

Evaluating logger certification attitudes and preferences: A Minnesota case study

Michael A. Kilgore
Jessica E. Leahy
Jacob S. Donnay
Calder M. Hibbard
Charles R. Blinn

Abstract

Performance-based logger certification is a relatively new concept in the United States. Under such a program, a logging business is certified after its timber harvesting and business practices are judged by an independent, third-party reviewer as meeting or exceeding specific performance standards. A study of Minnesota loggers was conducted to develop a better understanding of their attitudes toward and perspectives on logger certification. The survey revealed that the state's loggers were quite knowledgeable about logger certification. Loggers indicated higher timber prices, access to new markets for their timber, and easier access to private land timber were important outcomes of being certified. Yet, they perceived that instead of realizing these economic benefits, being a certified logger would likely result in more recordkeeping, greater restrictions on logging practices, and additional required training. Loggers described the most preferred certification program as one that was administered by a state logger education association, used only state-based auditing standards and auditing personnel, and removed a logger's certification status only after repeated failure of logging audits. While fewer than one of four loggers felt a logger certification program was needed, nearly three-fourths indicated they were likely to certify their business if a program was available. Loggers likely to certify their business had no greater familiarity with the concept of logger certification than did those loggers who were unlikely to certify their business. This study suggests design considerations for logger certification programs in Minnesota and other states.

The development of systems to certify forest management and timber harvesting practices is arguably one of the most influential global forest management trends of the past decade. These systems are intended to document the use of land management practices to conserve forests for their environmental, economic, and social benefits against predetermined standards. Most forestland certification systems in the United States (e.g., Forest Stewardship Council, Sustainable Forestry Initiative certification systems) have been designed for owners with large holdings (Vlosky and Granskog 2003). Consequently, the vast majority of the nation's approximately 65 million acres of third-party certified forests (13 percent of all timberland) are owned by large corporate entities and, to a lesser degree, state and county governments and universities (Vogt et al. 2000, Smith et al. 2001, Cabbage et al. 2003, Sample et al. 2003).

Performance-based logger certification has the potential to address a substantial challenge in the United States, namely

widespread certification of sustainable timber harvesting practices on private, non-corporate forests (i.e., family forests). Although this group of forestland owners controls 58 percent of the timberland, the amount of certified family forestland in the United States is very low (Smith et al. 2001, Newsom et al. 2003, Kilgore et al. 2005). With the customers of many primary forest product companies requiring that the wood fiber used in manufacturing come from certified

The authors are, respectively, Associate Professor, Dept. of Forest Resources, Univ. of Minnesota, St. Paul, MN (mkilgore@umn.edu); Assistant Professor, School of Forest Resources, Univ. of Maine, Orono, ME (jessica_leahy@umit.maine.edu); Policy Analyst, Pinchot Institute for Conservation, Washington, DC (jdonnay@pinchot.org); Policy Analyst, Minnesota Forest Resources Council, St. Paul, MN (hibb0006@umn.edu); and Professor and Extension Specialist, Dept. of Forest Resources, Univ. of Minnesota, St. Paul, MN (cblinn@umn.edu). Funding for this study was provided by the Blandin Foundation. This paper was received for publication in March 2006. Article No. 10172.
©Forest Products Society 2007.
Forest Prod. J. 57(1/2):84-90.

sources, logger certification may be one of the few (possibly the only) means by which timber harvesting practices on these lands can be certified on a meaningful scale.

The term “logger certification” has two distinct meanings in North America. Historically, the label has been used to describe a type of state-based, logger education program. To be certified under this type of education-based program, loggers typically must meet certain training, education, and/or work experience requirements and pass a written examination (MacKay et al. 1995). Once certified, loggers need to attend a minimum number of continuing education courses over a specified period in order to maintain their status as a certified logger. MacKay et al. (1995) reported that in 1993, six states and two provinces had education-based logger certification programs, with several requiring loggers to be certified in order to harvest timber in that state.

The other and more recent type of logger certification program is performance-based. To obtain the status of being a certified logger under this type of program, a logging company’s timber harvesting operations and business practices must be judged by an independent, third-party reviewer as meeting or exceeding the certification organization’s standards for sustainable operations. Like the education-based certification programs, designation as a certified logger under the performance-based certification program is conferred for a specified period of time. Once certified, loggers are subject to periodic, third-party field audits of their harvesting practices and can lose their designation as certified loggers if they fail to meet the program’s standards. Participation in a performance-based logger certification program is entirely voluntary.

While a fair amount of literature exists with respect to continuing education and training programs for loggers, little is known about the attitudes and perceptions of loggers toward performance-based logger certification programs. In fact, a review of the literature found no such studies. The closest report was from a study describing loggers’ attitudes toward and perceptions of an education-based logger certification program. In this study, Egan et al. (1997) surveyed loggers in West Virginia and found many were agreeable to such a program, but only if they deemed it to be financially worthwhile. The quality of a certification program was determined to be related to the content and quality of logger training efforts. The study also found that individuals with the greatest level of logging experience were the least enamored with that certification program. The major concern regarding logger certification that was expressed by the study participants was the significant cost imposed on loggers.

Given this information void, we sought to gain a contemporary and in-depth understanding of loggers’ attitudes toward and perceptions of performance-based logger certification in Minnesota. Specifically, we were interested in being able to more fully describe logger familiarity with the concept of this type of logger certification, likely participation under alternative logger certification program arrangements, willingness to pay to have their logging business certified, perceptions of the need for a logger certification program, and overall interest in becoming a certified logger.

Methods and data

To gather the information needed to accomplish the study’s objectives, a mail questionnaire was developed. In addition to reviewing the academic literature and other related survey in-

struments, survey design experts at the University of Minnesota and individuals involved in developing and delivering logger training and education programs in the state were consulted for their input on the format and content of the questionnaire. The questionnaire was four pages in length and contained 10 questions.

The Minnesota Logger Education Program (MLEP), a not-for-profit training and education organization for Minnesota loggers, provided a database containing the names and mailing addresses of its members. MLEP represents the single largest organization of Minnesota loggers, whose members collectively account for over 90 percent of all timber harvested in the state (MLEP 2006). Virtually all primary wood processing facilities in Minnesota require the Minnesota loggers who supply wood to their mills to be members of MLEP.

In spring 2005, the questionnaire was sent to MLEP loggers using Dillman’s Tailored Design Method (2000). This involved sending an advance-notification postcard to all questionnaire recipients; a questionnaire and a cover letter explaining the purpose of the study approximately one week later; a follow-up reminder postcard to non-respondents 10 days after the questionnaire was mailed; and a second cover letter and questionnaire mailed approximately three weeks after sending the reminder postcard to the remaining survey non-respondents.

Results

Of the 412 logging business owners who were mailed the questionnaire, 230 returned usable surveys and 12 returned incomplete and unusable questionnaires. The overall response rate was 59 percent, with a usable response rate of 56 percent. Comparisons between respondent data and statewide averages for key logger metrics (e.g., production volume, source of timber harvested by ownership group, tenure in the logging business) suggested survey respondents were not substantially different from the state’s logging community as a whole (Jaakko Poyry Consulting, Inc. 1992, Puettmann et al. 1998).

Chi-square tests were also performed to check for non-response bias based on when a questionnaire was returned following procedures described by Armstrong and Overton (1977). Chi-square tests were run on both key logging operator variables (e.g., years in business, level of annual timber production) and certification variables (e.g., familiarity with logger certification, likelihood of being certified, perceived need for certification). All tests showed independence (all p -values ≥ 0.48) between the logger operator or certification variable and whether the respondent was an early or late respondent. The results of these tests suggest the survey findings were indicative of MLEP loggers.

Profile of responding loggers

Survey respondents had considerable experience in the logging business, with 87 percent of respondents in business for at least 15 years, and the majority (57%) logging for more than 25 years. These individuals represented a mix of small and large logging businesses. The annual volume of timber harvested among the respondents averaged nearly 8,000 cords. Approximately 60 percent of the loggers harvested fewer than 5,000 cords during 2004, while another 30 percent harvested more than 10,000 cords.

Family forestland was the largest source of timber, accounting for 37 percent of the timber volume harvested by the sur-

Table 1. — Respondent sources of timber harvested in 2004.

Source	Mean annual volume (%)
Family forestland	37
State land	24
County land	22
Private, corporate land	9
National forest land	5
Tribal land	<1
Other	2

vey respondents (**Table 1**). Nearly one-quarter of the timber volume harvested came from state-owned forestland, while another 22 percent was harvested from county-administered forestland. National forest and tribal land produced the least volume of timber harvested by the respondents.

Familiarity with logger certification

Most Minnesota loggers were familiar with the concept of performance-based logger certification. Fifty-eight percent indicated they had some familiarity with logger certification, while another 28 percent described their level of understanding as extensive. Only 3 percent of the loggers surveyed had never heard of the term.

Importance of possible outcomes of logger certification

Respondents were asked to rate the level of importance associated with eight different possible outcomes of certifying their logging business on a four-point Likert scale, ranging from very important to very unimportant. Not surprising, loggers were most interested in receiving a financial return on their certification investment through higher prices for the timber they harvest (**Table 2**). More than 90 percent of the respondents indicated higher prices for their certified timber was an important or very important outcome. Being recognized as a responsible logger was also an important outcome of certification, with nine of 10 loggers indicating it was important or very important. Other highly rated certification outcomes included greater market access (both existing and new markets) as well as concern that it would result in more harvesting restrictions being imposed.

Likelihood of realizing possible outcomes of logger certification

Respondents also rated the likelihood of eight possible outcomes if their logging business was certified. The three most commonly cited perceived outcomes of being a certified logger were more restrictions on the types of harvesting practices they could apply, having additional training courses to attend, and more recordkeeping and paperwork (**Table 3**). For these perceived outcomes, at least 80 percent of the respondents believed these consequences were likely to happen as a result of being a certified logger. A majority of the respondents also felt that if their logging business was certified, this designation would give them recognition for using sustainable logging practices.

There appears to be an apparent disconnect between what loggers want from a certification program (**Table 2**) and what they believe would likely occur if they become certified (**Table 3**). While outcomes that provide greater benefits were

the most important to loggers, they believed that having their operation certified would largely result in the imposition of additional costs in the form of more training, greater harvesting restrictions, and increased recordkeeping. In fact, fewer than half of the respondents felt the most important potential benefits of certification (i.e., higher prices, greater market access) were likely to be realized.

Logger certification program design

Survey participants were queried for their preferences regarding several key attributes of a logger certification program. The respondent's interest in being certified in a logger certification program that contained a particular attribute was expressed on a four-point Likert scale from very likely to very unlikely to participate. The program design alternatives posed to the survey respondents were not mutually exclusive—loggers could have responded favorably (or unfavorably) to several program design alternatives.

Affiliation of logger certification organization

Loggers were most likely to participate in a logger certification program if such a program was administered by a logger education association (**Table 4**). When run by such an association, more than three-fourths of the respondents indicated they were likely to participate. A majority of loggers also favored a logger certification program that was administered through a logger trade or a forest products industry association. A logger certification program run by a forestland-owner association, educational organization (e.g., a university), or government failed to garner majority support from the responding loggers. Loggers were least likely to participate in a certification program if it was operated by an independent organization—one not tied to a trade or professional association.

Origin of standards used to certify loggers

The majority (73%) of Minnesota loggers indicated they would participate in a logger certification program if the criteria used to evaluate timber harvesting practices were based solely on Minnesota standards (**Table 4**). This rate of likely participation dropped off considerably if the logging standards were to be based, in whole or part, on national standards. Greater than three of four responding loggers would not participate in a logger certification program if the audit standards were nationally set, and about half would do so if the national standards were adapted to fit Minnesota's logging conditions.

Affiliation of logger certification program

The affiliation of a logger certification program with a regional certification program was generally viewed positively by Minnesota loggers (**Table 4**). Fifty-eight percent indicated they would likely participate if the certification program had this regional affiliation. However, affiliation with a national logger certification program or no program affiliation whatsoever was not viewed favorably—fewer than half of the survey respondents would apply for certification under either situation.

Public disclosure of field audit results

Three different ways of dealing with the results of a logger certification field audit were presented to the survey respondents: full disclosure of the audit results to the public; public disclosure only in summary form; and no disclosure (**Table 4**). Loggers did not discern greatly between the different sce-

Table 2. — Respondent perceived importance of various possible outcomes if its logging business was certified under a performance-based certification program.

Possible outcomes	Considered outcome important or very important (%)	Mean ^a
Higher prices paid for my timber	93	3.58
Recognition for good logging practices	90	3.37
Easier to purchase timber on private lands	77	3.18
More restrictions on harvesting practices	72	3.05
Access to new markets for my timber	74	3.01
Buyers preferring timber from certified logging operation	71	2.99
More recordkeeping and paperwork	62	2.73
Additional training courses to attend	52	2.51

^a4 = Very important; 3 = Important; 2 = Unimportant; 1 = Very unimportant

Table 3. — Respondent perceptions of possible outcomes if its logging business was certified under a performance-based certification program.

Possible outcomes	Considered outcome likely or very likely (%)	Mean ^a
More restrictions on harvesting practices	84	3.49
Additional training courses to attend	83	3.49
More recordkeeping and paperwork	80	3.40
Recognition for good logging practices	61	2.57
Buyers preferring timber from certified logging operation	46	2.42
Easier to purchase timber on private lands	30	2.18
Higher prices paid for my timber	29	2.12
Access to new markets for my timber	28	2.12

^a4 = Very likely; 3 = Likely; 2 = Unlikely; 1 = Very unlikely

Table 4. — Respondent likelihood of participation in a performance-based logger certification program under various program arrangements.

Likelihood of participation if ...	Likely or very likely to participate (%)	Mean ^a
Program is run by:	(%)	
Logger education association	78	3.18
Logger trade association	62	2.77
Forest products industry association	57	2.63
Forest landowner association	48	2.44
Educational institution	47	2.43
Government organization	41	2.33
Independent organization	35	2.28
Other	21	2.03
Standards used to audit logging operations are:		
Based solely on MN standards	73	3.10
Nationally set, but adapted to fit MN	52	2.56
Nationally set	23	1.95
The program is:		
Affiliated with a regional logger certification program	58	2.67
Affiliated with a national logger certification program	41	2.37
Separate program not affiliated nationally or regionally	39	2.33
The results of logging operation audits are:		
Not made available to the public	41	2.46
Made available to the public in summary form	45	2.41
Made fully available to the public	40	2.33
Failure to pass an audit results in:		
Losing your certified status only after repeated failure to pass audits	65	2.72
Not losing your certified status, but requiring additional training	52	2.57
Not losing your certified status and not requiring additional training	34	2.23
Losing your logger certification status	25	2.02
Program auditors reviewing logging operations are:		
Loggers and professional foresters	70	2.84
Only loggers	55	2.65
Loggers, professional foresters and other resource professionals	53	2.58
Loggers, professional foresters, other resource professionals and interest group representatives	33	2.16
Only auditors from MN	47	2.46
Included auditors from outside MN	24	1.95
Only auditors from outside MN	11	1.58

^a4 = Very likely; 3 = Likely; 2 = Unlikely; 1 = Very unlikely

narios presented, although they slightly preferred not having audit reports made public (mean score: 2.46) over making them available (mean score: 2.33). None of the options for disclosing field audit results received a favorable view by a majority of the respondents.

Consequences of failing field audits

Participants favored a program with substantial consequences for certified loggers who don't adhere to the certification standards. Nearly two-thirds indicated they were likely to participate in a program where repeated failure of the certification field audits meant the logging business would lose its certification status (Table 4). This was strongly favored over a program where a single failure to pass a field audit meant termination of a logger's certificate (only 25 percent would likely participate under such an arrangement). Loggers were not as supportive of any program that did not terminate a logger's certificate as a result of failing a field audit. Just over half of the respondents said they were likely to participate in a program where the only recourse was to attend additional training, and only one-third supported a program where there was no recourse for failing to meet the certification standards.

Characteristics of on-site reviewers

Loggers were most likely to participate in a logger certification program when the field auditors con-

sisted solely of loggers and professional foresters (Table 4). Seventy percent indicated they were likely to want to participate under such an arrangement. Field audit teams that consisted solely of loggers or included loggers, foresters, and other resource professionals were rated less highly—slightly more than half the survey respondents indicated support for each alternative. However, loggers showed clear preference for not involving representatives of special interest groups on the certification audit teams. When such groups were suggested, only one-third of the loggers indicated a willingness to participate.

Respondents also displayed a strong preference for audit teams that included only individuals from within the state (Table 4). Under such an arrangement, approximately half of the loggers indicated they were likely to apply to be certified. The rate of likely participation in a logger certification program dropped to 24 percent when nonresidents were part of the field audit teams. Only slightly more than one in 10 loggers was likely to participate when field audit teams included only nonresidents.

Most and least preferred logger certification program

Based on mean scores from the survey results, loggers described the most desirable performance-based logger certification program as one that:

- is administered by a logger education association,
- uses field auditing standards that were developed exclusively in Minnesota,
- uses only Minnesota-based loggers and foresters in conducting the certification field audits,
- removes a logger from the program after repeated failure to pass field audits,
- is affiliated with a regional logger certification program.

In contrast, the least desirable logger certification program based on mean scores from the survey results:

- is not affiliated with any particular organization,
- uses nationally set standards to audit logging operations,
- uses exclusively non-resident auditors when conducting the certification field audits,
- releases the non-summarized results of third-party field audits to the public,
- does not remove a logger from the program after repeated failure to pass field audits.

Willingness to pay to be certified

As the proposed annual cost of being a certified logger increased, so too did the proportion of loggers who felt others should assist in underwriting these program costs (Fig. 1). Forty-six percent of the responding loggers indicated the certified logger should bear the entire cost of being certified if the annual cost of doing so was \$100 per year. As the annual certification costs increased to \$250 and \$500, the percent who felt the certified logger should bear the entire cost decreased to 27 percent and 8 percent, respectively.

Need for a Minnesota logger certification program

The perceived need for a performance-based logger certification program in Minnesota was mixed among the survey respondents. Nearly four-in-10 respondents felt a logger certification program was not needed in the state, while another

37 percent were not sure whether such a program should be developed (Table 5). Fewer than one-quarter of the responding loggers felt a logger certification program was needed in Minnesota.

Likelihood of being a certified logger

In spite of lacking a strong sentiment that a performance-based logger certification program should be developed in Minnesota, interest among respondents in certifying their logging business was quite high. Nearly three-fourths of the respondents indicated they were somewhat to very likely to certify their logging business if a Minnesota logger certification program was available (Table 6). Only 8 percent of the respondents indicated they never intend to certify their business.

Analysis of selected logger subgroups

To assess whether the opinions and attitudes of respondents regarding logger certification differed according to certain characteristics, survey respondents were grouped according to whether they:

- purchased the majority of timber from family forests (hypothesizing these loggers saw a greater opportunity to access this market if they were certified),
- were large producers of timber (hypothesizing larger producers were more knowledgeable of certification and, hence, more likely to support it),
- would likely have their logging business certified (hypothesizing loggers willing to be certified saw a greater

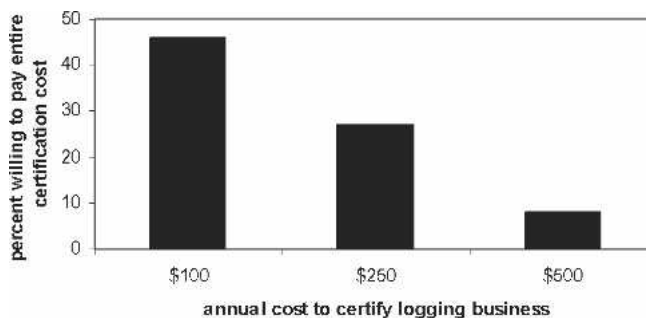


Figure 1. — Percent of respondents willing to pay the entire certification cost under different annual costs.

Table 5. — Respondent attitudes toward developing a performance-based logger certification program in Minnesota.

Need for a certification program	(%)
Yes, a logger certification program should be developed.	24
No, a logger certification program should not be developed.	39
Not sure if a logger certification program should be developed.	37

Table 6. — Likelihood of respondents certifying their logging business.

Likelihood of certifying	(%)
Very likely	29
Somewhat likely	45
Not very likely	18
Never	8

need for certification, greater certification benefits, and less costs).

Chi-square and t-tests were performed to determine where significant differences exist between each of the pairs of logger subgroups examined.

Reliance on family forests

Loggers who harvested at least 50 percent of their annual timber volume from family forestland (33 percent of all survey respondents) were similar to the loggers who did not rely on family forests as the majority source of timber with one notable exception (Table 7). The two groups' perception of being able to more easily purchase family-forest timber if certified was significantly different, refuting our hypothesis that family-forest-dependent loggers saw a greater opportunity to access this market if they became certified.

Large annual production

The 32 percent of responding loggers who harvested more than the mean annual volume (7,962 cords) were compared to

those whose annual harvest production was less than the mean (Table 7). In addition to having longer tenure in the business, large production loggers were less reliant on family forestland as a source of timber than small production loggers. Further, large production loggers were more likely to perceive a need for logger certification, yet were not significantly more likely to certify their business than small production loggers.

Likely to be certified

Not surprisingly, the opinions of the 74 percent of loggers who indicated they would likely certify their logging business if the opportunity existed differed in most respects about certification than those loggers not likely to be certified (Table 7). The former group of loggers generally valued most of the possible outcomes of logger certification as being more important than those unlikely to certify. They also saw some of the possible economic benefits of being certified (e.g., market preference, price premiums, new markets) as more likely to happen, even though their opinions about the likelihood of realizing additional costs of being certified (e.g., more

Table 7. — Differences among logger subpopulations regarding logger certification.

	Reliance on family forests		Annual production		Certification likelihood	
	Major	Minor	Large	Small	Likely	Unlikely
Percent of timber harvested from family forests ^b	--	--	26	43 ^f	37	40
In business for more than 25 years ^a	55	58	66	47 ^e	53	64
An extensive understanding of logger certification ^a	30	28	27	30	30	24
Importance of possible outcomes: ^{b, d}						
Higher prices paid for my timber	3.58	3.57	3.55	3.62	3.59	3.56
Recognition for good logging practices	3.42	3.33	3.44	3.35	3.46	3.12 ^e
Easier to purchase timber on private lands	3.32	3.10	3.21	3.20	3.26	2.96 ^e
More restrictions on harvesting practices	3.01	3.08	3.11	3.04	3.03	3.14
Access to new markets for my timber	3.06	3.00	2.95	3.07	3.08	2.83
Buyers preferring timber from certified logging operation	3.10	2.91	3.08	2.93	3.12	2.55 ^f
More recordkeeping and paperwork	2.64	2.78	2.75	2.66	2.79	2.60
Additional training courses to attend	2.56	2.49	2.53	2.52	2.61	2.25 ^e
Likelihood of possible outcomes: ^{b, d}						
Additional training courses to attend	3.45	3.48	3.52	3.48	3.46	3.53
More restrictions on harvesting practices	3.52	3.39	3.50	3.50	3.43	3.60
More recordkeeping and paperwork	3.35	3.38	3.42	3.36	3.31	3.56
Recognition for good logging practices	2.57	2.57	2.50	2.59	2.65	2.37 ^e
Buyers preferring timber from certified logging operation	2.30	2.53	2.33	2.48	2.55	2.12 ^f
Easier to purchase timber on private lands	1.91	2.31 ^e	2.24	2.12	2.30	1.94 ^e
Higher prices paid for my timber	2.15	2.15	2.12	2.10	2.25	1.81 ^e
Access to new markets for my timber	2.07	2.19	2.15	2.14	2.27	1.78 ^f
Likelihood of participation if: ^{b, c, d}						
Program run by logger education association	3.11	3.05	3.08	3.03	3.24	2.59 ^f
Standards used in program are based solely on MN conditions	2.97	3.17	3.2	3.08	3.30	2.61 ^f
Field audit results were not made available to the public	2.34	2.55	2.41	2.55	2.53	2.35
Logger loses certified status after repeated failure to pass audits	2.55	2.80	2.80	2.68	2.86	2.33 ^f
Program auditors included loggers and professional foresters	2.83	2.83	2.77	2.86	3.02	2.35 ^f
Program auditors were only from Minnesota	2.43	2.48	2.53	2.41	2.63	2.04 ^f
Logger pays entire \$100 annual cost for a certification program ^a	46	46	48	48	54	26 ^f
Need for logger certification ^a	42	37	55	34 ^e	55	<5 ^f
Somewhat to very likely to certify logging business ^a	72	75	83	73	--	--

^aX² test, reported as percent of participants who responded "yes."

^bt-test, reported as mean value.

^cHighest mean values from Table 4.

^d4-point Likert Scale with 4 = very likely or important; 1 = very unlikely or unimportant.

^ep-value ≤ 0.05. ^fp-value ≤ 0.01.

training to attend, more logging restrictions, more record-keeping) were not statistically different from loggers not willing to be certified. Additionally, loggers likely to certify their business saw a greater need for a logger certification. Interestingly, those loggers likely to certify their business were not significantly more familiar with the concept of logger certification than those loggers who were unlikely to certify their business.

Discussion and conclusions

The goal of this research was to develop a better understanding of Minnesota loggers' attitudes toward and perspectives on performance-based logger certification. The survey revealed that loggers were quite knowledgeable about this type of logger certification. Respondents indicated higher timber prices, access to new markets for their timber, and easier access to private land timber were important outcomes of being certified. Yet, they perceived that instead of realizing these economic benefits, being a certified logger would likely result in more recordkeeping, greater restrictions on logging practices, and additional required training. Loggers described the most preferred certification program as one that was administered by a state logger education association, used only state-based auditing standards and auditing personnel, and removed a logger's certification status only after repeated failure of logging audits. While less than one of four loggers felt a logger certification program was needed, nearly three-fourths indicated they were likely to certify their business if a program was available. Loggers likely to certify their business had no greater familiarity with the concept of logger certification than loggers who were unlikely to certify their business.

The findings from this study played an important role in developing Minnesota's performance-based logger certification program, the Minnesota Master Logger Certification program (MMLC). For example, the clear preference among the state's loggers for affiliating a logger certification program with a logger education program was a major reason for MMLC being administered by the Minnesota Logger Education Program. Similarly, the study results helped shape various aspects of the certification process such as the design of the field audit procedures. It is hoped that by reflecting the preferences of the state's loggers in the design of the MMLC, the likelihood of having an enduring and successful logger certification program will increase.

Voluntary, performance-based logger certification programs have only been established in a few states. Organizations in other states are likely to consider establishing similar programs in the near future as market forces place greater emphasis on demonstrating that the fiber used in wood products manufacturing is sourced from sustainably managed forests. While not a substitute for forestland certification, logger certification can be an effective means of demonstrating that good stewardship is being applied when harvesting timber. For states that have tens of thousands of family forest owners, certifying loggers may be a practical and cost-effective alternative to forestland certification. Logger certification may also be one of the few (possibly the only) options for advancing certification within a state when the majority of forestlandowners are either unaware of forest certification, not interested in having their land certified, or do not have the prerequisites needed to be certified (e.g., a written forest management plan for the property).

The types of data collected through this study can be extremely helpful in identifying the design of a logger certification program for a particular locale. State-to-state variability among loggers can be substantial due to the different types of logging equipment, business characteristics, harvesting methods, logger backgrounds, and state laws, rules and best management practices. While Minnesota loggers expressed clear preferences for certain certification program arrangements, loggers in other regions may have a completely different perspective on these same program attributes. Previous research has suggested that to be effective and credible, logger programs should be tailored to the unique needs and characteristics of the region's loggers (Egan 2005). This point appears particularly relevant to the design of a performance-based logger certification program. As such, additional research is needed to understand how and to what degree logger perspectives on logger certification differ from one part of the country to another.

Literature cited

- Armstrong, J.S. and T.S. Overton. 1977. Estimating nonresponse bias in mail surveys. *J. Mar. Res.* 14(3):396-402.
- Cabbage, F., S. Moore, J. Cox, L. Jervis, J. Edeburn, D. Richter, W. Boyette, M. Thompson, and M. Chesnut. 2003. Forest certification on state and university lands in North Carolina: A comparison. *J. of Forestry* 101(8):26-31.
- Dillman, D.E. 2000. *Mail and Internet Surveys: The Tailored Design Method*. 2nd ed. John Wiley and Sons, New York, NY. 464 pp.
- Egan, A.F. 2005. Training preferences and attitudes among loggers in northern New England. *Forest Prod. J.* 55(3):19-26.
- _____, C.C. Hassler, and S.T. Grushecky. 1997. Logger certification and training: A view from West Virginia's logging community. *Forest Prod. J.* 47(7/8):46-50.
- Jaakko Poyry Consulting, Inc. 1992. *Harvesting Systems: A background paper for a generic environmental impact statement on timber harvesting and forest management in Minnesota*. Environmental Quality Board, St. Paul, MN. 50 pp.
- Kilgore, M., J. Leahy, C. Hibbard, J. Donnay, K. Flitsch, D. Anderson, J. Thompson, P. Ellefson, and A. Ek. 2005. Developing a certification framework for Minnesota's family forests. Staff Pap. #176, Dept. of Forest Resources, Univ. of Minnesota, St. Paul, MN. 212 pp.
- MacKay, D.G., P.V. Ellefson, C.R. Blinn, and S.J. Tillmann. 1995. Timber harvester registration, certification, and licensing programs: A review of program status in the United States and Canada. Staff Pap. #106, Dept. of Forest Resources, Univ. of Minnesota, St. Paul, MN. 38 pp.
- Minnesota Logger Education Program. About the Minnesota Logger Education Program. Accessed June 16, 2006. www.mlep.org/about.htm.
- Newsom, D., B. Cashore, G. Auld, and J. Granskog. 2003. Forest certification in the heart of Dixie: A survey of Alabama landowners. *In: Forest Policy for Private Forestry: Global and Regional Challenges*. pp. 291-300. L. Teeter et al., eds. CABI Publishing, New York, NY. 307 pp.
- Puettmann, K.J., C.R. Blinn, H.W. McIver, and A.R. Ek. 1998. Status of Minnesota timber harvesting and silvicultural practice in 1996: A report to the Minnesota forest resources council. Rept. # MP0698. Minnesota Forest Resources Council, St. Paul, MN. 49 pp.
- Sample, V.A., W. Price, and C.M. Mater. 2003. Certification on public and university lands: Evaluations of SFC and SFI by the forest managers. *J. of Forestry* 101(8):21-25.
- Smith, B., J. Vissage, D. Darr, and R. Sheffield. 2001. *Forest Resources of the United States, 1997*. GTR NC-219. USDA Forest Serv., North Central Res. Sta., St. Paul, MN. 190 pp.
- Vlosky, R.P. and J.E. Granskog. 2003. Certification: A comparison of perceptions of corporate and non-industrial private forestland owners in Louisiana. *In: Forest Policy for Private Forestry: Global and Regional Challenges*. pp. 283-289. L. Teeter et al., eds. CABI Publishing, New York, NY. 307 pp.
- Vogt, K.A., B.C. Larson, J.C. Gordon, D.J. Vogt, and A. Fanzeres. 2000. *Forest Certification: Roots, Issues, Challenges, and Benefits*. CRC Press. New York, NY. 374 pp.