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# An Assessment of Training Needs for the Lumber Manufacturing Industry in the Eastern United States

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## Abstract

A training needs assessment of the primary forest products industry was conducted for 33 eastern states. This publication presents in detail the statistical analysis of the study. Of the 2,570 lumber manufacturing companies, consisting of firms with more than six employees for the U.S. Department of Labor Standard Industrial Classification Code 2421, the response rate to the survey was 18.1%.

The study found that over the next 5 years, 36% of the current skilled positions are projected to be replaced. Based on the number of new key employees that will be needed to replace current employees, the most important fields are lumber grading, millwrighting, and sawyers.

Employers are willing to send their employees to training programs, especially those programs that are three to five days in length. The maximum travel distances a regionalized training center should expect to draw from is a 275-mile radius.

Employers would be most interested in the core programs of wood products curriculum offered at community colleges in the past, including lumber inspection, sawyer training, and saw filing training. Millwrighting subjects also ranked highly with employers.

**Keywords:** lumber manufacturing industry, training needs assessment, wood product program, Haywood Community College

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# An Assessment of Training Needs for the Lumber Manufacturing Industry in the Eastern United States

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## Training Needs for the Lumber Manufacturing Industry

In 1969, Haywood Technical Institute, now Haywood Community College, Clyde, North Carolina, established a wood products program to train log graders, sawyers, lumber graders, dry kiln operators, planer mill operators, saw filers, and other key operational positions for the lumber industry. The program evolved into one offering individual courses, certificate programs, and an associate degree to students completing a 2-year program.

Students attending the different programs were often employed in key production positions with the lumber manufacturing industry immediately upon completion of their instruction. Those individuals that stayed with industry usually progressed to mid-level management and played important roles in keeping rural economies strong. Even though the program was a community college program, it attracted students from surrounding states and had an excellent reputation with the industry both nationally and internationally. The program had enrollment challenges and closed in 2003.

Since that time, some in the lumber manufacturing industry have noticed a void in available training for employees, and these concerns were expressed to different industry organizations. This study was conceived through the Southern Appalachian Multiple Use Council in cooperation with the USDA Forest Service, Forest Products Laboratory (FPL).

The lumber manufacturing industry has been adaptable and has remained competitive when compared with other manufacturing industries. For local rural economies based on the lumber manufacturing industry, well-paying manufacturing jobs are the norm. To remain competitive, the lumber manufacturing industry has stressed increasing productivity and yield from the raw material. Today the industry is significantly better able to convert logs to lumber, conserving

our timber resources while using human resources more effectively. To achieve this high level of performance, the industry has incorporated and modified various high technology disciplines such as metalworking, computer modeling, and scanning technology. In lumber manufacturing, these technologies are transformed into both operating and maintenance skills such as saw filing (the science of saw sharpening to maintain thin kerf saw blades), efficient primary log breakdown (the ability to harness computer modeling and scanning technology to increase product yield), and highly technical maintenance functions such as those related to programmable logic controls (PLC) and other electronic and hydraulic subsystems.

The skills required to operate a lumber manufacturing facility are a mixture of industry-specific skills (sawing fundamentals, operational efficiencies) and generic industrial skills (welding, industrial hydraulics, and industrial electrical skills). To teach industry-specific skills in a cost-effective manner, it may be best to teach them at either a regional or national center. The other critical (but industry generic) skills may be taught more cost-effectively at local training centers, such as community colleges, in conjunction with other industries.

## Objectives

The objectives of this study are to determine (1) the training needs of the lumber industry in the eastern United States, (2) the time and travel commitment the industry is willing to invest in employee training, and (3) an understanding of what skills are considered specific to lumber manufacturing and what can be combined with the needs of other industries and taught locally.

## Methods

A needs assessment of the primary forest products industry was conducted for 33 eastern states. The first step was

to raise awareness of the survey. News releases were sent to industry associations, groups, and industry newsletters including the Appalachian Hardwood Manufacturers, Hardwood Review, Southern Forest Products Association, Wood Components Manufacturers Association, Hardwood Research Council, Hardwood Manufacturers Association, Southeastern Lumber Manufacturers Association, Southern Pine Inspection Bureau, North Carolina Forestry Association, Southeastern Saw Filers Educational Association, Northeastern Lumber Manufacturers Association, Midwest Sawfilers Association, Southern Sawfilers Association, Lake Erie and Ontario Sawyers and Sawfilers Association, Lake States Sawfilers Educational Association, Southeastern Dry Kiln Club, Ohio Valley Dry Kiln Association, Southern Appalachian Multiple Use Council, and the Hardwood Market Report.

A questionnaire was developed with input from the FPL Wood Products Research Assistant Director, industry representatives with the Southern Appalachian Multiple Use Council, and educators, including two of the authors. The draft questionnaire was then given to industry cooperators to evaluate the survey and add their input.

The final survey was mailed to 2,570 lumber manufacturing companies comprised of firms with more than six employees for the U.S. Department of Labor Standard Industrial Classification Code (SIC) 2421, Saw and Planing Mills, for the 33 states that comprise the Eastern United States. Under the newer North American Industry Classification System codes (NAICS, which has replaced the SIC system), this includes 32113-Sawmills; 321912-Cut Stock, Resawing Lumber, and Planing; 32918-Other Millwork (including flooring); and 321999-All Other Miscellaneous Wood Products Manufacturing. The initial mailing was followed up with another copy of the survey sent out to non-responding firms approximately 5 weeks after the initial mailing. In order to spur response to the survey, those responding will be eligible for a drawing for a gift donated by an industry cooperator. The raw data were then compiled in Microsoft Excel and statistically analyzed using SAS Version 9.1.3 (SAS Institute Inc., Cary, North Carolina).

## Results and Discussion

The initial mailing yielded a result of 306 firms responding. The final tally of returned surveys was 465, for a response rate of 18.1%. The geographical location of the respondents is shown in Table 1. Of these respondents, 72% were hardwood producers, 22% were pine producers, and 6% were mixed hardwood and pine producers.

The participants in the survey were categorized by their annual production. Hardwood and hardwood/pine producers with an annual production of greater than 10 million board feet were considered large, whereas pine producers with an annual production greater than 50 million board feet were considered large. The average hardwood operation in the

**Table 1—Survey response from 464 lumber manufacturing firms**

State	Respondents by state (no.)	Respondents by state (%)
AL	14	3.02
AR	9	1.94
CT	1	0.22
FL	8	1.72
GA	15	3.23
IA	4	0.86
IL	6	1.29
IN	10	2.16
KY	19	4.09
LA	3	0.65
MA	5	1.08
MD	3	0.65
ME	15	3.23
MI	22	4.74
MN	6	1.29
MO	19	4.09
MS	11	2.37
NC	63	13.58
NH	10	2.16
NJ	1	0.22
NY	17	3.66
OH	15	3.23
PA	29	6.25
RI	0	0.00
SC	14	3.02
TN	29	6.25
TX	6	1.29
VA	45	9.70
VT	7	1.51
WI	29	6.25
WV	28	6.03
Other	1	0.22
Total	464	100.0

survey produced 11.1 million board feet annually, the average pine operation produced 46.9 million board feet annually, and the average for the mixed hardwood/pine operation was 7.9 million board feet annually.

The participants were asked if they were primarily a sawmill, a remanufacturing plant, concentration yard, or a combination of a sawmill and a remanufacturing plant or concentration yard. Overall, sawmills accounted for 76.3% of the responses.

### Type of Manufacturer

The type of manufacturer responding by species and size follows:

- Small hardwood sawmills, 37.6%
- Large hardwood sawmills, 18.0%

- Small pine sawmills, 12.0%
- Large pine sawmills, 4.9%

### Number of Employees

The survey asked the participants about their number of employees. Overall, the average number of employees was 53.5. The average numbers of employees was broken down by the type of species processed:

- Hardwood operation, 49.9
- Pine operations, 74.1
- Mixed hardwood/pine operations, 32.0

The average number of employees was broken down by the type of manufacturing:

- Sawmills, 50.2
- Re-manufacturers or concentration yards, 48.7
- Both sawmills and remanufacturing or concentration yards, 153.6

Pine producers are generally considered more efficient in terms of production per person hour than hardwood producers. Figure 1 shows the average annual production in millions of board feet per employee.

The number of key employees currently employed in the eastern United States and the estimated number of key employees to be replaced in the next 5 years is presented in Table 2. Overall, these firms have 37,779 key employees with 13,531 (36%) of them expected to be replaced in the next 5 years. The increase in technology and the large number of projected new employees will create a tremendous need for training. From the projected number of new employees, the most important fields are lumber grading, millwrighting, and sawyers. Technology is moving in the direction of replacing lumber graders with machines. This trend is already seen in larger softwood mills with machines assisting lumber graders with decisions. With the average production level of hardwood firms being smaller and the variation in hardwood lumber being greater, it will be more difficult to replace hardwood lumber graders with new technology. As technology increases, the need for skilled millwrights will increase. Sawing will be a skill that will be needed in the foreseeable future.

### Finding Skilled Employees

Employers were asked how they currently obtained skilled employees and responded as follows (1, never; 3, sometimes; 5, always):

- Training in house, 3.02
- Hire a trained employee, 2.04
- Train in house and send out for specialized training, 1.57
- Train in house and bring in an outside trainer, 1.02

The response from hardwood producers was not significantly different than that of pine or mixed hardwood/pine

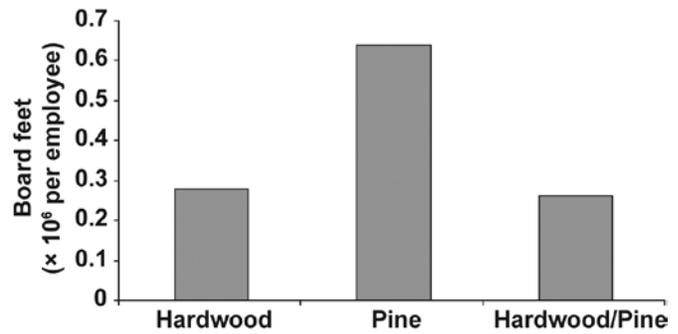


Figure 1—Annual production by species per employee.

producers. Bringing in an outside trainer, hiring a trained employee, and sending out for specialized training were not frequently used. The dilemma for the lumber manufacturing industry is evident. Training in house is often difficult because of the demands on the time of supervisors and managers. Hiring skilled employees from other mills is often expensive because employees from other mills often have a short tenure and move on to other opportunities. Outside trainers are limited, leaving the industry with limited choices for developing a skilled work force. The combination of a high replacement rate of skilled employees over the next 5 years and the fact that most employees are trained in house point to considerable training opportunities in the future.

### Use of a Regional Training Center

Manufacturers using different species were asked if they would use a regional center if one were available to train their employees: (1, never; 3, sometimes; 5, always):

- Hardwood manufacturers, 2.79
- Pine manufacturers, 3.15
- Hardwood/pine manufacturers, 2.71
- Average of all manufacturers, 2.79

There was no statistical difference (0.05 level) between the responses from the type of species produced. Producers in general responded that they would sometimes use a regional training center. This is in contrast with their current method of acquiring skilled employees, training in house, or hiring outside employees.

### Length of Training

Employers indicated the number of employees they would be willing to send next year to different length training venues:

- Three-day workshop, 2.35
- Week-long workshop, 1.60
- Two-week workshop, 1.08
- Two-month course, 0.61
- Four-month course, 0.56

The shorter the training session is, the more supportive the employers are and the more willing they are to send their

**Table 2—Current and projected number of key employees to be replaced in the next five years in firms larger than six employees for eastern United States<sup>a</sup>**

Key employees	Average number of current employees (responses)	Ratio of projected hires in next 5 years compared with current employees (responses)	Current employees (no.)	Projected replacement employees needed (no.)
Log grader/scaler	1.77 (374)	0.32 (213)	4,549	1,456
Sawyers	2.28 (385)	0.36 (238)	5,860	2,110
Saw filers	1.59 (334)	0.32 (175)	4,086	1,307
Lumber inspectors	3.30 (381)	0.39 (175)	8,481	3,308
Dry kiln operators	1.17 (329)	0.33 (128)	3,007	992
Planer operators	1.45 (324)	0.39 (145)	3,726	1,453
Millwrights	3.14 (341)	0.36 (196)	8,070	2,905
Overall		0.36	37,779	13,531

<sup>a</sup> Standard Industrial Classification Code 3421, Saw and Planing Mills.

employees. In practical terms, it means employers are more willing to send employees to short-term workshops (three-day and week-long) than to longer sessions. Using the average number of employees that employers are willing to send to each length of training times the number of firms, there is a potential audience of 15,935 employees in the eastern United States, broken down as follows:

- Three-day, 6,040
- One-week, 4,112
- Two-week, 2,776
- Two-month, 1,568
- Four-month, 1,439

Compare the total number of employees that manufacturers are willing to send to training next year (15,935) to the total number of key employees expected to be replaced in the next 5 years (13,531). These numbers strongly suggest that opportunities to provide training to the industry exist.

### Travel Distance for Training

Firms were asked the maximum travel distance they would send their employees for training venues of different lengths if a regional center were available (expressed in miles):

- Three-day, 208
- Week-long, 271
- Two-week, 306
- Two-month, 389
- Four-month, 352

Combining the information about the desirable distance of training centers with the information about the number of

employees firms are willing to send to training venues of different length, one can interpret that the draw radius for a successful regional training program would be approximately 275 miles.

### Training or Hiring Employees

The interests of employers in sending for training or hiring employees with different skills follow (1, no interest; 3, moderate interest; and 5, strong interest):

- Lumber inspector, 2.47
- Sawyer, 2.10
- Saw filer, 1.93
- Millwright, 1.76
- Log grading, 1.71
- Dry kiln operator, 1.58
- Planer operator, 1.52

Overall, there was a different level of interest for different skills. Employers would be most interested in lumber inspectors, sawyers, and saw filers. These were coincidentally the core program of the past Wood Products Program at Haywood Community College. Millwrighting was surprisingly only ranked fourth in employers' interest in sending to training or hiring employees with specific training. This is in contrast to the high projected demand for individuals with millwrighting skills as seen by the projected replacement levels in the next 5 years. When further analyzing the data, pine producers were more interested in dry kiln operators' training than hardwood producers, which can be attributed to the current availability of hardwood lumber drying courses.

## Hardwood Lumber Inspector

Employers expressed different levels of interest about various hardwood lumber inspector subjects were expressed by number (1, no interest; 3, moderate interest; 5, strong interest):

- Measurement and tally, 2.99
- Rules for the standard grades, 2.76
- Species inspection, 2.65
- Hardwood lumber markets, 2.38
- Supervision and management, 2.32
- Lumber packaging, 2.20

Hardwood producers were more interested in teaching the fundamentals including measurement and tally, standard grading rules, and rules for grading species rather than skills that would be more useful for refining operations. The later skills assist in more advanced job positions that graders may move into later in their career; for example, lumber sales.

## Sawyer Training

Employer interest levels in various subjects related to sawyer training were expressed by number (1, no interest; 3, moderate interest; 5, strong interest):

- Grade sawing, 2.86
- Carriage and equipment maintenance, 2.62
- Mill alignment, 2.64
- Edger and trimmer operation, 2.51
- Band saw operations, 2.41
- Optimizer function, set-up, and maintenance, 2.31
- Circle saw operation, 1.98

Hardwood, pine, and mixed hardwood/pine producers responded differently, which can be expected considering their current operation. For instance, grade sawing is much more critical in a hardwood lumber operation than in a pine structural lumber operation.

Employers were more interested in grade sawing, carriage and equipment maintenance, mill alignment, edger and trimmer operation, and band saw operation than optimizer function, set-up, and maintenance and circle saw operation.

## Saw Filing

Employer interest levels in various subjects related to saw filing were expressed by number (1, no interest; 3, moderate interest; 5, strong interest):

- Grinder alignment and maintenance, 2.27
- Band saws, leveling, tensioning, grinding, 2.25
- Thin kerf saw/gang saws, 1.97
- Carbide/satellite tipping and grinding, 1.87
- Headsaw, circle saw, hammering, 1.86
- Supervision and management, 1.84

Hardwood, pine, and mixed hardwood/pine producers responded with very little difference on different subjects.

In practical terms overall, employers put different weight on different subjects. Employers were more interested in grinder alignment and bandsaw filing than the other subject areas.

## Millwrighting

Employer interest levels in various subjects related to millwrighting were expressed by number (1, no interest; 3, moderate interest; 5, strong interest):

- Basic electrical maintenance and trouble shooting, 2.86
- Hydraulics, 2.84
- Machine and mill alignment, 2.80
- Pneumatics, 2.70
- Maintenance planning, 2.67
- Programmable logic controller (PLC) and control circuits, 2.59
- Machine feed rates and variables, 2.52
- Welding, 2.47
- Drive selection and alignment, 2.46
- Supervision and management, 2.36

Millwrighting was never a separate subject area in Haywood Community College's Wood Products Program (it was always combined with the other job skills), yet it received the strongest overall response by all producers. The strong positive response to millwrighting subjects was also in contrast to the fourth place ranking in employers' interest in sending or hiring employees to or with specific training skills. The strong interest in millwrighting subjects is, however, in line with the high projected demand for individuals with millwrighting skills in the next 5 years. Hardwood, pine, and mixed hardwood/pine producers responded with statistically insignificant levels of difference.

## Log Grading

Employer interest levels in various subjects related to log grading were expressed by number (1, no interest; 3, moderate interest; 5, strong interest):

- Relation of log grade to lumber grade, 2.47
- Grade yield studies, 2.45
- Scaling volume compared to defect deduction, 2.43
- Volume yield studies, 2.38
- Supervision and management, 2.08
- Species identification, 1.95

Overall, employers were more interested in the relation of log grades to lumber grades, grade yield studies, scaling volume/defect deductions, and volume yield studies than supervision/management and species identification.

Further analysis showed that the different subjects had different levels of responses by the different

producers—hardwood, pine, or mixed hardwood/pine producers. The difference in the responses by the different producers can be expected considering how they currently operate. For instance, identifying log species is critical in a hardwood operation, whereas many southern yellow pine producers group the different pine species together.

### Dry Kiln Operator Training

Figures 2 and 3 present the different interest levels from hardwood and pine manufacturers in various subjects related to dry kiln operator training. When the data were analyzed, hardwood producers had a different response than pine producers. The difference in the responses can be expected because pine lumber, in most cases, is dried differently (faster and in more extreme conditions) than hardwoods. Hardwood producers wanted the courses that are taught in traditional hardwood kiln operator training courses, whereas pine producers were most interested in kiln maintenance, operations, and high temperature drying.

### Planer Operations

Planer operations are more integral to pine operations than hardwood operations.

Employer interest levels in various subjects related to planer operator training were expressed by number (1, no interest; 3, moderate interest; 5, strong interest) by pine manufacturers:

- Planer alignment, maintenance, and troubleshooting, 3.05
- Planer mill productivity and machine feed rates, 2.82
- Knife grinding, 2.68
- Pattern setup, 2.49
- Supervision and management, 2.49
- Dry storage moisture control, 2.14
- Rip saw operation, 1.95

Pine manufacturers were most interested in planer alignment, maintenance and troubleshooting, planer mill productivity and machine feed rates, and knife grinding.

In all the different subject areas, supervision and management training was usually rated lower compared with other subject areas. This was an interesting response, as development of supervisors and managers is often identified as weak by lumber manufacturers. Often technically competent personnel are promoted to supervisors with poor results because the new supervisors lack personnel skills.

### Training Support from Companies

Companies are willing to provide different levels of training support were expressed by number (1, no interest; 3, moderate interest; 5, strong interest):

- Help educate grade/high school youth in the opportunities in the forest products industry, 2.16

- Help recruit students in their local area, 2.10
- Willing to send and find students from their area, 1.69
- Willing to support a general scholarship fund for students, 1.33

No significant differences in the level of support were evident between the different producers—hardwood, pine, or mixed hardwood. Employers were willing to help educate grade and high school youth in the opportunities within the forest products industry and help recruit students in their local area. Thereafter, their interest in support tapers off.

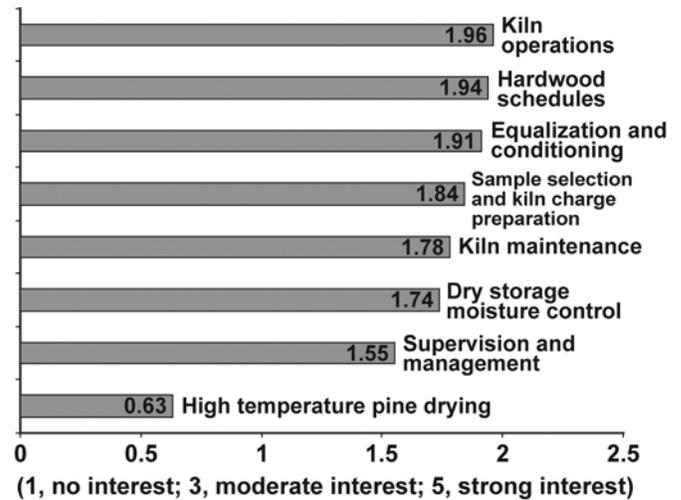


Figure 2—Different interest levels in various subjects related to dry kiln operator training by hardwood producers.

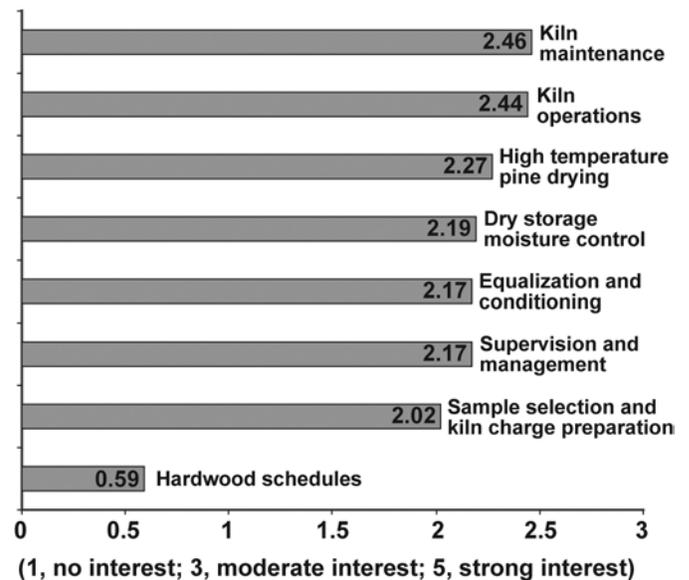


Figure 3—Different interest levels in various subjects related to dry kiln operator training by pine producers.

## Conclusions and Recommendations

The study reflected that lumber manufacturers in the eastern United States presently have a strong tendency to obtain skilled employees by training in house or hiring employees with those needed skills from other manufacturers. Over the next 5 years, 36% of the current skilled positions are projected to be replaced. Based on the number of new key employees that will be needed to replace current employees, the most important fields are lumber grading, millwrighting, and sawyers. The study showed that the potential demand for training is much greater than the expected number of employees to be replaced in the next 5 years.

Employers are willing to send their employees to training programs, especially those programs that are three days to one week in length. The maximum travel distance a regionalized training center should expect to draw from is a 275-mile radius.

Employers would be most interested in subjects that were the core program of past wood products at Haywood Community College, including training for lumber inspectors, sawyers, and saw filers. Millwrighting was surprisingly only ranked fourth in employers' interest in sending or hiring employees to or with specific training. This is in contrast to the high projected demand for individuals with millwrighting skills as seen by the projected replacement levels in the next 5 years. It is therefore recommended that any new training program for employees include millwrighting as an area of concentration.

Employers were willing to help educate grade and high school youth in opportunities in the forest products industry and help recruit students in their local area. Recruitment of students for training programs by educational institutions has proven to be one of the biggest obstacles of having successful training programs in the forest products industry in the past. A key part of having a successful training program in the future will be for the institution to capitalize on the industry's willingness to educate grade and high school youth in the opportunities in the forest products industry and help recruit students in their local area by coordinating and mobilizing recruitment efforts.