### A Long-Term Monitoring Program to Assess the Northern Forests Logging Industry Health

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 Strong connections were made to the logging community through this research and although the contractors are diverse and strongly independent, they face similar challenges throughout the region related to logging capacity, rising costs, and changing demographics.

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# **Project Summary**

The forest resources industry is an integral part of the economy, ecology, and culture of the Northern Forest region of New York, Vermont, New Hampshire, and Maine. The forest products manufacturing industry provides over 92,000 jobs and \$14.4 billion to the region (NEFA 2007). The logging sector of the forest resources industry provides significant employment to rural communities in addition to harvesting and transporting this valuable and renewable resource to processing facilities. Despite the importance of the logging sector, there have been relatively few studies in recent years that focused on logging businesses, and as noted by Egan et al. (2006), there are many hidden costs in timber harvesting and barriers to production. A labor shortage and an aging workforce have been projected for the logging industry, and numerous studies have been conducted to address recruitment (Pan Atlantic/Irland Group 1999, Egan & Taggart 2004, Egan 2005, Egan 2009). Based on a survey of logging business owners across the states of the Northern Forest, this report will describe business attributes and harvest operation details with an emphasis on existing logging infrastructure. This study is a baseline for future, periodic surveys that can be used to analyze trends in the logging industry, and a tool for logging contractors, policy makers, or professional organizations to identify areas for improvement in forest operations.

# **Background and Justification**

### **The Northern Forest Region**

- The Northern Forest is a 26 million acre area across New York, Vermont, New Hampshire, and Maine.
- The forest resources industry is a substantial contributor to the region's economy and culture.
- The logging sector of the forest resources industry provides significant employment to rural communities.
- Despite the importance of the logging sector, there have been relatively few studies in recent years that focus on logging businesses.



Northeastern States Research Cooperative (http://nsrcforest.org/about-nsrc, 1/27/2013).

# **Background and Justification**

### Significance of the Logging Industry

- Forest-based manufacturing shipments contribute \$14.4 billion to the region's economy and employ over 92,000 people with approximately 11,000 people employed in the logging sector
- Employment in this sector provides valuable jobs to people in rural communities where other jobs are not always available.
- Maine loggers harvest more than half of all wood products in the region, most likely due to higher levels of mechanization and larger forest tracts in the state.
- Maine and New Hampshire are the most mechanized of the New England states.
- Logging businesses in New York have reported the estimated market value of their equipment, but particular pieces in operation were not a part of the study.
- Logging industry studies performed in the Northeast have not been focused on the equipment infrastructure for timber harvesting and transportation and previous studies did not compare the number of loggers by harvest system and volume produced.



# **Background and Justification**

### **Challenges of the Logging Industry**

- Previous studies indicate that loggers enjoy working in the outdoors, have a sense of independence, and find satisfaction using skills to perform a task or meet a challenge.
- Although loggers reported that their profession was not understood or appreciated by the public, the average public perception of logging was that it involves skilled work.
- Loggers were found to strongly prefer on-the-job training with safety and equipment maintenance as the top training priorities.
- The business environment for logging contractors has also been the subject of previous studies with regard to regulatory climate, volatile fuel costs, increasing equipment costs, and low mill prices. Further, poor weather conditions, poor road conditions, breakdowns, and moving equipment were found to be the most prevalent causes of limiting production.
- Although previous studies have provided some information regarding logging capacity and the proportion of mechanized, conventional, and small-scale logging operations, it does not cover the entire Northern Forest region.



## Rationale & Objectives

- There is no single agency or organization in the Northern Forest region that collects and analyzes data related to logging businesses on a regular basis. Professional logging associations in each state advocate for their members and they undoubtedly collect data about forest operations, but there is not a coordinated effort across the entire region.
- In order to identify trends in key areas for the logging sector in the Northern Forest region, a repeatable, cohesive assessment of logging businesses is needed. A study of logging business owners across the region provides valuable insight into the business attributes, productivity, and limitations of forest operations.
- The objective of this study is to develop a baseline dataset of logging industry metrics for the Northern Forest region to better understand business attributes, business owner demographics, harvest methods, production and capacity, and equipment infrastructure.

# Approach

- Surveys completed in two phases: I) Maine;
  II) New Hampshire, New York and Vermont
- Both surveys were designed following the Dillman Tailored Design Method.
- Question design was intended to ensure comparability to previously distributed surveys and repeatability for future studies.
- Multiple choice, Likert scale, and check list questions were used to minimize written responses, shorten time to complete the survey, and enable quantitative analysis of responses.
- Open-ended, written response questions were included to gather individual qualitative information that would not otherwise be available through the preceding question types.





## Results

- Phase I & II Results
  - Response Rates
  - Demographics and Business Attributes
  - Harvest Production and Capacity
  - Logging Equipment
    Infrastructure
  - Training Needs



## Results – Response Rates

- Similar response rates to other surveys in the logging industry
- Response rate in Maine represents
  30% of the volume harvested in 2010.
- Decreasing response rate with increased distance from UMaine suggests future studies to engage researchers from other states.



State	ME	NH	VT	NY	All
Number of Respondents	209	22	99	94	424
Response rate	20%	17%	13%	9%	17%

## **Results – Demographics**



## **Results – Demographics**



## Results – Demographics Year of establishment



## **Results – Demographics**



## Results – Demographics Motivations for Logging





ME

NH



VT



### Information Sources within the Industry

Organization	ME (n=309)	NH (n=44)	VT (n=86)	NY (n=97)
Northeastern Loggers' Association	29	13	27	43
Northeast Master Logger Certification Program	44	2	4	1
Forest Resources Association	18	3	1	1
Maine Certified Logging Professional	168	1	-	-
Professional Logging Contractors of Maine	34	-	-	-
New Hampshire Timber Harvesting Council	-	19	2	-
Logger Education to Advance Professionalism	-	1	30	4
Vermont Woodlands Association	-	-	9	-
Empire State Forest Products Association	-	-	1	33
Other	16	5	12	15

Success and performance of harvesting was defined mostly by qualitative measures for all three harvest methods.



### Results – Harvest Production and Capacity Harvest Method by Frequency of Response

**NEW HAMPSHIRE** MAINE WT (40%) WT (38%) CTL (9%) . (10%) TL (53%) TL (50%) VERMONT **NEW YORK** CTL (12%) CTL (4%) WT (18%) WT (10%) TL (86%) TL (70%)

Tree-length harvests (manual felling and cable skidders) are the most common across the region based only on number of contractors.

### Results – Harvest Production and Capacity Harvest Method by Volume Reported

With the exception of New York, whole-tree harvesting dominates the industry based on volume produced.



### Results – Harvest Production and Capacity Harvest Method by Weekly Production



Harvest Method	Production, tons/week (cords/week)			
	Average	Median	<b>Standard Deviation</b>	
Tree-Length	81 (33)	60 (24)	49 (20)	
Cut-to-Length	256 (102)	150 (60)	182 (73)	
Whole-Tree	306 (123)	400 (160)	241 (96)	



# Results – Logging Equipment Infrastructure (Phase II only)

• 75% subcontracted a portion of trucking requirements



Distance to Mill	Average	Minimum	Maximum	Standard Deviation
Average (miles)	46	3	400	42
Maximum (miles)	124	20	600	87

# Results – Logging Equipment Infrastructure

(Phase II only)

- Each type of logging equipment from this survey, with the exception of the stroke delimber, includes machines with less than 1000 hours (or < 1 year old).</li>
- It is encouraging to find that at least some contractors have been able to reinvest into their businesses through significant capital purchases, but the average machine hours for each type of equipment is high.
- Even under an optimistic estimate of 2000 productive hours per year, it is clear that the logging businesses included in this survey are using equipment that is at least four to five years old on average.





# Results – Logging Equipment Infrastructure

(Phase II only)

- The very nature of repairs and maintenance on logging equipment is unpredictable.
- Although repair costs are expected to increase with machine hours, no such trend could be detected from the data collected in this study.
- Analysis by machine type did not find a significant relationship between machine hours and repair costs.
- Feller-bunchers and chippers had the widest range for repair and maintenance costs and they also had significantly higher costs than transportation equipment.







## Results – Training Needs

- 65% of respondents felt they have access to qualified loggers and operators due to:
  - quality reputation within the industry, hiring of family members, management style, employment benefits, work ethic
- Response differed by harvest method with whole-tree and tree length contractors at 73% and 60% respectively. Only 38% of cut-tolength contractors felt they had access to qualified operators

## Results – Training Needs

- 35% of respondents felt they do not have access to qualified loggers and operators due to:
  - lack of technical skills required, character of potential employees, long hours of work and low hourly rates in logging business, regulations and certifications

## Results – Training Needs

- 70% of respondents indicated there is a need for entry level training for in-woods workers with suggestions related to:
  - use of CLP as a base program, training on different types of equipment, basic forestry skills, "on-thejob" training

#### **Business Attributes and Business Owner Demographics**

- Logging businesses tend to be small companies and the business owners tend to be in a mature demographic. Across all states in this study 86% of logging businesses had five or fewer employees, 60% of business owners were greater than 50 years old, and over 50% of business owners have been in the logging industry for at least 30 years.
- Approximately 40% of business owners entered the industry without any familial attachment to logging and 20% of logging businesses were established since 2000.
- Business owners have a strong desire for independence and they enjoy their work, although many cited significant challenges associated with managing people and making a living in the logging industry. They judged their performance by their reputation in the industry, the quality of their work, and satisfaction of their clients.



#### **Harvest Production and Capacity**

- Tree-length harvest systems (chainsaw, cable skidder) are the most common system throughout the region in terms of frequency, but they rank last in total production.
- Production by harvest system is not uniform across the region. For example, 77% of production in Maine is by whole-tree systems compared to only 12% in New York.



#### Harvest Production and Capacity

- Average weekly production, in tons, was found to be significantly different among all three harvest methods (Tree-Length <100, Cut-to-Length >250, Whole-Tree >300) across all four states.
- Weather conditions were overwhelmingly cited as the most important limitation to achieving maximum production across all states and all business sizes. There was close agreement in regard to other top-rated limitations such as market price, mechanical breakdowns, road conditions, and mill closures and quotas.



#### **Equipment Infrastructure**

- Some logging businesses have made significant capital investments in new logging equipment, but on average harvesting machines have close to 7,000 hours and primary transportation equipment have over 10,000 hours.
- Using an optimistic estimate of 2,000 productive hours per year, it is clear this means that a lot of equipment in the industry is at least four to five years old.
- Repair and maintenance costs for logging equipment are highly variable and they are a function of more than simply machine hours.



# **Future Directions**

Information generated through this project will serve as a baseline for future surveys of loggers in this region. Researchers associated with this project have already begun detailed investigation of successful and innovative logging contractors through the support of NSRC – Theme 1. Results will be incorporated into a harvesting model (PATH) and a series of workshops in 2015.



## List of Products

#### Publications (Graduate Students Underlined; \* Denotes Peer-Reviewed)

- \*<u>Stone, I.J</u>., J.G. Benjamin, and J.E. Leahy. 2012. The Impact of Innovation on Biomass Supply in Maine's Logging Industry. *Forest Products Journal*. 61(7):579-585.
- \*<u>Stone, I.J</u>., J.G. Benjamin, and J.E. Leahy. 2011. Applying Innovation Theory to Maine's Logging Industry. *Journal of Forestry.* 109(8):462-469.
- Benjamin, J.G. 2013. Northeast Logging Survey Results (Part 2): Business Characteristics. The Cutting Edge June 2013. The Trust to Conserve Northeast Forestlands. 1p.
- Benjamin, J.G. 2012. Northeast Logging Survey Results (Part 1): Demographics. The Cutting Edge December 2012. The Trust to Conserve Northeast Forestlands. 1p.
- <u>Leon, B.</u> and J.G. Benjamin. 2013. A Survey of Business Attributes, Harvest Capacity and Equipment Infrastructure of Logging Businesses in the Northern Forest. The Northern Forest Logging Industry Assessment. University of Maine. Orono, ME. 29p
- Benjamin, J.G. 2012. University of Maine Research on the Northeast Logging Industry (Part 3): Biomass Innovations. The Cutting Edge - September 2012. The Trust to Conserve Northeast Forestlands. 1p.
- Benjamin, J.G. 2012. University of Maine Research on the Northeast Logging Industry (Part 2): Innovation Activities. The Cutting Edge – June 2012. The Trust to Conserve Northeast Forestlands. 1p.
- Benjamin, J.G. 2012. University of Maine Study Focuses on the Northeast Logging Industry. The Cutting Edge – March 2012. The Trust to Conserve Northeast Forestlands. 1p.
- <u>Stone, I.J.</u>, J.G. Benjamin, and J.E. Leahy. 2011. Case Studies of Innovation in Maine's Logging Industry: Preliminary Findings. Report to Project Participants. January 7.

## List of Products

#### **Presentations (Graduate Students Underlined)**

- Benjamin, J.G. 2013. Trends in the Northeast Logging Industry: Man, Machine and Money. 21<sup>st</sup> Loggers and truckers Convention – New Hampshire Timberland owners Association. Concord, NH. October 19, 2013.
- Benjamin, J.G. 2013. The University of Maine's iFOR Program: Innovative Forest Operations Research. Northeastern Loggers' Association Equipment Expo and Logger Workshops. Bangor, ME. May 17.
- Benjamin, J.G. 2013. Forest Business Planning Workshop NE Logging Industry Overview and Process Improvement. Vermont Forest Parks and Recreation Department. Essex Junction, VT. May 10.
- Benjamin, J.G. 2013. iFOR The University of Maine's Innovative Forest Operations Research Program. Northern Hardwood Research Institute Seminar Series. Edmundston, NB. April 10.
- Benjamin, J.G. and <u>B. Leon.</u> 2013. Northeast Logging Industry Assessment. Forest Resources Industrial Forum. Brewer, ME. April 4.
- Benjamin, J.G. 2012. Innovation in the Northeast Logging Industry. Society of American Foresters – Maine Chapter Fall Meeting. Forestry Innovations – Thinking Outside the Box, While Inside the Woods. Orono, ME. October 9, 2012.

## List of Products

#### **Presentations (Graduate Students Underlined)**

- Leon, B., J.G. Benjamin and J.E. Leahy. 2012. Maine's Logging Industry Assessment Survey Results. New England Council on Forest Engineering 2012 Workshop: *Insects and Diseases that Impact Our Forests & Reducing the Impact of Your Forest Road Network.* (Student Poster Session.) University of Maine, Orono, ME. March 5-6, 2012.
- <u>Leon, B.,</u> J.G. Benjamin and J. Leahy. 2012. Northern Forest Logging Industry Assessment: Preliminary Results. Eastern CANUSA Forest Science Conference. University of New Hampshire. Durham, NH. November 1-3.
- Benjamin, J.G. 2011. Developing a Monitoring Program to Assess the "Health" of Your Forest Operation. Forest Products Community Symposium: Striving, Thriving, or Just Surviving? Lyons falls, NY. November 9.
- Benjamin, J.G. and J.E. Leahy. 2011. Maine's Logging Contractor Survey Preliminary Results. Forest Resources Association Northeast Region Industrial Forum: *Harvest Capacity – Is it Adequate to Meet Maine Forest Industry Needs?* Bangor, ME. October 6, 2011.
- <u>Stone, I.J</u>., J.G. Benjamin, and J.E. Leahy. 2011. *The Impact of Innovation in the Logging Industry on Biomass Supply*. Woody Biomass Energy Research Symposium for the Northern Forest. University of Vermont. Burlington, VT. April 28-30.
- <u>Stone, I.J.</u>, J.G. Benjamin, and J.E. Leahy. 2011. *Application of Innovation Theory in Maine's Logging Industry: Development and Adoption of Harvesting Systems*. New England Regional Council on Forest Engineering 2011 Workshop: Forest Policy, Wildlife, and Soils. (1<sup>st</sup> place in Student Poster Session.) Orono, ME. March 7-8.