{-value} = 0.0390$ .

<sup>2</sup> We conducted an analysis of variance for unbalanced data (ANOVA), examining the relationships between firm capital investment and sub-region, harvesting system, and sub-region\*harvesting system. The overall model was statistically significant ( $F_{14,481} = 24.45$ ,  $p\text{-value} < 0.0001$ ) as were the explanatory variables harvesting system ( $F_4 = 52.04$ ,  $p\text{-value} < 0.0001$ ) and sub-region\*harvesting system ( $F_8 = 16.53$ ,  $p\text{-value} < 0.0001$ ). Sub-region was not statistically significant ( $F_2 = 0.99$ ,  $p\text{-value} = 0.3740$ ), suggesting there was no significant difference in average firm investment across sub-regions.



**Table 1.** Distribution of harvesting systems (percent of firms) among geographic sub-region.

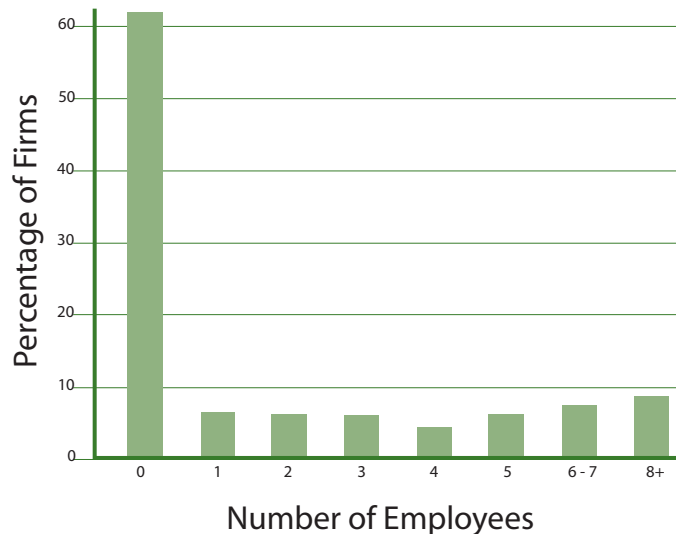
Geographic Sub-Region	Harvesting System				
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other
Southern Wisconsin	41.2	42.9	9.2	5.0	1.7
Northern Wisconsin	32.6	42.0	13.5	9.4	2.4
All Wisconsin	35.4	42.3	12.1	8.0	2.2
Michigan Upper Peninsula	37.1	32.8	22.0	6.4	1.6
Entire Region	36.0	39.1	15.4	7.4	2.0

► *Employment*

The majority of logging firms (62%) reported having no employees (Figure 6). Typically, these individuals sub-contract a portion or portions of the harvesting process to others in the logging or trucking sector. Based on anecdotal evidence, this is a substantial change in business practice compared to twenty years ago. Historically, logging was a labor-intensive activity in which firms employed many workers. Crews of 10, 20, 30, or more employees were common. However, capital, in the form of highly productive and efficient logging equipment, has replaced the individual worker on the forest floor. Of those businesses that did employ workers, the average number of full- and part-time employees per firm was 4.1 and 0.7, respectively. As illustrated in Figure 6, relatively few of the region’s logging firms (8%) employ eight or more full-time workers. The largest firm reported having 34 full-time employees.

For firms with employees, 88% of respondents indicated that reliable workers were hard to find. Eighty-seven percent also said skilled workers were hard to find. These results were consistent across the three sub-regions, however, assessments of worker turnover differed by sub-region.<sup>3</sup> More respondents from southern Wisconsin (26%) agreed that worker turnover was high. In contrast, 18% of the firms with employees in northern Wisconsin firms and 21% of the firms with employees in Michigan’s Upper Peninsula reported that they agreed with the statement. Collectively, these responses suggest that labor availability and, to a lesser extent, labor retention, may be problematic in the regional logging sector.

**Figure 6.** Distribution of the regional logging sector by the number of firm employees.



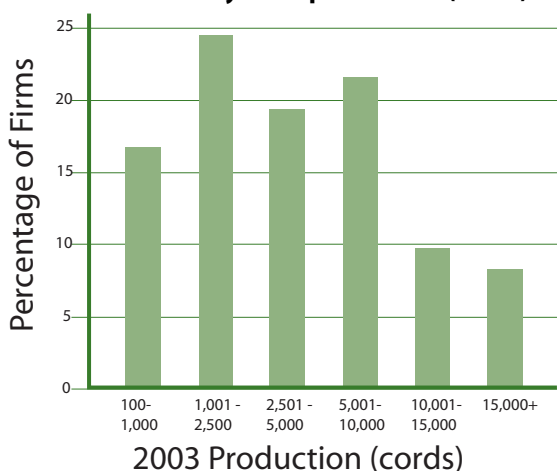
<sup>3</sup> The null hypothesis that sub-regions responded similarly to the statement “worker turnover is high in my company” was rejected using a chi-squared test with  $\chi^2 = 17.2$ ,  $df = 8$ , and a  $p$ -value = 0.0285.

## TIMBER PRODUCTION & STUMPAGE SUPPLY

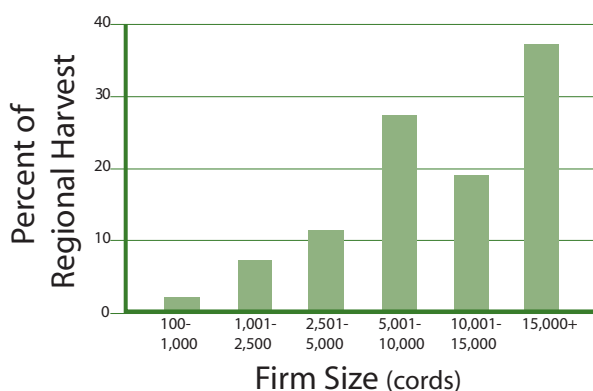
### ► Firm Production

The average logging firm harvested slightly more than 5,900 cords in 2003; however, there was a considerable range in production, with firms harvesting from 100 cords to more than 56,000 cords (Figure 7). In general, the sector is characterized by a large number of small firms and comparatively fewer big ones.<sup>4</sup> One-half of firms produced less than 3,200 cords annually; and only one-quarter harvested more than 8,000 cords. Just 8% of the

**Figure 7. Distribution of the regional logging sector by 2003 production (cords).**



**Figure 8. Contribution to the total regional timber harvest by firm size.**



firms fell into our largest production category, producing more than 15,000 cords. This pattern of firm size distribution – with many small firms and few large operations – was consistent among the three sub-regions.

Despite the prevalence of small logging firms, production within the region is concentrated among large firms. For example, firms producing 2,500 cords or less in 2003 represented 41% of the firms surveyed; but these same firms accounted for only 9% of the regional timber harvest. In contrast, the largest 8% of firms harvested one-third (34%) of the timber in the region (Figure 8).

We also examined the distribution of firm size by the type of harvesting system employed. The overwhelming majority of small firms – 74% of firms producing less than 1,000 cords and 57% of the firms in the 1,001-2,500 cord size class – were chainsaw-based operations. On the other hand, the firms with the largest production were predominately mechanized in which cut-to-length systems dominated<sup>5</sup> (Table 2). On average and at the regional level, firms utilizing both cut-to-length and feller-buncher systems had the highest production: 12,106 cords per year. Exclusively cut-to-length firms produced 8,415 cords per year, while feller-buncher firms produced 5,511 cords per year. Chainsaw-based operations produced significantly less timber – just 2,302 cords annually: 42% of feller-buncher operations and 27% of cut-to-length operations.<sup>6</sup>

### ► Timber Sales, Tract Size, and Harvest Volumes

The average logging firm worked on 8.5 timber sales in 2003 but this number varied significantly depending upon the sub-region and the type of harvesting system employed<sup>7</sup> (Table 3). Across the region, the

average number of timber sales that a firm harvested increased as one moved from north to south. Firms based in Michigan's Upper Peninsula harvested 5.5 sales in 2003 while their

<sup>4</sup> The null hypothesis that firm production is normally distributed was rejected using a Shapiro-Wilk test with  $W = 0.694$  and a  $p$ -value  $< 0.0001$ .

<sup>5</sup> The null hypothesis that production classes were similarly distributed among harvesting systems was rejected using a chi-squared test with  $\chi^2 = 211.8$ ,  $df = 20$ , and  $p$ -value  $< 0.0001$ .

<sup>6</sup> ANOVA revealed statistically significant differences ( $F_{14,540} = 12.55$ ,  $p$ -value  $< 0.0001$ ) in mean firm production among harvesting systems ( $F_4 = 35.06$ ,  $p$ -value  $< 0.0001$ ) and the interaction term sub-region\*harvesting system ( $F_8 = 4.03$ ,  $p$ -value  $= 0.0001$ ). Sub-region was not statistically significant ( $F_2 = 1.61$ ,  $p$ -value  $= 0.2011$ ), suggesting there was no significant difference in average firm production across sub-regions.

<sup>7</sup> ANOVA revealed statistically significant differences ( $F_{6,527} = 16.91$ ,  $p$ -value  $< 0.0001$ ) in the average number of timber sales harvested among geographic sub-regions ( $F_2 = 27.85$ ,  $p$ -value  $< 0.0001$ ) and harvesting systems ( $F_4 = 11.45$ ,  $p$ -value  $< 0.0001$ ).

counterparts in Southern Wisconsin harvested more than twice that amount – 13.8. Further analyses revealed that while northern firms harvested fewer timber sales per year, these sales were significantly larger, both in terms of the median sale area<sup>8</sup> (Table 4) and the total

**Table 2.** Average firm production (cords) by type of harvesting system and geographic sub-region, 2003.

Geographic Sub-Region	Harvesting System					
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	All Systems
Southern Wisconsin	1,508	8,088	6,602	5,127	1,975	5,003
Northern Wisconsin	2,636	9,000	3,762	9,827	3,117	6,121
All Wisconsin	2,214	8,698	4,472	8,854	2,831	5,756
Michigan Upper Peninsula	2,465	7,711	6,626	19,963	3,667	6,219
Entire Region	2,302	8,415	5,511	12,106	3,059	5,913

**Table 3.** Average number of timber sales harvested in 2003 by type of harvesting system and geographic sub-region.

Geographic Sub-Region	Harvesting System					
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	All Systems
Southern Wisconsin	9.6	17.9	12.1	13.4	6.5	13.8
Northern Wisconsin	4.8	10.8	7.7	10.1	4.4	8.2
All Wisconsin	6.6	13.2	8.8	10.9	4.9	10.0
Michigan Upper Peninsula	3.5	6.6	5.1	13.1	2.8	5.5
Entire Region	5.5	11.3	7.1	11.5	4.5	8.5

**Table 4.** Median timber sale tract size (acres) by type of harvesting system and geographic sub-region, 2003.

Geographic Sub-Region	Harvesting System					
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	All Systems
Southern Wisconsin	42	33	44	45	38	39
Northern Wisconsin	55	64	58	71	82	61
All Wisconsin	51	56	51	58	52	53
Michigan Upper Peninsula	58	67	99	117	69	67
Entire Region	54	58	61	70	57	59

<sup>8</sup> A nonparametric median test revealed statistically significant differences ( $\chi^2 = 33.3$ ,  $df = 2$ , and  $p$ -value  $< 0.0001$ ) in the median area per timber sale among geographic sub-regions.

**Table 5.** Average timber sale harvest volume (cords per sale) by type of harvesting system and geographic sub-region, 2003.

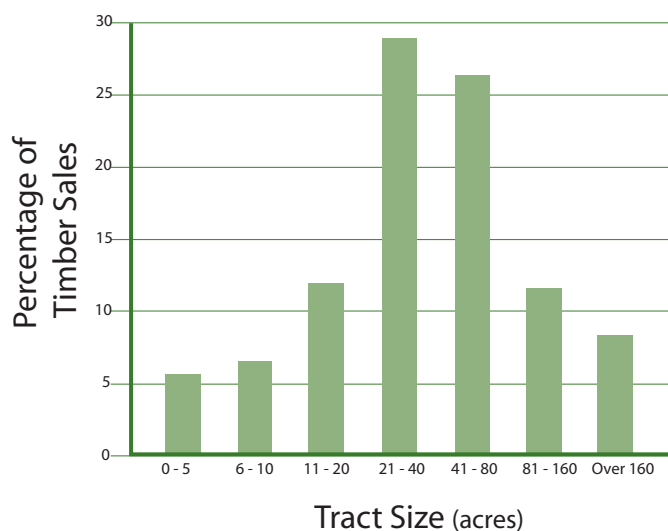
Geographic Sub-Region	Harvesting System					All Systems
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	
Southern Wisconsin	297	505	641	437	304	425
Northern Wisconsin	627	986	636	913	1,369	822
All Wisconsin	504	824	637	807	1,103	691
Michigan Upper Peninsula	787	1,255	1,843	1,897	2,179	1,255
Entire Region	602	946	1,195	1,142	1,318	878

harvest volume<sup>9</sup> (Table 5). For example, timber sales in the Upper Peninsula were approximately two times larger in area and three times larger in harvest volume than sales in Southern Wisconsin. This regional distribution of sale size reflects the different ownership patterns among the three sub-regions. Smaller parcels owned by private woodland owners dominate in the southern part of the region; whereas, ownership patterns are more balanced across public, industrial, and private woodland owners in the north.

Regionally, the median timber sale was 59 acres in size. In this case, the median is a more appropriate descriptive measure of tract size (as opposed to the average) given the manner in which timber sale areas were reported and estimated. The average timber sale yielded 878 cords. Most timber harvests fell into the 21-40 acre and 41-80 acre size classes – 29% and 27%, respectively (Figure 9). Approximately 20% of the region’s timber sales were greater than 80 acres. In contrast, small sales (i.e., 10 acres or less) accounted for just 13% of the regional timber harvests. These findings provide clear evidence that most logging firms focus their procurement efforts on large timber sales. This is expected as large sales offer improved economies of scale. Scale economies are important to all firms but especially those operating

highly productive harvesting systems characterized by high fixed costs. As sale size increases, firms spread their fixed costs over more acres and more cords, enhancing their per-cord profit margins. In addition, large sales reduce the frequency of relocating to new tracts, which decreases equipment moving costs and trims unproductive time spent in transit between sales. Collectively, these factors contribute to a better bottom line, other things being equal. Although the survey did not specifically ask about a minimum economically viable timber sale size, Figure 9 illustrates a distinct break at 20 acres, with the overwhelming majority of sales (75%) being 21 acres or larger. The distribution of timber sales implies that a minimum size of 20 acres may be necessary to attract the attention of most logging firms.

**Figure 9. Distribution of timber sales by tract size.**



<sup>9</sup> ANOVA revealed statistically significant differences ( $F_{14,519} = 7.57, p\text{-value} < 0.0001$ ) in the average harvest volume per timber sale among geographic sub-regions ( $F_2 = 27.96, p\text{-value} < 0.0001$ ), harvesting systems ( $F_4 = 7.17, p\text{-value} < 0.0001$ ), and the interaction term sub-region\* harvesting system ( $F_8 = 2.68, p\text{-value} < 0.0069$ ).

Foresters and woodland owners should keep the 20-acre threshold in mind when preparing silvicultural prescriptions, scheduling harvests, and establishing timber sales. Our survey results indicate that harvests of 20 acres or less may not be readily marketable. Small sales with many high value trees will always be an exception, but typical small sales, at least at prevailing stumpage prices, may attract few bidders or go unsold. This is not to suggest small stands cannot be managed; rather, there appears to be a limited number of firms that are currently interested in or capable of harvesting small tracts.

As previously indicated, the number and size of timber sales also varied depending on the type of harvesting system(s) a firm utilized. Chainsaw-based firms harvested fewer and smaller timber sales. Specifically, they worked on 5.5 sales in 2003 with a median tract size of 54 acres and an average harvest volume of 602 cords. This was significantly less than fully mechanized firms, particularly those using cut-to-length or multiple harvesting systems. For example, cut-to-length firms harvested an average of 11.3 sales in 2003, the median harvest block size was 71 acres, and yielded 946 cords. Firms using both cut-to-length and feller-buncher systems reported similar timber sale characteristics (Tables 3, 4, and 5). The “Other” category of harvesting system, which accounts for 2% of firms surveyed, warrants further comment.

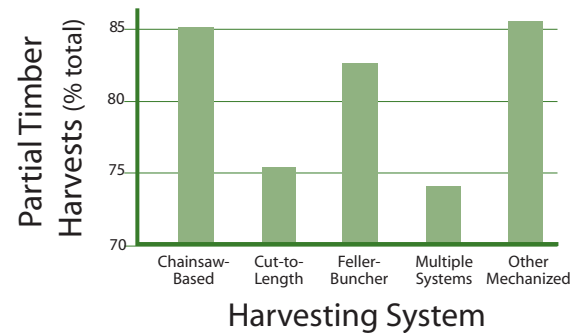
In southern Wisconsin, this group was comprised primarily of firms utilizing non-standard system configurations, such as feller-bunchers working with manual processing. However, in northern Wisconsin and Michigan’s Upper Peninsula, the “Other” category included firms that chip whole trees on site. Chipping systems are large, high capacity operations. This fact is reflected in the larger average tract size and harvest volumes that characterize firms in the “Other” category working in the north.

Firms reported that 80% of their 2003 harvest volume was obtained via partial timber harvests, such as thinnings, improvement cuts, shelterwood treatments, individual-tree selection, and group selection. The remainder (20%) was obtained from clearcutting. The distribution of partial versus clearcut prescriptions was consistent among the three sub-regions but varied significantly depending on the type of harvesting system firms employed<sup>10</sup> (Figure 10). Generally, cut-to-length firms and firms using both feller-buncher and cut-to-length systems harvested a statistically greater proportion of their annual production from clearcuts (24% and 26%, respectively) when compared to chain-saw-based companies (15%).

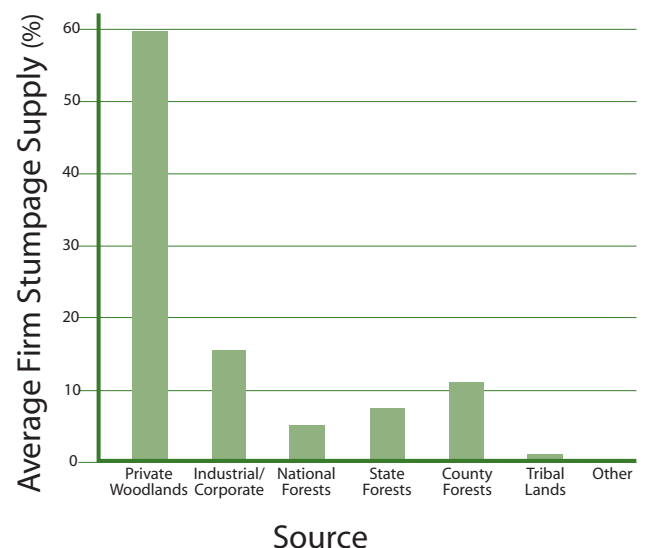
### ► Stumpage Sources

Private woodlands were the dominant source of timber for the region’s logging sector. The average firm obtained 60% of its harvest volume from this ownership group (Figure 11). The heavy

**Figure 10. Average firm frequency of partial timber harvests by type of harvesting system.**



**Figure 11. Average firm stumpage supply by source (%).**



<sup>10</sup> ANOVA revealed statistically significant differences ( $F_{14,506} = 2.21, p\text{-value} = 0.0066$ ) in the proportion of harvest volume obtained via clearcuts. Differences existed among the type of harvesting system employed ( $F_3 = 5.21, p\text{-value} = 0.0004$ ) but not sub-region ( $F_2 = 0.20, p\text{-value} = 0.8181$ ) or the interaction term sub-region\*harvesting system ( $F_8 = 1.22, p\text{-value} = 0.2851$ ).

dependence on private woodlands reflects regional landownership patterns where 60% of commercial timberland is owned by families and individuals. Regionally, industrial/corporate forests were the next single largest source of respondents' timber, accounting for 15% of their timber supply. Collectively, public lands provided 24% of the sector's timber stumpage; however, the supply of timber was uneven across the various public ownerships. Firms obtained most of their public stumpage from county forests (12%) with state and national forests providing 7% and 5% of firm stumpage, respectively.

Closer inspection of stumpage supply revealed that 35% of the region's logging firms obtained 100% of their timber from private woodlands. In addition, 41% of firms derived more than three-quarters of their stumpage from this ownership. Thus, private woodlands, along with their importance to regional timber supply, are similarly critical to the direct economic well-being of a large number of the region's logging firms. It is interesting to note that while many firms focus on private woodlands for timber, a sizeable number avoid this stumpage source completely: 11% of firms reported obtaining none of their timber from private woodlands. Instead, they focused their procurement activities on industrial/corporate forests and public lands.

Dependence on private woodlands varied significantly by sub-region and harvesting system<sup>11</sup> (Table 6). In southern Wisconsin, loggers procured more than three-quarters of their harvest volume (78%) from private woodlands. In this sub-region, the overwhelming majority of timberland is owned by individuals and families, so it is no surprise that private woodlands are the primary stumpage supplier. By comparison, southern Wisconsin logging firms obtained only 7% of their stumpage supply from industrial/corporate lands. In northern Wisconsin and Michigan's Upper Peninsula, private woodlands were still the primary timber supplier, providing 54% and 56% of logging firm's stumpage, respectively. However, the distributions of stumpage supply among forest ownerships were considerably more balanced. Logging firms based in northern Wisconsin obtained 30% of their timber from public sources (once again, county forests were the largest suppliers) and 12% from industrial/corporate lands. In the Upper Peninsula, industrial/corporate landholdings played a more dominant role, providing firms 23% of their timber stumpage with public lands contributing 21%.

As stated above, reliance on private woodlands for stumpage also varied depending upon the type of harvesting system(s) firms employed. As a group, chainsaw-based firms derived 73% of their stumpage from these woodlands; whereas fully mechanized operations obtained from 48% to 53% of their stumpage from them. On the other hand, fully-mechanized operations procured a significantly greater proportion of their timber from public lands (particularly county forests) and corporate/industrial ownerships.

Twenty-six percent of logging firms reported that they cleared land for residential or commercial development in 2003. Such practices are termed "terminal harvests" (Thorne and Sundquist 2001) and they are important from a timber supply perspective because they reflect a permanent or near-permanent change in land use away from productive timberland. Most of the firms (46%) conducting terminal harvests were based in northern Wisconsin.

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<sup>11</sup> ANOVA revealed statistically significant differences ( $F_{14,530} = 8.85$ , p-value < 0.0001) in the proportion of harvest volume obtained from family forests. Differences existed among sub-region ( $F_2 = 21.64$ , p-value < 0.0001), the type of harvesting system employed ( $F_4 = 10.73$ , p-value < 0.0001), and the interaction term sub-region\*harvesting system ( $F_8 = 4.70$ , p-value < 0.0001).

**Table 6.** Average firm stumpage supply (% of total harvest volume) by landownership group, type of harvesting system, and geographic sub-region, 2003.

Landownership Group	Harvesting System					All Firms
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	
Southern Wisconsin						
Private Woodlands	91	73	78	85	-	78
Industrial/Corporate	7	9	0	7	-	7
County Forests	2	15	22	0	-	13
State Forests	0	1	0	8	-	2
National Forests	0	0	0	0	-	0
Northern Wisconsin						
Private Woodlands	65	47	75	35	60	54
Industrial/Corporate	9	22	0	18	0	14
County Forests	16	20	24	32	15	19
State Forests	5	3	1	2	0	4
National Forests	4	8	0	12	25	6
All Wisconsin						
Private Woodlands	76	57	76	52	60	61
Industrial/Corporate	8	17	0	14	0	12
County Forests	10	18	23	21	15	17
State Forests	3	3	1	4	0	3
National Forests	3	5	0	8	25	4
Michigan Upper Peninsula						
Private Woodlands	72	61	34	53	-	56
Industrial/Corporate	8	13	36	18	-	23
County Forests	1	0	6	3	-	1
State Forests	9	14	24	15	-	14
National Forests	9	11	0	11	-	7
Entire Region						
Private Woodlands	73	53	49	48	70	60
Industrial/Corporate	8	18	29	16	3	15
County Forests	8	14	11	15	15	12
State Forests	6	8	4	11	5	7
National Forests	3	6	6	7	7	5

This is the same sub-region that has experienced substantial increases in housing density in recent decades. It appears that a small portion of the logging sector (5%) has focused their operations on this stumpage market, with terminal harvests accounting for 50% to 100% of their timber sales. In estimating the change in frequency of terminal harvest between 1998 and 2003, 42% of firms reported that the number of their terminal harvests had increased; 51% stated that it had remained the same; and only 7% of firms indicated a decrease in terminal harvests.

## BUSINESS ENVIRONMENT

### ► *Products & Markets*

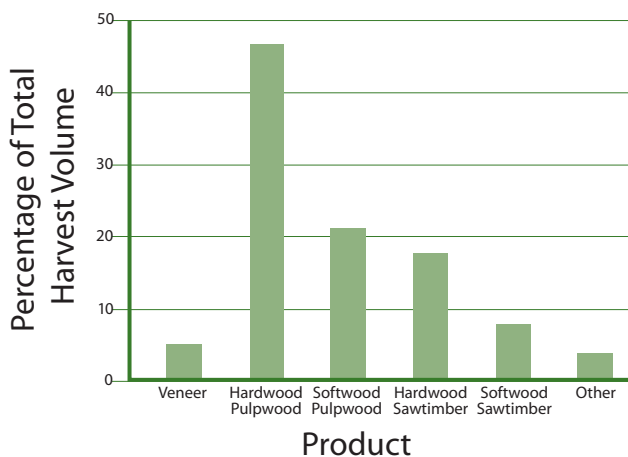
The region’s logging firms produce a diverse array of forest products; however, hardwood pulpwood was the leading output, accounting for 47% of average firm production in 2003 (Figure 12). The dominance of hardwood pulpwood is the result of the region’s substantial pulp and paper industry and an abundant hardwood forest resource. The logging sector functions as the link between the two, providing the essential raw material that the pulp and paper sector demands. Softwood pulpwood was the next largest product group, representing 21% of firm production. Thus, pulpwood is the major forest output of the region’s logging sector, totaling over two-thirds of annual firm output. Firms reported that, on average, one-quarter of their total production was sawtimber, consisting of hardwood sawlogs (18%) and softwood sawlogs (7%). Veneer comprised approximately 5% of firm output with other miscellaneous products such as firewood, posts, and poles, comprising the balance (3%).

Product mix varied significantly depending upon where the firm was located and the harvesting system(s) used.<sup>12</sup> In general, southern Wisconsin firms were characterized by a lower average proportion of pulpwood (54%) and a higher average proportion of sawtimber production (39%) compared to firms located in northern Wisconsin (pulpwood = 70%; sawtimber = 22%) and Michigan’s Upper Peninsula (pulpwood = 70%; sawtimber = 21%). Somewhat

surprisingly, all regions reported similar portions of veneer production (Upper Peninsula = 6%; southern Wisconsin = 5%; and northern Wisconsin = 4%).<sup>13</sup>

Chainsaw-based firms produced a significantly larger percentage of sawtimber (33%) and a significantly smaller percentage of pulpwood (49%) than their fully mechanized counterparts. This is particularly true in southern Wisconsin where the average chainsaw based firm reported that over two-thirds of their production (69%) was sawtimber and veneer. In contrast, the average sawtimber and veneer production of fully mechanized

**Figure 12. Average logging firm product mix (% of total output).**



<sup>12</sup> ANOVA revealed statistically significant differences in the proportions of pulpwood and sawtimber produced by the region’s logging firms (Pulpwood:  $F_{14,531} = 17.27$ , p-value < 0.0001; Sawtimber:  $F_{14,531} = 19.45$ , p-value < 0.0001). Differences existed among sub-region (Pulpwood:  $F_2 = 31.54$ , p-value < 0.0001; Sawtimber:  $F_2 = 53.27$ , p-value < 0.0001), the type of harvesting system employed (Pulpwood:  $F_4 = 22.32$ , p-value < 0.0001; Sawtimber:  $F_4 = 19.30$ , p-value < 0.0001), and the interaction term sub-region \* harvesting system (Pulpwood:  $F_8 = 11.17$ , p-value < 0.0001; Sawtimber:  $F_8 = 11.07$ , p-value < 0.0001).

<sup>13</sup> Although the difference in veneer production between northern Wisconsin and Upper Peninsula firms was small, just 2 percentage points, it was statistically significant.



**Table 7.** Average firm output (% of total harvest volume) by major product group, type of harvesting system, and geographic sub-region, 2003.

Product Group	Harvesting System					All Firms
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	
Southern Wisconsin						
Hardwood Pulpwood	18	37	44	46	70	30
Softwood Pulpwood	10	37	26	25	8	24
Hardwood Sawtimber	48	14	16	16	12	28
Softwood Sawtimber	12	9	8	10	2	11
Veneer	9	2	4	3	8	5
Northern Wisconsin						
Hardwood Pulpwood	46	51	44	48	55	48
Softwood Pulpwood	20	25	25	19	12	22
Hardwood Sawtimber	20	11	11	16	18	15
Softwood Sawtimber	7	8	6	6	5	7
Veneer	5	3	5	5	9	4
All Wisconsin						
Hardwood Pulpwood	36	46	44	48	58	42
Softwood Pulpwood	16	29	26	20	11	23
Hardwood Sawtimber	30	12	12	16	17	19
Softwood Sawtimber	9	8	7	7	4	8
Veneer	7	3	5	4	8	5
Michigan Upper Peninsula						
Hardwood Pulpwood	53	49	65	56	47	54
Softwood Pulpwood	13	24	9	23	13	16
Hardwood Sawtimber	18	11	16	11	15	15
Softwood Sawtimber	4	9	2	4	20	6
Veneer	6	5	7	2	5	6
Entire Region						
Hardwood Pulpwood	42	47	54	50	55	47
Softwood Pulpwood	15	28	17	21	12	21
Hardwood Sawtimber	26	12	14	15	16	18
Softwood Sawtimber	7	8	4	6	9	7
Veneer	6	3	6	4	7	5

operations located in the same sub-region varied between 25% and 29% of total firm output (Table 7). At the regional level, sawtimber and veneer production ranged from 23% for cut-to-length firms to 25% for firms employing multiple mechanized harvesting systems. Although mechanized harvesters and processors are quite versatile and highly productive, they are limited by the maximum tree size they can harvest. This is not the case for chainsaw operations. Moreover, chainsaw felling and processing lends itself to the production of high quality sawtimber where logs can be closely inspected and the highest grade products

extracted from each tree. When paired with cable skidding, chainsaw-based operations can work safely and productively on a variety of sites, including the rolling topography of southern Wisconsin where much of the sawtimber and veneer resource grows.

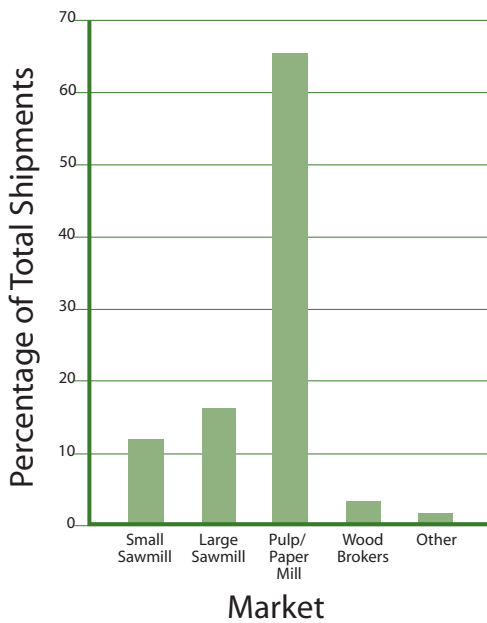
The region's wood markets were closely aligned to the products harvested. On average, logging firms delivered 65% of their output to pulp and/or integrated pulp and paper mills; 12% to small sawmills with annual production less than 5 million board feet per year; and 16% to large sawmills with annual production of 5 million board feet or greater (Figure 13). Wood brokers play a small role in the marketing of wood products as firms delivered only 4% of their total production, on average, to this market.

As was the case for the products harvested, markets varied depending on firm location and the harvesting system(s) employed.<sup>14</sup> Table 8 shows that southern Wisconsin firms and firms employing chainsaw-based harvesting systems relied more heavily on sawmills, particularly small mills, than fully mechanized firms or firms located in the northern parts

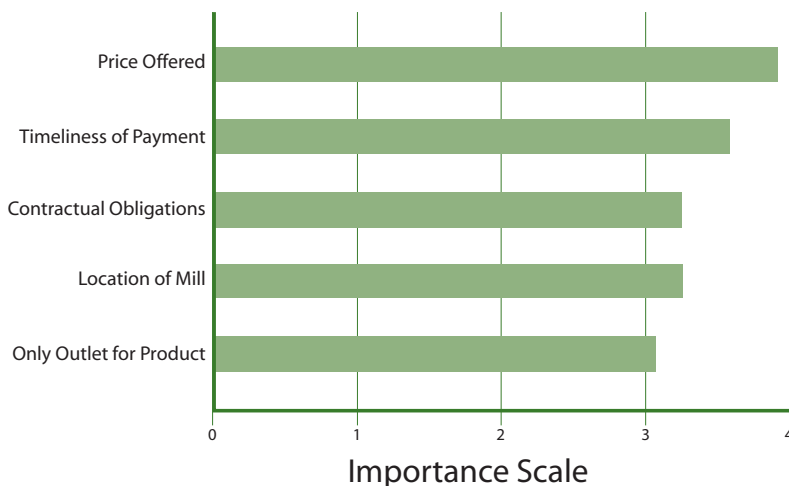
of the region. Northern firms and fully mechanized firms, in turn, were highly dependent on pulp and/or integrated pulp and paper mills as a market for their output, with shipments to pulp and paper-making facilities representing 69% to 78% of total firm production.

Respondents rated the relative importance of several market factors that provide insights on the marketing decisions of the region's logging firms (Figure 14). All factors were rated as being somewhat or very important in influencing firms' marketing decisions, but there were slight statistically significant differences among the

**Figure 13. Average firm wood markets (% of 2003 shipments).**



**Figure 14. Mean importance of factors affecting logging firm marketing decisions.**



<sup>14</sup> Markets varied significantly among the region's logging firms (Small sawmill:  $F_{14,521} = 3.90$ , p-value < 0.0001; Large sawmill:  $F_{14,521} = 6.06$ , p-value < 0.0001; Pulp or integrated pulp & paper mill:  $F_{14,521} = 18.84$ , p-value < 0.0001). Significant differences occurred among sub-regions (Small sawmill:  $F_2 = 10.22$ , p-value < 0.0001; Large sawmill:  $F_2 = 12.19$ , p-value < 0.0001; Pulp or integrated pulp & paper mill:  $F_2 = 38.83$ , p-value < 0.0001); harvesting systems (Small sawmill:  $F_4 = 6.83$ , p-value < 0.0001; Large sawmill:  $F_4 = 6.15$ , p-value < 0.0001; Pulp or integrated pulp & paper mill:  $F_4 = 29.31$ , p-value < 0.0001); and in some cases the interaction of sub-region \* harvesting system (Large sawmill:  $F_8 = 4.48$ , p-value < 0.0001; Pulp or integrated pulp & paper mill:  $F_8 = 8.60$ , p-value < 0.0001). There was no significant difference in the use of wood brokers among firms ( $F_{14,521} = 1.08$ , p-value = 0.3771).

**Table 8.** Average wood destination (% of total harvest volume) by market, type of harvesting system, and geographic sub-region, 2003.

Market	Harvesting System					All Firms
	Chainsaw Based	Cut-to-Length	Feller-Buncher	Multiple Systems	Other	
Southern Wisconsin						
Small Sawmill	27	13	17	7	20	19
Large Sawmill	39	13	12	18	0	25
Pulp or Integrated Mill	21	70	69	73	80	50
Wood Buyer	7	2	2	0	0	4
Other	5	1	0	2	0	3
Northern Wisconsin						
Small Sawmill	17	8	13	12	8	12
Large Sawmill	17	11	9	15	13	13
Pulp or Integrated Mill	62	78	76	72	69	71
Wood Buyer	4	3	2	2	6	3
Other	1	0	0	0	3	1
All Wisconsin						
Small Sawmill	20	10	14	11	11	14
Large Sawmill	25	12	10	15	10	17
Pulp or Integrated Mill	46	75	74	72	72	64
Wood Buyer	5	2	2	2	4	3
Other	3	1	0	0	2	1
Michigan Upper Peninsula						
Small Sawmill	13	8	7	4	5	9
Large Sawmill	15	17	11	18	30	15
Pulp or Integrated Mill	62	69	75	75	62	68
Wood Buyer	5	4	4	3	2	5
Other	5	1	3	0	0	3
Entire Region						
Small Sawmill	18	9	11	9	10	12
Large Sawmill	22	13	10	16	14	16
Pulp or Integrated Mill	52	73	75	73	70	65
Wood Buyer	5	3	3	2	7	4
Other	3	1	1	0	2	2

sub-regions.<sup>15</sup> Firms located in the Upper Peninsula assigned a greater importance to timeliness of payment than firms in northern Wisconsin. Additionally, northern Wisconsin firms thought mill location was statistically more important than firms from southern Wisconsin. Logging firms also identified the most important and second-most important factors they consider when selling their wood. The overwhelming majority of firms (72%) identified mill price as the single most important factor that influenced their marketing decisions. Contractual obligations followed with 12% of responses. Regarding the second-most important factor, responses were more evenly distributed; however, timeliness of payment was cited with the greatest frequency (34%) followed by mill location (25%). These rankings were consistent across all sub-regions and harvesting systems.

► *Profitability, Costs, & Key Economic Issues*

Firms rated their 2003 profitability using a 5-point scale that ranged from “Very Poor” to “Excellent,” with “Break even” as the mid-point. “Break even” was the most common response (37%) followed by “Good” (33%); an additional 1% of firms reported that their profitability was “Excellent” (Figure 15). Although it is encouraging that the majority of respondents reported break-even or better economic performance in 2003, more than one-quarter of

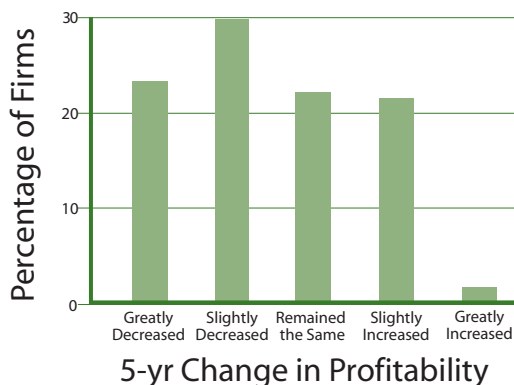
the region’s logging firms (28%) cited “Poor” or “Very Poor” profitability. This self-assessment of profitability suggests that one in four logging firms experienced difficult financial conditions in 2003. Further analyses revealed no clear patterns among sub-regions, harvesting systems, or firm sizes and profitability; that is, poor profitability was equally prevalent across all segments of the logging sector.

In comparing how firm profit margins had changed over the 5-year period 1998-2003, responses were more or less evenly distributed among the categories (Figure 16). The one exception being that only a few firms, less than 2% of respondents, thought their profit margins had increased greatly during the preceding 5 years. Forty-six percent of firms believed their profit margins had remained the same or increased while 54% believed they decreased. This response pattern was consistent across the region but it varied significantly depending on the type of harvesting system employed and firm size.<sup>16</sup> Specifically, fully mechanized firms were more likely to report declining profitability, whereas chainsaw-based firms generally reported stable or increasing profit margins during the same time period (Figure 17). In addition, profitability trends were strongly and negatively linked to firm size (Figure 18). That is, as size increased firms were more likely to report decreasing profit margins. One must be careful, however, not to read too much into this result. Numerous factors contribute to firm profitability and one should not infer direct causality between increasing firm size and declining profit margins.

**Figure 15. Logging firm’s assessment of their 2003 profitability.**



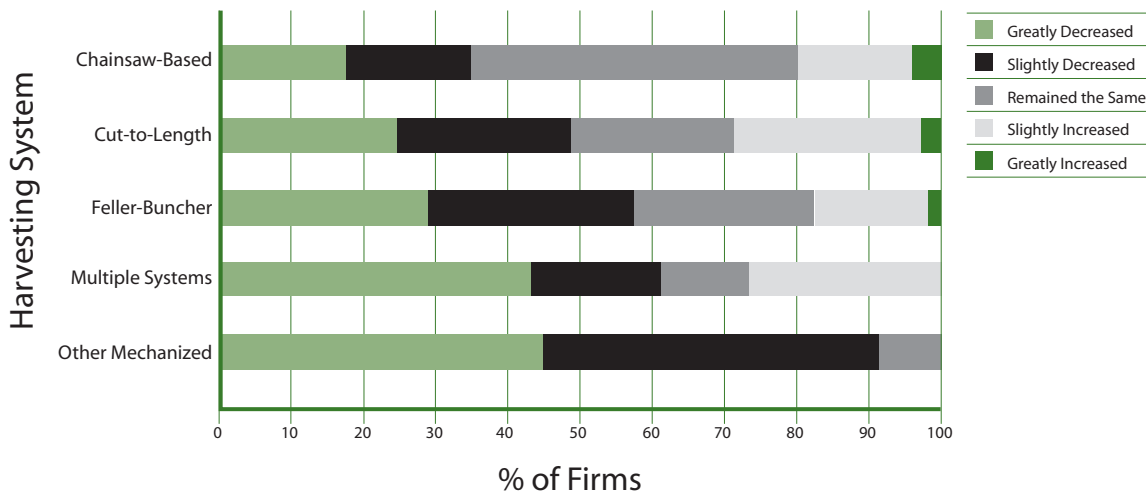
**Figure 16. Five-year change in firm profitability, 1998-2003.**



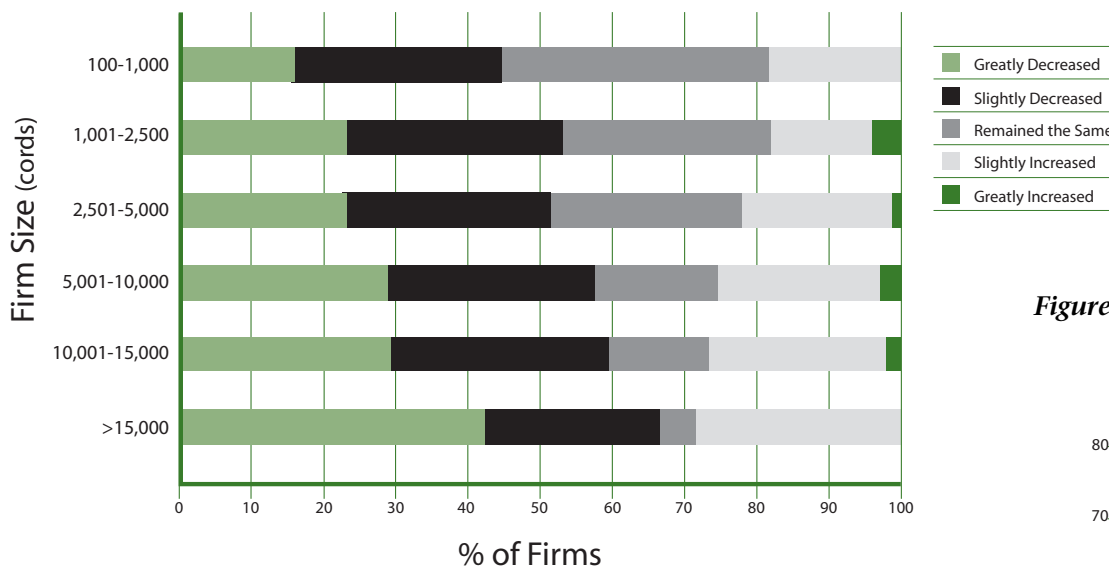
<sup>15</sup> Firms differed significantly among sub-regions in their assessment of the importance of mill location ( $F_{6,508} = 2.16$ , p-value = 0.0456) and timeliness of payment ( $F_{6,512} = 2.36$ , p-value = 0.0295) when deciding where to sell their wood.

<sup>16</sup> Profitability trends differed significantly among firms depending upon the harvesting system(s) employed ( $\chi^2 = 38.2$ , df = 16, and p-value = 0.0014) and firm size ( $\chi^2 = 38.4$ , df = 20, and p-value = 0.0079).

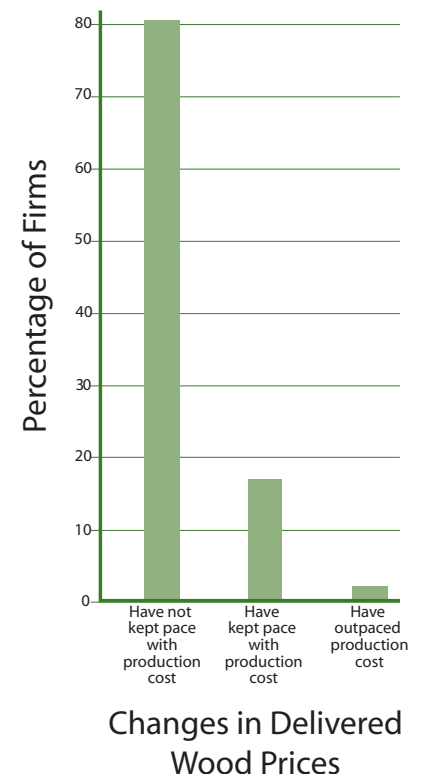
**Figure 17. Five-year change in firm profitability by type of harvesting system, 1998-2003.**



**Figure 18. Five-year change in firm profitability by firm size, 1998-2003.**



**Figure 19. Relative change in delivered wood prices over the 5-year period, 1998-2003.**



Exploring revenues and costs more closely, we found that 81% of firms stated that increases in delivered wood prices did not keep pace with increases in delivered wood costs over the previous 5 years (Figure 19). Delivered wood price (i.e., mill price) is the price the logger receives from the mill for delivering forest products to the mill gate. Delivered wood cost is the total production cost incurred by the logger and includes the costs of stumpage, timber harvesting and processing, and hauling of forest products to the mill. In comparison, 17% of firms thought mill prices did keep pace with costs and only 2% believed that mill price increases outpaced increases in production costs. Interestingly, there were significant differences among sub-regions:<sup>17</sup> a greater proportion of firms based in southern Wisconsin (24%) reported that delivered wood prices had kept pace with production costs. One possible explanation for this difference is that, proportionally, southern Wisconsin firms produce a greater volume of sawtimber. It is conceivable that delivered sawlog prices received by southern

<sup>17</sup> Perceptions of delivered wood price trends differed significantly among the sub-regions ( $\chi^2 = 12.9$ ,  $df = 4$ , and  $p$ -value = 0.0118).

Wisconsin firms more closely matched increasing production costs, whereas delivered pulpwood prices did not, or at least not to the same extent. Perceptions of mill price trends did not differ among firms employing different harvesting systems but they did differ based on firm size.<sup>18</sup> Although the majority of firms in every size class believed mill prices had not kept pace, a significantly larger proportion – 30% – of firms in our smallest size category (annual production less than 1,000 cords per year) believed mill prices matched production cost increases during the period 1998-2003.

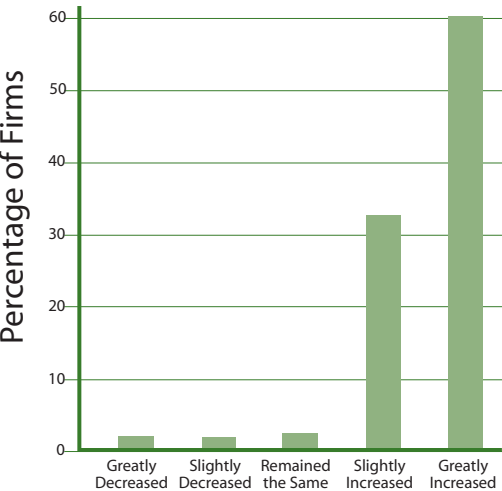
We must be careful interpreting this result. In economic terms, the logging sector approaches perfect competition in which no one firm has an influence on prevailing market price. Therefore, it is unlikely that small firms received a higher price for their delivered wood than larger operations. What is more probable is that small firms did not experience the same magnitude of harvesting cost increases as larger firms. Indeed, subsequent analyses support this interpretation: 61% of the region’s logging firms indicated that their delivered wood costs had increased greatly, and another 33% of firms reported a slight increase in costs (Figure 20). Only 4% of firms cited a decrease in logging costs during the previous five years. This view was consistent among sub-regions; however, it varied significantly depending on the harvesting system the firm employed and its annual production.<sup>19</sup> Once again, most firms reported an increase in logging costs, irrespective of the harvesting system used or their size. However, a significantly greater proportion of small firms and chainsaw-based firms reported that their costs had remained the same, compared to their counterparts.

Respondents rated the importance of 11 factors that could affect the profitability of their logging business (Figure 21). All factors were identified as being somewhat to very important. Respondents identified mill prices and stumpage prices as being very important to firm profitability as both factors attained the same average score, 3.9. Equipment maintenance,

fuel prices, and stumpage availability were rated slightly lower, having an average score of 3.8. Less important were labor and wages, equipment replacement, worker’s compensation, and regulations with scores for these factors ranging from 3.2 for regulations to 3.5 for labor and wages – closer in value to the somewhat important category. Lastly, employee benefits and logger training received the same average importance scores of 2.9, the lowest among all factors.

Respondents also identified the two factors that were most important to remaining profitable. Thirty-one percent of respondents identified stumpage prices as the single most important factor; 30% identified mill prices; and 12% identified stumpage availability (Figure 22). None of the remaining factors represented more than 6% of the respondents’ responses. Regarding the second-most important factor, once again stumpage prices, mill prices, and stumpage availability figured prominently, obtaining 28%, 22%, and 16% of the respondents’ votes, respectively. The relative importance of stumpage prices and mill prices was consistent across all sub-regions, harvesting systems, and firm sizes. However, there was a

**Figure 20. Five-year change in wood production costs, 1998-2003.**

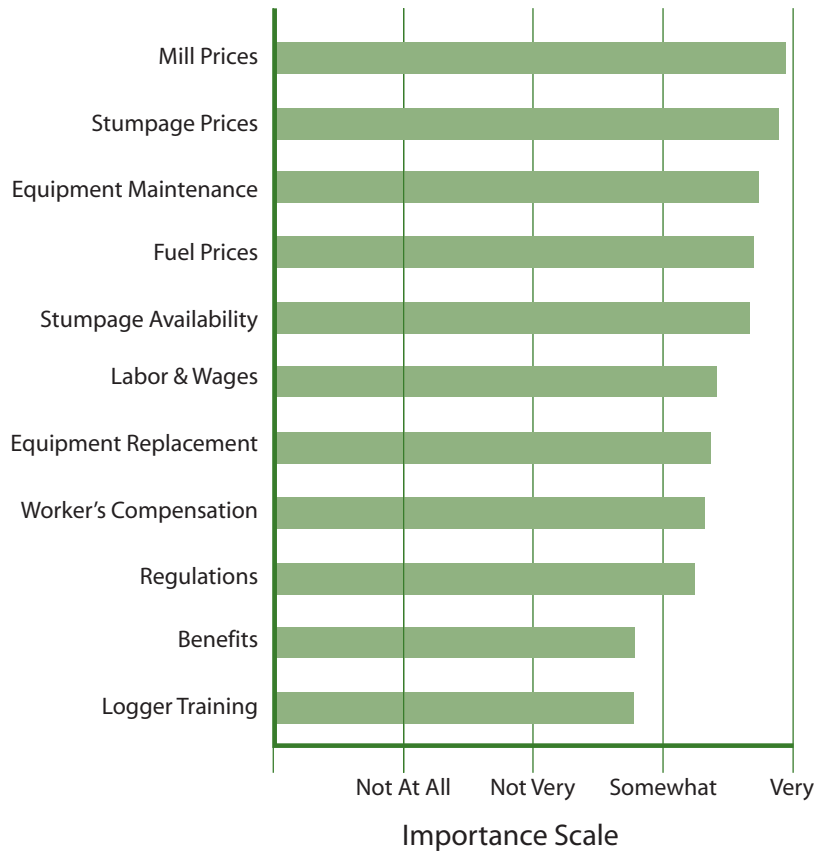


Change in Wood Production Costs

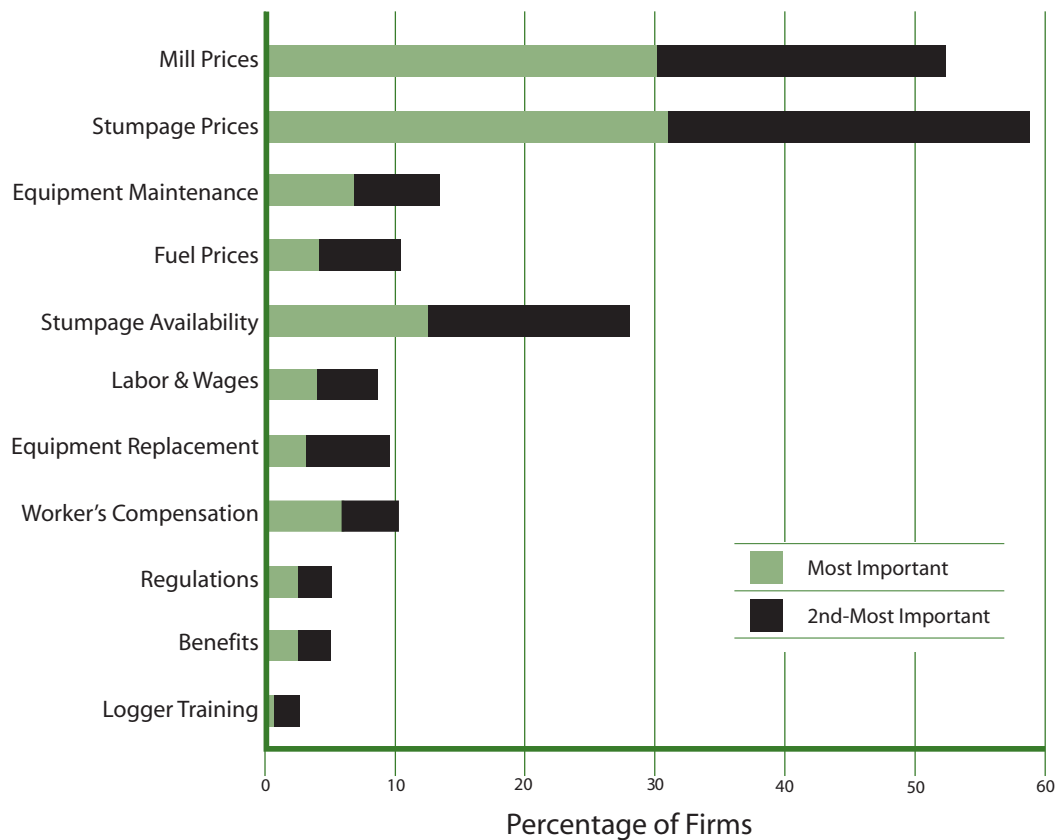
<sup>18</sup> Perceptions of delivered wood price trends also varied significantly among firm size classes ( $\chi^2 = 25.5$ ,  $df = 10$ , and  $p$ -value = 0.0044).

<sup>19</sup> Five-year cost trends differed significantly among firms depending upon the harvesting system(s) employed ( $\chi^2 = 36.4$ ,  $df = 16$ , and  $p$ -value = 0.0025) and firm size ( $\chi^2 = 70.9$ ,  $df = 20$ , and  $p$ -value < 0.0001).

**Figure 21. Factors influencing logging firm profitability and their relative importance.**



**Figure 22. Logging firm ratings of key profitability factors.**



difference in the ranking of stumpage availability among sub-regions.<sup>20</sup> Namely, firms located in southern Wisconsin identified worker's compensation issues more often than stumpage availability concerning impacts on profitability.

From the logger's perspective, efforts to improve the financial health of the regional logging sector must focus on stumpage prices, mill prices, stumpage availability and, to a lesser extent, worker's compensation. The pressing question is, "What can be done?" Stumpage prices and mill prices are determined in a market environment. Although basic economic theory says that stumpage prices should drop with an increase in supply, increasing timber supply from a landscape dominated by small, private, and increasingly parcelized woodlands presents a formidable challenge. Regarding mill prices, pulpwood is the leading forest product and the region's pulp and paper mills compete in national and international markets. Any competitive advantage they enjoy is based in part on relatively inexpensive wood fiber. Thus, there is a financial limit that pulp and paper mills can pay for wood.

Modifying worker's compensation rules and rates does present a credible opportunity to improve firm profitability. However, the impact of any changes may not be uniform across the sector or region. Nearly two-thirds (64%) of all firms were fully mechanized and 62% reported having no employees. In addition, only firms located in southern Wisconsin identified worker's compensation as an important profitability issue. Therefore changes to worker's compensation may have uneven impacts within the sector. This is not to suggest that worker's compensation changes should not be pursued; rather, policy makers need to be aware of the potential for variable impacts on the region's logging firms.

Of the 11 factors impacting profitability, only five – equipment maintenance, labor and wages, equipment replacement, employee benefits, and logger training – fall under the firm owner's direct control. The remaining six are external factors over which the logger has no influence. With the exception of equipment maintenance, loggers reported that these "controllable" factors have a significantly smaller impact on firm profitability. Thus, logging firm owners perceive their position as one where they have no control over the price they receive for their product and only limited control over their costs. As shall be seen in the next section, this financial situation may contribute to a somewhat pessimistic outlook for the sector.

#### ► *Firm retention*

Twenty-three percent of the region's logging firms stated they did not expect to be in business in five years with no significant differences by sub-regions, harvesting systems, or firm size. While one should be careful interpreting survey responses pertaining to future intentions (as opposed to actual behaviors), the fact that nearly one in four firms expects to leave the sector is cause for serious concern. It suggests the general sector contraction that started several years ago could quite possibly continue in the near term. The annual production of these "departing" firms totaled more than 600,000 cords, or approximately the capacity of one major pulp and paper facility. Although these departures represent a large potential drop in timber harvesting capacity, the ultimate impact on timber supply is unclear as their lost production could be absorbed by the excess capacity of remaining logging firms and/or the entry of new firms to the sector. Nonetheless, these potential departures merit further discussion.

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<sup>20</sup> The distribution of important factors differed significantly among firms depending upon the region in which they were located ( $\chi^2 = 61.0$ ,  $df = 22$ , and  $p\text{-value} < 0.0001$ ).



Nearly three-quarters (74%) of “departing” firms cited economic pressures as the reason for their exit. Thus, the financial difficulties discussed in the previous section appear to be real, with potentially real consequences. The regional logging sector is financially pinched between increasing timber harvesting costs (including stumpage) and mill prices that have not kept pace in the short term. This financial environment is not economically sustainable for a sizable component of the sector. The balance of departing firms – 26% – reported they were exiting because of the imminent retirement of the firm owner or health-related issues. As was presented earlier in this report, 23% of firm owners were 55 years or older. The departure of this senior cohort is not unusual or unexpected. All business sectors are dynamic. However, the general financial condition of the logging industry, coupled with a graying of firm owners and apparent limited recruitment, raises concerns about the future structure and health of the sector which, in turn, could impact the large forest products industry which it supports.

Historically, the departure of logging firms has been offset by productivity increases attained through the adoption of new harvesting technologies. But with 64% of logging firms already fully mechanized and the balance of firms somewhat constrained in their ability to mechanize because of terrain or timber characteristics, it remains to be seen what future productivity gains can be achieved.



A. Jeff Martin

## SUMMARY, CONCLUSIONS, & POLICY IMPLICATIONS

This study provides the first comprehensive look at the logging sector operating in Wisconsin and Michigan's Upper Peninsula. From our investigations, we found a complex and dynamic sector that links an extensive and diverse forest resource to an equally extensive and diverse wood products industry. Spatially, the regional logging sector has two distinct components. In southern Wisconsin, logging firms are typically chainsaw-based operations characterized by relatively low annual production and low capital investment. Consistent with forest ownership patterns, private woodlands are, by far, the dominant source of stumpage supply. Firm production is typically distributed across many small timber sales, with sawtimber comprising a relatively larger proportion of the product mix. In contrast, logging firms operating in northern Wisconsin and Michigan's Upper Peninsula are more likely to use mechanized harvesting systems that are highly productive, but require high capital investment. Private woodlands still remain the primary source of stumpage in the north, but industrial, corporate, and public forests contribute a sizeable portion of timber as well. Pulpwood is the dominant product removed and marketed. We conclude with a discussion of the three primary challenges we see facing the logging sector in the near term: accessing small woodland, global markets, and internal dynamics.

### ACCESSING SMALL WOODLANDS

Logging firms harvest 60 percent of the region's timber from private woodlands. The last three decades have seen considerable change in woodland ownership and in the objectives and motivations of woodland owners. Considerably more people own forestland today than in the past, with only a slight increase in the total land area of private woodlands. To accommodate new owners, widespread parcelization has and continues to occur. The potential consequences of these changes are considerable. Past studies have shown that small private woodlands are less likely to be actively managed than large ones (Thompson and Jones 1981; Romm et al. 1987). Along with operational scale constraints, small ownerships may offer their owners fewer resource management options due to the limited area on which to pursue multiple objectives. Because timber production and income are rarely high priorities among woodland owners, future timber sales on small woodlands may be less intensive and may yield less timber per acre than in the past. This may be particularly true for the cohort of relatively affluent woodland owners from urban areas who are increasingly purchasing woodlands as recreational or retirement properties.

Logging firms have developed a mix of strategies to be competitive in a forest landscape comprised of variable parcel sizes and diverse ownerships. The data presented here and related studies suggest that one strategy has been a division or partitioning of the stumpage market within the region's logging sector (Rickenbach and Steele In press). It appears that logging firm owners deliberately structure their business to target a specific stumpage source. Public and corporate/industrial timber sales are typically larger than those found on private woodlands in terms of sale area and volume. As such, they offer scale economies that are attractive to highly productive, mechanized harvesting systems. In contrast, timber sales on private woodlands are usually smaller and may confer a competitive advantage to chainsaw-based firms that generally operate with lower fixed harvesting costs.

One implication of increased stumpage supply specialization and, by extension, increased diversity of logging firms, is the potential for forest management and policy decisions to differentially impact firms within the logging sector. For example, efforts to increase the supply of timber from private woodlands would likely affect all segments of the logging sector; however, firms located in southern Wisconsin and chainsaw-based firms could be expected to feel the largest impact given their considerable dependence on this ownership. Similarly, changes in forest policy or management practices on public lands would differentially impact northern logging firms, particularly fully mechanized operations. Thus, resource managers and decision-makers should be aware that the practices, programs, and policies they implement could impact segments of the logging sector differently, imparting advantages to some firms and disadvantages to others.

Logging firm specialization may help alleviate some small-scale issues, but the sector's overwhelming reliance on private woodlands for stumpage implies that broader solutions may be required. In 1997, 28 percent of Wisconsin private woodlands and 14 percent in the Upper Peninsula were in ownerships of 50 acres or smaller (Leatherberry et al. 1998; Leatherberry 1999). These percentages are increasing: national studies predict an average private woodland ownership size of 17 acres by the year 2010 (Sampson and DeCoster 2000). Accessing relatively small timber sales on these properties in a manner that is economically feasible may require some form of timber sale aggregation and/or coordination. In such situations, several nearby timber sales spanning multiple ownerships could be co-established and coordinated to occur at the same time. The advantage of an aggregated and coordinated approach is threefold: First, it facilitates the implementation of needed forest management prescriptions on small ownerships. Second, it provides adequate timber volume to attract interested bidders. And third, it decreases a key cost to logging firms: the cost of moving equipment.

Woodland owners are exploring different organizations such as landowner associations and cooperatives that might accomplish aggregation, but widespread participation in these or similar organizations is unlikely in the short term. More important will be the further adoption of aggregation by consulting and industrial foresters and by individual loggers themselves. Recent data indicate that consulting and industrial foresters aggregate timber sales, but the practice is uncommon and the scale is relatively small (Rickenbach and Jahnke In press). To foster such aggregation, we recommend there be continued experimentation and evaluation as aggregation can both reduce logging costs and increase forest management activity on small private woodlands.

## GLOBAL MARKETS

Another key issue facing the logging sector is continued change in wood markets. Consolidation of the pulp and paper sector into fewer, more global firms; regional mill closures; timber company divestitures of large forest holdings to land investment and management organizations; meaningful competition from emerging economies; and various international trade agreements have created much uncertainty within the wood products industry. While loggers often and proudly describe themselves as "independent", the factors that influence their ability to profitably sell the products they harvest are increasingly determined beyond their control and, in many cases, beyond the control of the mills they sell to.

As a case in point, extensive divestitures of timberland have led some mills to play a more active role in stumpage markets, particularly on public ownerships. Hence, mills are increasing their reliance on contract logging where loggers are hired simply to harvest trees. This, in turn, has intensified competition for stumpage in some markets and for some species; but it has also created new opportunities for contract logging. Similarly, the emergence of land investment and management organizations and timber procurement companies, (i.e., firms that provide management services to and purchase stumpage from woodland owners) has increased stumpage competition and led to additional logger contracting.

Collectively, these marketplace changes are altering the traditional role of the independent logger. Historically, logging firms purchased stumpage, processed standing timber, and marketed the products produced. However, in a contract setting, the firm's role is to get raw forest products from the stump to the mill with reduced opportunities for marketing and manufacture of value added products. This represents a considerably different business model in which greater focus is placed on commodity production, harvesting efficiency, and cost minimization. Although the amount of contract logging has increased in recent years, it remains to be seen whether it will become the new business model for many of the region's logging firms. Overall, such marketplace uncertainty defines the new operating environment for logging firms and all participants in the wood products sector.

#### INTERNAL DYNAMICS

Amid this backdrop of a changing forest resource and a changing marketplace, is a changing logging sector. The sector is mature, with nearly one quarter of firm owners at or within 10 years of retirement age. In contrast, there are relatively few new logging firms entering the profession. This raises important questions about the future size, structure, and capacity of the logging sector, particularly when one considers that one in four logging firms believed they would not be in business within five years. Historically, adoption of highly productive, fully mechanized harvesting systems has offset reductions in the logging workforce; however, it is unclear what future opportunities exist for further technology adoption. Moreover, a "technological fix" does not address one of the most pressing challenges to firm profitability identified by loggers: stumpage availability. Thus, internal sector dynamics combined with a changing resource and a changing marketplace, place the region's logging sector an important juncture.

Specific recommendations do not emerge from our survey but the success of the region's logging firms will ultimately depend on their ability to meet the time-sensitive requirements of wood products firms. This suggests the need for two things. First, logging firms and mills will need greater collaboration, not less, to meet downstream product demands. Second is the need to improve the collective knowledge regarding available stumpage – particularly from private woodlands. Wisconsin's Managed Forest Law program (MFL) provides a useful model in that the recommended and mandatory practices are documented for all program participants. The MFL and other direct public and private assistance programs can help mills, foresters, and loggers focus procurement efforts on those owners with harvest intentions. However, these programs are often expensive and have limited participation (e.g., nearly 29,000 woodland owners, 17% of those eligible, are enrolled in the MFL).

Clearly, there is a need to re-evaluate the status of the region's logging sector on a periodic basis to establish trends that can more clearly guide resource professionals and key decision-makers. Such studies are common for the forest resource, the wood products industry, and private woodland owners. However, this has not been the case for professional loggers. Yet the logging sector intersects all three in that loggers are directly responsible for implementing forestry practices on the ground, supplying wood-based industries with raw materials, and helping woodland owners achieve their land management goals. Hence, loggers have an important experience and perspective that should inform the practice and policy of forestry.

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# APPENDIX – SURVEY QUESTIONNAIRE

## Timber Supply

We would like to begin the questionnaire with some questions about the timber you produce. In answering these questions, please provide your **best estimates**. Please either mark your responses with an “X” or write in your answers where appropriate. Remember, all of your answers will remain strictly confidential.

**1. Do you own or manage an independent logging business?**

- Yes; please complete this survey.
- No; you do not have to complete this survey, but we would welcome your comments on the logging industry. Please use the comment box on the outside back cover for your comments.

**2. When looking back at the last 5 years, would you say the timber volume you harvested has increased, decreased, or remained the same?**

- Greatly increased
- Slightly increased
- Remained the same
- Slightly decreased
- Greatly decreased

**3. When looking back at the last 5 years, would you say the number of sales you harvested has increased, decreased, or remained the same?**

- Greatly increased
- Slightly increased
- Remained the same
- Slightly decreased
- Greatly decreased

**4. Using your best estimate, how much timber volume did you harvest in 2003?**

**Please use the units that best fit your recollection. For example, “10,000 cords and 20 thousand board feet.”**

- a.  Cords
- b.  Thousand board feet (MBF)
- c.  Tons
- d.  Other unit (please specify)

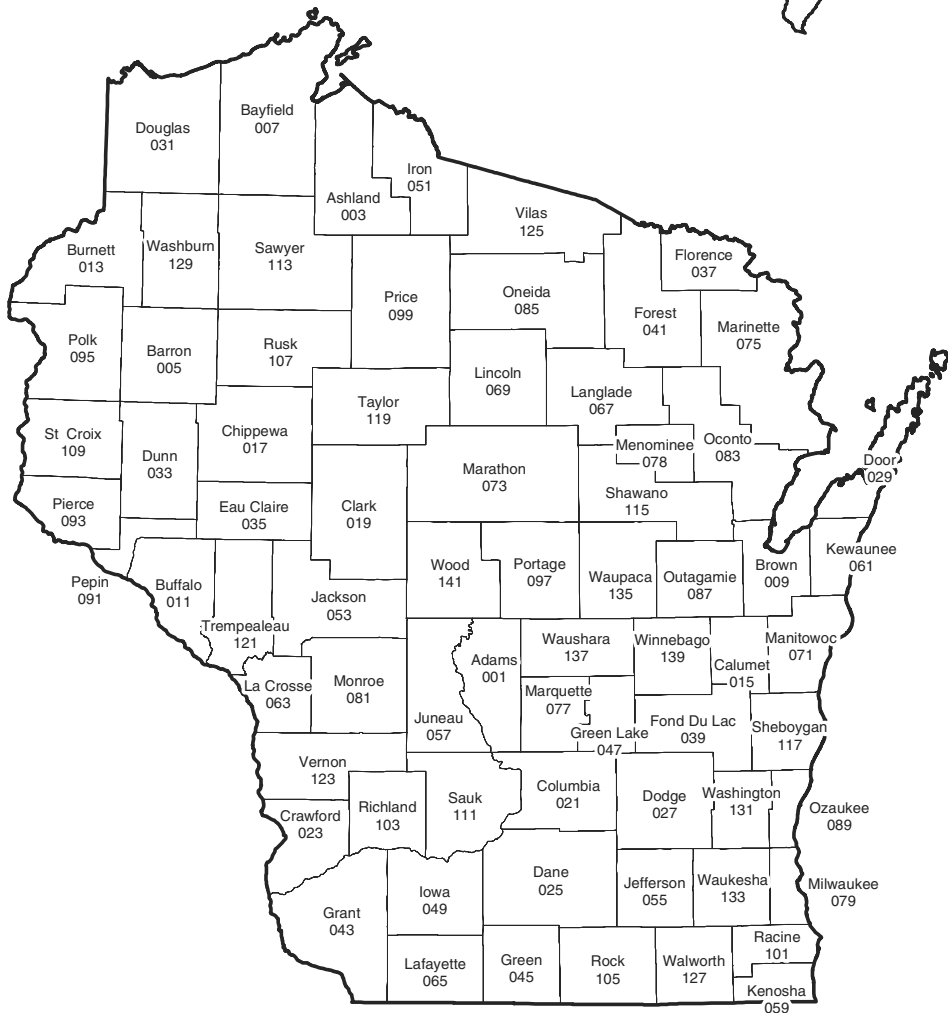
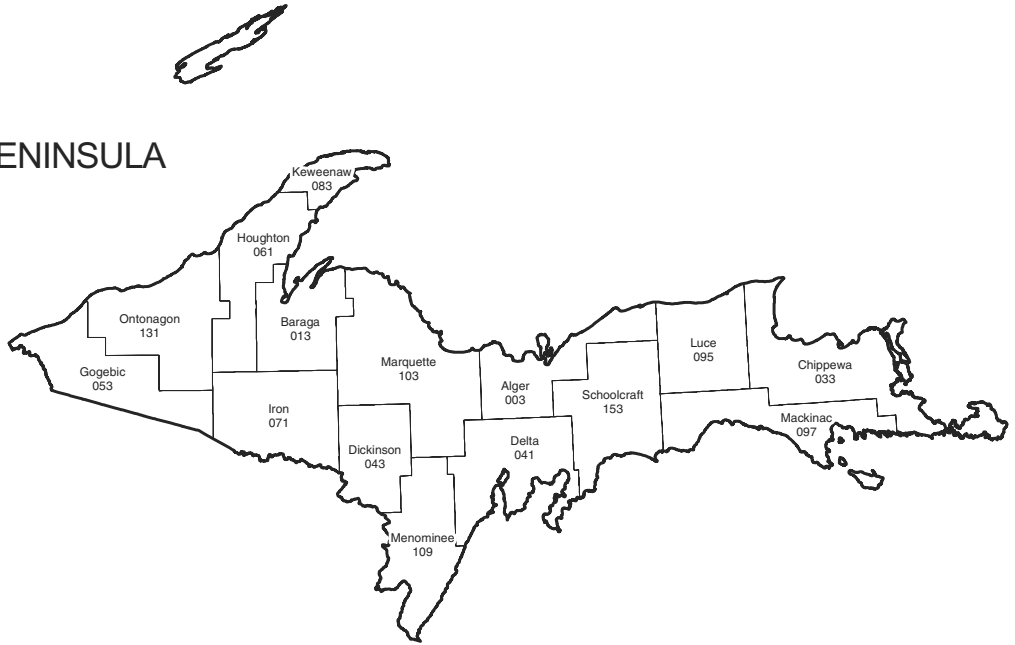
**5. How many individual timber sales did you complete or partially complete in 2003?**

- a. Completed
- b. Partially Completed

6. On the map below, please CIRCLE each of the names of the counties where you cut most of your timber in 2003. If this includes timber cut in other states, please list them below.

6a. Other states (please specify):

## MICHIGAN-UPPER PENINSULA



## WISCONSIN

**7a. Of your 2003 logging operations, how many were in each of the following acreage categories?**

**7b. Also, how many of the sales in each acreage category would you rate as profitable?**

	7a. Total number of sales	7b. Total number of sales that were profitable
0-5 acres		
6-10 acres		
11-20 acres		
21-40 acres		
41-80 acres		
81-160 acres		
161 acres or more		

**8. Did you harvest any timber in 2003 on land being cleared for residential or commercial development purposes?**

- Yes  
 No (skip to Q9)

→ **8a. If yes, how many sales did you complete or partially complete for development purposes?**

\_\_\_\_\_

**9. When looking back at the last 5 years, has the number of sales you completed or partially completed to clear land for residential or commercial development increased, decreased, or remained the same?**

- Greatly increased  
 Slightly increased  
 Remained the same  
 Slightly decreased  
 Greatly decreased

**10. What percentage of your 2003 harvest volume came from the following ownership categories? (If none, please write in "0." These should total 100%.)**

	Ownership Category	% Harvested
a.	Private woodlands	
b.	Industrial or corporate owned forests	
c.	National forests	
d.	State forests	
e.	County forests	
f.	Tribal forests	
g.	Other (please specify):	
	<b>TOTAL</b>	<b>100%</b>

**11a-11b. What percentage of your 1998 and 2003 harvest volume was obtained via clearcutting or partial cutting/thinning? (If none, write in "0." These should total 100%.)**

		11a. % of Harvest Volume in 2003	11b. % Harvest Volume in 1998 (5 years ago)
a.	Clear-cut		
b.	Partial/thinning cuts		
	<b>TOTAL</b>	<b>100%</b>	<b>100%</b>



**12. What percentage of your 2003 harvest volume was allocated to the following product categories? (If none, write in "0." These should total 100%).**

	Product Category	% 2003 Harvest Volume
a.	Veneer	
b.	Hardwood pulp	
c.	Hardwood sawtimber	
d.	Softwood pulp	
e.	Softwood sawtimber	
f.	Other (please specify):	
	TOTAL	100%




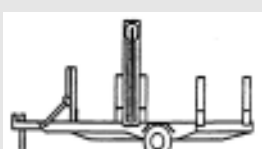

**13. What percentage of your 2003 harvest volume did you deliver to the following types of mills? (If none, write "0." These should total 100%).**

	Mill Type	% Delivered in 2003
a.	Small sawmill (produces less than 5 million board feet per year)	
b.	Large sawmill (produces 5 million board feet per year or more)	
c.	Pulp or Paper Mills	
d.	Log Buyers	
e.	Other (please specify):	
	TOTAL	100%

## Nature of Business

*The next set of questions is about the nature of your business in terms of your harvest systems and personnel.*

**14. How many of the following pieces of equipment do you actively use in felling and processing timber? (If none, write "0." Do NOT include older pieces of machinery that are non-operational or only used for parts.)**

		#
a.	Chainsaws <i>(no image)</i>	<input type="text"/>
b.	Feller-bunchers 	<input type="text"/>
c.	Harvesters 	<input type="text"/>
d.	Delimbers 	<input type="text"/>
e.	Slashers 	<input type="text"/>
f.	Chippers 	<input type="text"/>
h.	Other (please specify): _____	<input type="text"/>

15. How many of the following pieces of equipment do you actively use in off-road transport? (If none, write "0." Do NOT include older pieces of machinery that are non-operational or only used for parts.)

#

a. Cable Skidders




b. Grapple Skidders




c. Forwarders




d. Loaders

(no image)

e. Other  
(please specify):

16. How much capital is invested in this logging business?

\$

17. What percentage of that capital is invested in harvesting equipment?

%

18. During 2003, what volume could you have produced working at full capacity? Please use the units that best fit your recollection. For example, "10,000 cords and 20 thousand board feet."

- a.  Cords
- b.  Thousand board feet (MBF)
- c.  Tons
- d.  Don't Know

19. What volume of wood do you need to produce annually to break even financially? This should include paying yourself.

- a.  Cords
- b.  Thousand board feet (MBF)
- c.  Tons
- d.  Don't Know

20. How would you rate your company's profitability in 2003?

- Very poor
- Poor
- Average (broke even)
- Good
- Excellent

21. In the last 5 years, have your profit margins:

- Greatly increased
- Slightly increased
- Remained the same
- Slightly decreased
- Greatly decreased

**22. Which statement best reflects the general trend in delivered wood prices over the past 5 years? (Mark only one answer.)**

- Delivered wood prices have **outpaced** production costs.
- Delivered wood prices have **kept pace** with production costs.
- Delivered wood prices have **not kept pace** with production costs.

**23. In the last 5 years, have your costs...**

- Greatly increased
- Slightly increased
- Remained the same
- Slightly decreased
- Greatly decreased

**24. Below are a list of factors that might affect the profitability in the logging industry. Please circle the number that indicates how important each is to your business.**

		Not Important at all	Not very Important	Somewhat Important	Very Important	Not Applicable
a.	Benefits (not including workman's compensation)	1	2	3	4	7
b.	Equipment Maintenance	1	2	3	4	7
c.	Equipment Replacement	1	2	3	4	7
d.	Fuel Prices	1	2	3	4	7
e.	Labor and Wages	1	2	3	4	7
f.	Logger Training	1	2	3	4	7
g.	Mill Prices	1	2	3	4	7
h.	Regulatory	1	2	3	4	7
i.	Stumpage Availability	1	2	3	4	7
j.	Stumpage Prices	1	2	3	4	7
k.	Worker's Compensation	1	2	3	4	7
l.	Other (please specify):	1	2	3	4	7

**25a-25b. Which of the factors in Question 24 above is the most important and second most important factor in remaining profitable? (Insert letter).**

a. Most important

b. Second most Important

**26. Below is a list of factors that might affect to whom logs are sold. Please circle the number that indicates how important each is to your decision in selecting to whom you sell your wood.**

		Not at all Important	Not very Important	Somewhat Important	Very Important	Not Applicable
a.	Contractual obligations	1	2	3	4	7
b.	Location of mill	1	2	3	4	7
c.	Only outlet for product	1	2	3	4	7
d.	Price offered	1	2	3	4	7
e.	Timeliness of payment	1	2	3	4	7
f.	Other (please specify):	1	2	3	4	7

**27a-27b. Which of the factors in question 26 above is the most important and second most important factors in whom you decide to sell your wood? (Insert letter).**

a. Most important

b. Second most important

**28. Do you employ workers?**

- Yes  
 No (skip to Q31 on next page)

→ **28a. How many workers does your company employ?**

		Full time	Part time
a.	Woods workers		
b.	Truck drivers		
c.	Procurement		
d.	Mechanics		
e.	Office and clerical		
f.	Supervisor/ manager/owner		
g.	Landowner assistance forester		

**29. A family business is one in which the family plays a central role in the leadership and daily workings of the business and includes at least two family members. Based on this definition, is your company a family business?**

- Yes
- No (skip to Q30)

→ **29a. Will future generations (e.g. son, daughter, niece, nephew) of the owner's family take over the business?**

- Very unlikely
- Somewhat unlikely
- Somewhat likely
- Very likely
- No heirs
- Don't know

**30. For each of the following employment related statements, please indicate the degree to which you agree or disagree by circling the number that corresponds to the response that best applies.**

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a.	Reliable workers are hard to find.	1	2	3	4	5
b.	Skilled workers are hard to find.	1	2	3	4	5
c.	Worker turnover is high in my company.	1	2	3	4	5

**31. Do you expect to be in the logging business in 5 years?**

- Yes (skip to Q32 on next page)
- No; Please explain why in the box below.



**32. Please think about what logging will look like in 5 years. For each statement, please circle the number that best describes your opinion.**

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a.	There will be fewer, but larger, logging contractors.	1	2	3	4	5
b.	There will be more subcontracting, with no employees.	1	2	3	4	5
c.	There will be much less logging in my area because of urban sprawl.	1	2	3	4	5
d.	Logging will be more mechanized.	1	2	3	4	5
e.	Logging practices will be more regulated.	1	2	3	4	5
f.	Logging will be pretty much like it is now.	1	2	3	4	5
g.	More woodlots will be harvested for residential or commercial development.	1	2	3	4	5
h.	More "low impact" logging equipment will be used.	1	2	3	4	5
i.	Logging parcel sizes will be smaller.	1	2	3	4	5
j.	Loggers will have to travel further for good logging chances.	1	2	3	4	5
k.	Stumpage prices will increase.	1	2	3	4	5
l.	Mill prices will increase.	1	2	3	4	5
m.	We will face greater competition from outside the United States.	1	2	3	4	5

## Demographics

**33. Are you the owner?**

- Yes  
 No (go to Q33a)

**33a. If no, what is your role?**

**33b. What is your age?**

Years old

**33c. What is the age of the owner(s)?**

Years old

**34. What is your age?**

Years old

**35. What percentage does logging contribute to your household income?**

- 0-25%  
 26-50%  
 51-75%  
 Over 75%

**36. How many years have you been in the logging industry?**

Years

**37. How many years has this company been in operation?**

Years

**38. Are you....**

- Male  
 Female

**39. Would you describe yourself as:**

- White (non-Hispanic)  
 Black or African American  
 Hispanic or Latin American-origin  
 Asian or Asian American  
 Native American  
 Other (please specify)

**40. Would you be interested in participating in a follow-up personal interview in the summer or fall of 2004 to help us better understand your state's logging sector?**

- Yes  
 No → *Please skip to last page.*

**40a. If yes, please provide contact information and the best time/way to reach you.**

Name

---

Address

---

City

---

State

---

Zip code

---

Phone number

---

FAX number

---

E-mail

---

Best time/way to reach you

---



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## Status of the Logging Sector in Wisconsin and Michigan's Upper Peninsula 2003

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