An Educational Needs Assessment of Workforce Supply and Readiness in Maine's Forest Products Industry

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Abstract

A combination of youth out-migration and lack of in-migration have led to an aging workforce and population decline in Maine, whereas simultaneous declines in pulp and paper demand and biomass utilization have had negative impacts on the perceived future of the once-dominant forest products industry. These changes may increase uncertainty among employers as to the availability and training of the next generation of forest industry workers. This study reports our findings from an analysis of workforce supply and readiness in Maine's forest products industry. To estimate possible gaps in skills and work culture, we administered a survey to current forestry students and employers in the forest products industry. Skills were assessed in three domains: soft skills, knowledge skills, and technical skills. Our gap analysis focused on the difference between the stated importance of skills to employers and the current level of skill knowledge in the workforce across all three domains. Employers identified dealing with change, motivating personnel, negotiating contracts, problem solving, and financial analysis as the top educational needs. In addition, we assessed the willingness of students to accept the culture of work within the forest products industry. Despite the anecdotes shared by employers, we did not find significant evidence of a work culture mismatch between current students and their potential future employers. We recommend that gaps related to regulations, certification standards, or log scaling be addressed through workshops or on-the-job training, whereas areas such as customer relations, marketing, or problem solving could be emphasized in academic curriculum.

The forest products industry in the United States has been in a state of transition since the 1990s because of multiple factors, including global trade, shifts in demand, technological changes, and changing ownership structures (Woodall 2011). These industry adjustments are highly visible in Maine, where the shift in private land ownership structures from vertically integrated companies to timber investment management organizations and real estate investment trusts has transformed forest production and management (Jin and Sader 2006, Bliss et al. 2010). Furthermore, changes in pulp and paper markets have led to substantial mill closures. In the 8 years between 2008 and 2016, 10 mills closed in Maine, half of which were along the Penobscot River, which runs through the heart of the state (Lustig 2016).

Although the forest products industry has been affected by these changes, Maine remains poised to support a thriving forest-based economy. Comprised of 17 million acres of land, the forest covers 89 percent of the state (Butler 2018). Maine's forest products industry generated US$8.5 billion in sales and supported 33,538 jobs directly and indirectly in 2016 (Crandall et al. 2017). With 90 percent of forests privately owned and over half independently certified to sustainability standards, Maine has ample supply and proximity to the eastern seaboard, one of the largest consumer demand markets in the world (FOR/Maine 2018). Recent upgrades and investments by Nine Dragons, Pleasant River Lumber, Sappi, and Verso have revitalized remaining mills, and the historical legacy of the industry in the state, both pulp and paper and sawmilling, presents numerous opportunities for infrastructure reuse and colocation across the state. Maine has great potential as a location of emerging and advanced wood materials such as biofuels or nanomaterials (FOR/Maine 2018, Maine Center for Business and Economic Research [MCBER] 2019).

These changes in product demand in forest industries have resulted in shifting employment opportunities. These shifts are both technological and geographic; technological changes may shift the skills needed in labor supply, whereas the concentration of mills lost in specific regions of the state (e.g., the loss of pulp and paper production in central Maine) may lead to geographic shifts in labor demand. These forces may result in a skills mismatch between what's needed in the workforce and what potential employees possess, or a spatial mismatch between the current supply and demand for industry labor. These mismatches may be exacerbated in areas with a higher concentration of older workers, as in northern and central Maine, due to population stagnation and youth out-migration leaving the state with an aged or aging workforce (Vail et al. 2019). Maine has the highest percentage of baby boomers of any US state and young people continue to migrate out of state (Governor's Office of Policy and Management [GOPM] 2016). With limited population growth as an economic driver, the state and the forest products industry need to ensure efficient allocation of labor, along with attracting younger workers and out-of-state skilled labor to join or stay in the workforce. This task is made more complicated by the recent shifts affecting the industry. In addition to Maine having one of the highest rates of economic contributions of the forest products industry in the country at 4.96 percent of gross state product (Crandall et al. 2017), it is also an excellent example of the challenges currently facing employers in the forest products industry nationally. This backdrop of shifting global demands and technologies, changing demographics, and the high spatial concentration of closures some areas are experiencing has led to complications in finding an equilibrium between workforce supply and demand.

In states with substantial forest products industries, researchers have used questionnaires to assess how well workforce skills match industry needs. The assessments can help guide both education and training programs by identifying current gaps between industry need and worker readiness. Previous workforce assessments have been conducted in Oregon, Virginia, Louisiana, Alaska, and Minnesota (Hansen and Smith 1997, Vlosky and Chance 2001, Thomas et al. 2005, Reeb et al. 2009, Espinoza et al. 2012), but not in Maine to our knowledge. Additionally, past studies have focused solely on labor demand responses from employers, and have not considered student self-assessment of skills, nor looked at potential new areas of mismatch such as work culture. Stakeholders in Maine have expressed concern that gaps in work culture expectations may be a source of disconnect between labor supply and demand.

This study establishes a baseline of information on workforce needs and skills for Maine at a time of significant challenges and adds to the body of work on workforce assessments in the forest products industry by expanding the scope of the assessment. Rather than rely exclusively on industry needs, we incorporated forestry student responses in the analysis, categorized skills into domains, and added a section to assess work culture expectations for both employers and future employees. We had the following objectives: (1) evaluate the educational needs of the forest products industry in Maine, (2) identify gaps in soft skills, knowledge skills, and technical skills between labor supply and demand, (3) identify gaps in work culture between labor supply and demand, and (4) develop recommendations that will reduce mismatches among the forest products industry labor supply and demand.

Methods

Sampling

A questionnaire, similar to those assessing the needs of Oregon's forest products industry in 1995 and 2007 (Hansen and Smith 1997, Thomas et al. 2005) as well as Minnesota's forest products industry in 1997 (Bowe et al. 1999), was developed and administered in collaboration with industry partners from March to May of 2017. Distribution of paper questionnaires took place at industry meetings, and an electronic version created using Qualtrics software was shared through email lists. Organizations aiding in questionnaire distribution included the Maine Forest Products Council, Professional Logging Contractors of Maine, Forest Resources Association–Northeast, and Northern Forest Products Industry Cluster. To collect data from future employees, the electronic version of the questionnaire was also distributed in May 2017 to students 18 years of age and over in forestry-related education programs at multiple levels in Maine: four regional career and technical education (CTE) high schools that have forestry or logging programs (Dyer Brook, Farmington, Mexico, and South Paris), the University of Maine at Fort Kent, which offers a Society of American Foresters (SAF)-accredited associate's degree in applied forest management, and the University of Maine, which offers SAF-accredited bachelor's and master's degrees in forestry and a bachelor's in forest operations, bioproducts, and bioenergy. The student version of the questionnaire mirrored the employer version.

The employer questionnaire was emailed to 925 individuals and paper versions were distributed to 100 people in person at regional meetings. We received a total of 177 responses for an employer response rate of 17 percent. The email distribution lists for this study had members spanning the entire Northeast region. We anticipate that our low response rate is due to many recipients operating outside of Maine's forest products industry. However, our response rate is comparable with that of Reeb et al. (2009) and our total number of respondents is consistent with previous workforce assessments (Brown and Niemiec 1997, Vlosky and Chance 2001, Thomas et al. 2005, Espinoza et al. 2012). All student responses were collected electronically. High school students completed the questionnaire at the annual CTE Loggers' Meet, whereas university students received the survey link via email from an instructor. We received responses from 35 of the 66 students invited to participate, for a student response rate of 53 percent.

Questionnaire design

This questionnaire was based on the discrepancy method initiated by Borich (1980), later used by Bratkovich and Miller (1993), and advanced by Hansen and Smith (1997), establishing it as the standard method for measuring educational needs in the forest products industry. Forest products industry professionals were asked to rate, on a Likert scale of 1 to 5 where 1 is low and 5 is high, both the importance to their company and the current employee knowledge of various skills. From these scores employer educational need was calculated as:

$$\text{Educational need} = (\text{importance rating} - \text{knowledge rating}) \times \text{mean importance rating}$$

Students were asked to rate, using the same scales and skill lists, how important each skill was to the forest products industry, and their current level of knowledge for each skill.

The 34 skills were grouped into three major domains: soft skills, knowledge skills, and technical skills. In addition, we explored five aspects of work culture relevant to the forest products industry that stakeholders felt might be an emerging area of mismatch between potential employees and employers: living remotely in the field, requiring extended absences from home, working in areas without cell phone coverage, living without internet, and working nontraditional hours (defined here as outside of 7 a.m. to 6 p.m.).

Data analysis

Employer educational need was calculated for each of the skills using the previously described equation. To understand potential mismatches between employers and potential employees, a gap analysis assessed the difference between the stated importance to employers and stated student knowledge of skills or acceptance of work culture using an independent sample t test with a P value of 0.05. Analysis was conducted using IBM SPSS Statistics 25 software.

Results

Demographics

Employer respondents ($n = 177$) were primarily from the logging and trucking industry (24%) followed by pulp and paper (18%) and softwood lumber (17%). The firm size of respondents was dominated by large companies with over 50 employees (46%). The next largest groups of respondents were from firms with fewer than 10 employees (27%) and 20 to 50 employees (23%), with just 4 percent of respondents employed at companies with 10 to 19 employees. Middle managers made up 35 percent of respondents, followed closely by owners (32%) and upper management (21%); 5 percent of respondents identified as entry level, and 7 percent other. The number of years respondents had worked for their current employer ranged from 1 to 40, with an average of 17 years.

Student respondents ($n = 35$) were comprised of 47 percent from Maine and 41 percent from the remainder of the northeast United States; 12 percent did not indicate their home state. Ninety-six percent of student respondents plan to look for a job in the forest products industry now or in the future, demonstrating a high level of attachment to the industry. Students articulated a strong desire to remain in the state after completion of their educational programs. When asked why they chose to pursue a forest resources education, one student respondent stated, "My love of the outdoors drove me to this education and learning about forests has kept me here." Another student wrote, "I grew up in Maine and would like to be a part of keeping Maine's forests healthy."

Educational needs of the Maine forest products industry

On the basis of employer-rated level of importance and current employee knowledge of 34 skills, we calculated the Maine forest products industry educational needs (Table 1). Of the three skill domains measured, employers ranked soft skills among the highest educational need, followed by

Table 1.—Ranked mean educational need of 34 subject areas based on 177 Maine forest products industry respondents. Educational need is defined as (importance rating – knowledge rating) × mean importance rating using a scale of 1 (low) to 5 (high).

Skill[a]	Educational need	Domain	Rank
Dealing with change	4.71	Soft skills	1
Motivating personnel	4.33	Soft skills	2
Negotiating contracts	3.93	Soft skills	3
Problem solving	3.52	Soft skills	4
Financial analysis	3.46	Technical skills	5
Customer relations	3.17	Soft skills	6
Marketing	2.96	Knowledge	7
Presentation and public communication	2.88	Soft skills	8
Public relations	2.55	Soft skills	9
Finding market information	2.45	Knowledge	10
Product pricing and distribution	2.16	Knowledge	11
Inventory, quality, and process control	2.09	Knowledge	12
GIS/mapping	2.07	Technical skills	13
Sales	2.06	Soft skills	14
Safety	1.98	Knowledge	15
Regulations	1.97	Knowledge	16
Remote sensing/LiDAR	1.78	Technical skills	17
Using growth and yield models	1.78	Technical skills	18
Developing business plans	1.60	Knowledge	19
Office programs	1.52	Technical skills	20
Technical writing	1.50	Technical skills	21
Log scaling and tree quality	1.42	Technical skills	22
Wood properties and quality	1.37	Knowledge	23
Promotion	1.35	Soft skills	24
New product development	1.32	Technical skills	25
Certification standards	1.27	Knowledge	26
Creating harvest plans/silviculture	0.46	Technical skills	27
Implementing harvest plans/silviculture	0.45	Technical skills	28
Harvesting equipment operation	0.44	Technical skills	29
CAD/CAM/CNC	0.30	Technical skills	30
Sawing technology	0.16	Technical skills	31
Recreation use management	0.13	Soft skills	32
Lumber grading	−0.04	Technical skills	33
Tree felling	−0.74	Technical skills	34

[a] GIS = geographic information system; LiDAR = light detection and ranging; CAD = computer aided design; CAM = computer aided manufacturing; CNC = computer numerically controlled.

knowledge areas. Technical skills dominated the bottom of the list in terms of ranking of employer needs. The top five skills with the highest educational need as indicated by employers were dealing with change, motivating personnel, negotiating contracts, problem solving, and financial analysis.

Gap analysis of skills and knowledge

In examining potential gaps between the stated importance to employers and student's self-assessment of current knowledge, 15 of the 34 skills (44%) were found to have no gap between employer importance and student knowledge, or were ranked lower by employers than students (Table 2). Just over half of the skills assessed, 19, or 56 percent, showed a significant gap between employer need and student competence, with 16 having medium (>0.5) or large (>0.8) effect sizes. Mismatched skills were found primarily among the soft skill and knowledge domains. However, of

Table 2.—Skill gap analysis of 34 skills using independent sample t tests to compare the stated importance of each from 177 forest products industry employers and current knowledge of each from 35 forestry students in Maine using a scale of 1 (low) to 5 (high).

Domain	Skill[a]	Mean employer importance	Mean student knowledge	Mean difference[b]	Effect size
Soft skills	Negotiating contracts	4.28	2.44	1.839***	1.78
	Customer relations	4.32	2.97	1.354***	1.37
	Sales	3.70	2.71	0.991***	0.86
	Promotion	3.22	2.53	0.691***	0.65
	Problem solving	4.65	3.97	0.680***	0.87
	Motivating personnel	4.22	3.56	0.662**	0.65
	Recreation use management	2.80	3.48	−0.686**	0.59
	Dealing with change	4.38	3.85	0.535*	0.53
	Public relations	4.07	3.82	0.247	0.24
	Presenting	3.84	3.74	0.101	0.10
Knowledge	Marketing	3.86	2.30	1.556***	1.34
	Finding market information	4.13	2.61	1.528***	0.01
	Regulations	4.54	3.21	1.326***	1.50
	Product pricing and distribution	3.71	2.67	1.042***	0.87
	Inventory and quality control	3.89	3.03	0.863***	0.72
	Certification standards	3.92	3.12	0.801***	0.73
	Wood properties and quality	3.96	3.45	0.509*	0.46
	Developing business plans	3.35	3.09	0.263	0.22
	Safety	4.62	4.38	0.249	0.30
Technical skills	Creating harvest plans	4.07	3.61	0.460*	0.37
	Financial analysis	4.08	2.73	1.351***	1.17
	Implementing harvest plans	4.07	3.21	0.860***	0.67
	Log scaling and tree quality	3.97	3.33	0.635***	0.55
	Office programs	3.87	3.42	0.442	0.39
	GIS/mapping	3.91	3.48	0.429	0.36
	Using growth and yield models	3.28	2.94	0.338	0.25
	Technical writing	3.57	3.27	0.293	0.24
	Remote sensing/LiDAR	3.00	2.75	0.250	0.19
	New product development	2.88	2.70	0.182	0.14
	CAD/CAM/CNC	2.14	2.18	−0.042	0.03
	Lumber grading	2.63	2.88	−0.248	0.19
	Harvesting equipment operation	3.21	3.52	−0.303	0.21
	Sawing technology	2.31	2.85	−0.537	0.37
	Tree felling	2.63	3.97	−1.339	0.97

[a] GIS = geographic information system; LiDAR = light detection and ranging; CAD = computer aided design; CAM = computer aided manufacturing; CNC = computer numerically controlled.

[b] * = $P < 0.05$; ** = $P < 0.01$; *** = $P < 0.001$.

these 19 mismatch skills (Table 3), students only indicated an average knowledge level of less than 3 on a 5-point scale for 8 of the skills: sales, promotion, negotiating contracts, customer relations, finding market information, marketing, product pricing, and financial analysis. For the remaining 10 mismatched skills, the mean student response was above 3, which was interpreted as indicative of an emerging skill or knowledge.

Gap analysis of work culture

Despite perceptions that younger generations are less willing to accept conditions required in many natural resource jobs, we did not find evidence of a work culture mismatch in our gap analysis (Fig. 1). In fact, students indicated an overall high willingness to accept characteristics of forestry-related work culture we assessed, whereas many of the "traditional" features of woods or forest products industry work were rated as low in importance by employers, including extended absences from home, living remotely, and living without internet. There was no statistical difference between employer importance and student acceptability responses to working in areas without cell phone coverage.

Discussion

The forest industry across the country is struggling with an aging workforce and difficulties filling jobs and attracting young workers (MCBER 2019); Maine is not unique in experiencing this. Whereas previous workforce assessments of the forest products industry identified high educational needs in specific forestry-related technical skills in Oregon, Alaska, and Virginia (Thomas et al. 2005, Reeb et al. 2009, Espinoza et al. 2012), our results indicated that soft skills and knowledge domains dominate the highest areas of educational need as indicated by employers. This may indicate that natural-resource-based fields have become less specialized than in the past, that Maine's industry has fewer specific needs for particular technological skills than other states, or that forestry-related programs are successfully equipping students with the appropriate technical skills needed in the field. One student respondent wrote that the most useful aspect of the program was "all of the knowledge geared towards the industry, networking, [and] internship opportunities."

Although a little more than half of the 34 skills assessed in the gap analysis were found to have mismatches, students already have an emerging knowledge base (rated a 3 or
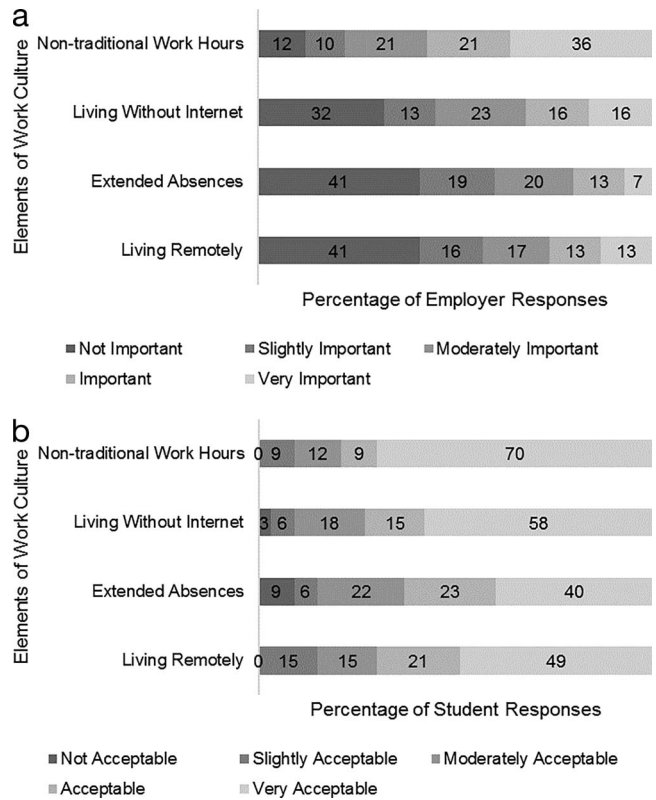
Table 3.—Mismatched skills from a gap analysis using independent sample t tests comparing the stated importance of 34 skills.

Domain	Emerging student knowledge (mean response > 3)	Limited student knowledge (mean response < 3)
Soft skills	Problem solving	Negotiating contracts
	Motivating personnel	Customer relations
	Dealing with change	Sales
		Promotion
Knowledge	Regulations	Marketing
	Inventory and quality control	Finding market information
	Certification standards	Product pricing and distribution
Technical skills	Wood properties and quality	Financial analysis
	Creating harvest plans	
	Implementing harvest plans	
	Log scaling and tree quality	

Figure 1.—Comparison of work culture elements stated importance to forest products industry employers and acceptability to forestry students in Maine.

higher for mean knowledge level) in 10 of the skills. We suggest that these gaps between worker level of knowledge and employer need may be closed through formal or informal training. For example, skill development in regulations, certification standards, or log scaling could be broadened through participation in workshops or targeted on-the-job training specifically addressing these important (and changing) topics. The most pressing areas for focus among educational institutions are those in which students rated below 3 for mean knowledge level and employers rated as a high importance. These are areas where the future labor supply may be least prepared to meet the needs of employers in the forest products industry. Bolstering coursework to include additional aspects of customer relations, marketing, or financial analysis could strengthen the skill sets of students and improve their readiness to enter the labor market. Determining how to offer these types of skills in a hands-on way is likely to be welcomed by students. One student respondent indicated that the least favorite aspect of the program was ''classes that should have a lab not having one.''

Perceptions that youth are unwilling to accept conditions traditionally associated with forest-related jobs were not supported by this study. This, in combination with the surprising lack of importance placed on traditional work conditions by employers, refutes the idea expressed by stakeholders that a work culture mismatch may be driving some of the difficulty in attracting and retaining labor in the industry. On the contrary, conditions associated with the forest products industry appear to be attracting students. A student respondent stated that a favorite aspect of the program was ''working outside and being able to see first-hand accounts from professionals in the industry.'' Another student wrote that the most useful aspect of the program was ''the hands-on experience, being able to have multiple classes out in the field.''

Although many resource-dependent counties are experiencing population decline, our student respondents indicated a high level of acceptance to live in remote, forested places. Additionally, students had a high level of acceptability of living in areas without cell phone coverage—which perhaps is not surprising since large swaths of Maine are not generally covered by wireless providers. Connecting young workers to the rural places where much forest industry work takes place could have a cascading series of benefits. The

pool of potential new in-migrants could be a boom to many communities struggling with population decline. They could also provide a continuity of labor that is needed in the industry, and the skills needed to adapt to a possible future industry that incorporates new technologies or processes. Sense of community is a draw for young workers, as one student respondent wrote that a favorite aspect of the program was ''the community—if something isn't going well, somebody will notice and help you out. On the flip side, if you're struggling, you can find help easily by asking almost anyone.''

Although our assessment was targeted toward the skills and workforce within the forest products industry, one interesting finding was the consistent importance of soft skills not specific to forestry or forest products manufacturing, such as dealing with change or problem solving. Developing these soft skills in current students and young workers would have the benefit of better meeting the needs of the current industry, while also increasing competencies that would serve students well in the broader economy that is dynamic and susceptible to change. These skills, some of which reach beyond the scope of the forest products industry, could also be utilized in other sectors, leading to more resilient populations and economies in rural communities.

Limitations and future research

Overall, our results provide both some refutation and some confirmation of the difficulties of matching labor

supply to labor demand in resource-dependent industries, particularly those in remote or rural areas or places with declining population. However, the findings of this study should be considered in light of some limitations. Our low response rate may be explained by the fact that we distributed our questionnaire through professional organizations with a broad geographic reach. We likely encountered recipients beyond our target population of Maine's forest products industry. The second limitation is our analysis of high school and college students as a single population. Though the high school programs are certified as CTE and designed to prepare students for the workforce similar to college coursework, schools would garner more insight to their specific population needs if analyzed uniquely. Unfortunately, this may not be statistically possible because of the low numbers of high school students enrolled in forestry-related programs. Third, these data are limited in that the information is self-reported by employers and students and based on their perceptions rather than observation, testing, or other means of assessing proficiency. Finally, one potential source of the difficulty in linking young workers with the forest industry might not be with mismatches in skills and expectations of current students but rather that the pool is too small. It may be that not enough students are entering the forestry education pipeline. Students appear aware of this anomaly as well. One student respondent wrote that they are pursuing a career in forest resources ''to make a difference in a field of work that is interesting and seems to be declining in interest.'' Our assessment focused on current forestry students, who have to some extent self-selected into the field. Although enrollment in the forestry program at the University of Maine steadily increased from 2009 to 2016, it is possible that we are missing the perspectives of students not attracted to the industry, and that the total number of students is still inadequate to meet current labor demand.

Our study has established a baseline for workforce needs and skills in Maine. Although our results are somewhat different from previous assessments in other states in finding more gaps in soft skills than technical skills, they also point to areas where educational programs can improve the workforce readiness of current forestry students. We did not find evidence of a work culture mismatch, a concern of many stakeholders. This study lays the groundwork for future development of the gap analysis and investigation into other potential sources of mismatch, such as work culture, and continuing assessment of the success of the industry at efficiently matching labor supply and demand in a changing world.

Acknowledgments

Literature Cited

Bliss, J. C., E. C. Kelly, J. Abrams, C. Bailey, and J. Dyer. 2010. Disintegration of the US industrial forest estate: Dynamics, trajectories, and questions. *Small-Scale Forestry* 9(1):53–66.

Borich, G. D. 1980. A needs assessment model for conducting follow-up studies. *J. Teach. Educ.* 31(3):39–42.

Bowe, S., R. Smith, J. Massey, and E. Hansen. 1999. A methodology for determining extension constituent needs: A case analysis in the forest products industry. *J. Ext.* 37(4).

Bratkovich, S. M. and L. E. Miller. 1993. Perceived educational needs of innovative Ohio sawmill operators. *Forest Prod. J.* 43(3):35.

Brown, T. D. and S. S. Niemiec. 1997. Survey of the training needs in Oregon's lumber manufacturing industry. *Forest Prod. J.* 47(1):29.

Butler, B. J. 2018. Forests of Maine, 2017. Resource Update FS-160. USDA Forest Service, Northern Research Station, Amherst, Massachusetts. 3 pp.

Crandall, M. S., J. L. Anderson, and J. Rubin. 2017. Impacts of recent mill closures and potential biofuels development on Maine's forest products industry. *Maine Pol. Rev.* 26(1):15–22.

Espinoza, O., R. Smith, S. Lyon, H. Quesada-Pineda, and B. H. Bond. 2012. Educational needs of the forest products industry in Minnesota and Virginia in 2012. *Forest Prod. J.* 62(7–8):613–622.

FOR/Maine. 2018. Vision and roadmap for Maine's forest products sector. https://formaine.org/wpcontent/uploads/2019/04/FORMaine_Report_DL_041119.pdf. Accessed August 7, 2019.

Governor's Office of Policy and Management. 2016. Maine population outlook to 2034. https://www.maine.gov/economist/projections/pub/Population%20Outlook%20to%202034.pdf. Accessed November 13, 2016.

Hansen, E. and R. Smith. 1997. Assessing educational needs of the forest products industry in Oregon and Virginia. *Forest Prod. J.* 47(4):36.

Jin, S. and S. A. Sader. 2006. Effects of forest ownership and change on forest harvest rates, types and trends in northern Maine. *Forest Ecol. Manag.* 228(1):177–186.

Lustig, A. 2016. A rift in the woods: The forces pulling apart the lives of Maine's iconic loggers. *Bangor Daily News.* http://mainefocus.bangordailynews.com/2016/12/a-rift-in-the-woods/#.XU9pzuhKg2w. Accessed February 26, 2017.

Maine Center for Business and Economic Research (MCBER). 2019. Maine logger and log trucker employment availability and wage analysis report executive summary. http://maineloggers.com/new/wp-content/uploads/2019/03/Professional-Logging-Contractors-of-Maine-Occupational-Wage-Analysis_final-1.pdf. Accessed August 7, 2019.

Reeb, J. E., S. Leavengood, and C. Knowles. 2009. Needs assessment of the Oregon forest products industry. *Forest Prod. J.* 59(4):35.

Thomas, J., E. Hansen, and A. M. Brackley. 2005. An assessment of educational needs in the Alaskan forest products industry. *Forest Prod. J.* 55(9):19.

Vail, D. J., D. Moreland, and M. Wilson. 2019. Reshaping Maine woods destinations for twenty-first-century tourists. *Maine Pol. Rev.* 28(1):28–37.

Vlosky, R. P. and N. P. Chance. 2001. Employment structure and training needs in the Louisiana value-added wood products industry. *Forest Prod. J.* 51(3):34–41.

Woodall, C. W., P. J. Ince, K. E. Skog, F. X. Aguilar, C. E. Keegan, C. B. Sorenson, and W. B. Smith. 2011. An overview of the forest products sector downturn in the United States. *Forest Prod. J.* 61(8):595–603.