Evaluating the Growth Potential of the Maple Syrup Industry in the Northern Forest

Principal Investigator: Brian Chabot

Affiliation/Institution: Cornell University

Email: bfc1@cornell.edu

Mailing address: Little Rice Hall, Cornell University, Ithaca, NY 14850

Co-Principal Investigators: Michael Farrell, Richard Stedman

Affiliations/Institutions: Cornell University

Emails: mlf36@cornell.edu, rcs6@cornell.edu

Completion date: September 30, 2013

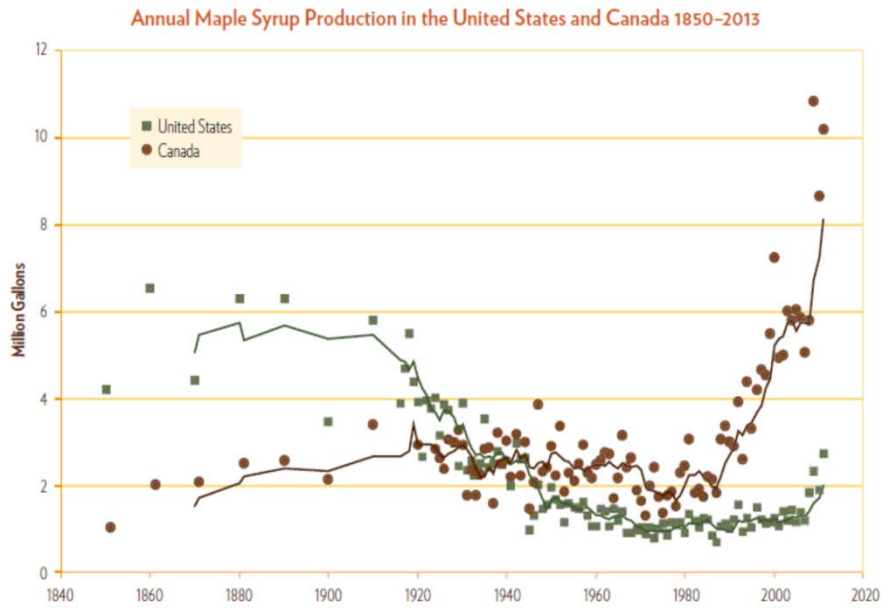
This project explored the growth potential of the maple syrup industry in the Northern Forest and the biologic, economic, and social factors that are affecting development of the maple resource for syrup production.

Funding support for this project was provided by the Northeastern States Research Cooperative (NSRC), a partnership of Northern Forest states (New Hampshire, Vermont, Maine, and New York), in coordination with the USDA Forest Service.
http://www.nsrcforest.org

Project Summary

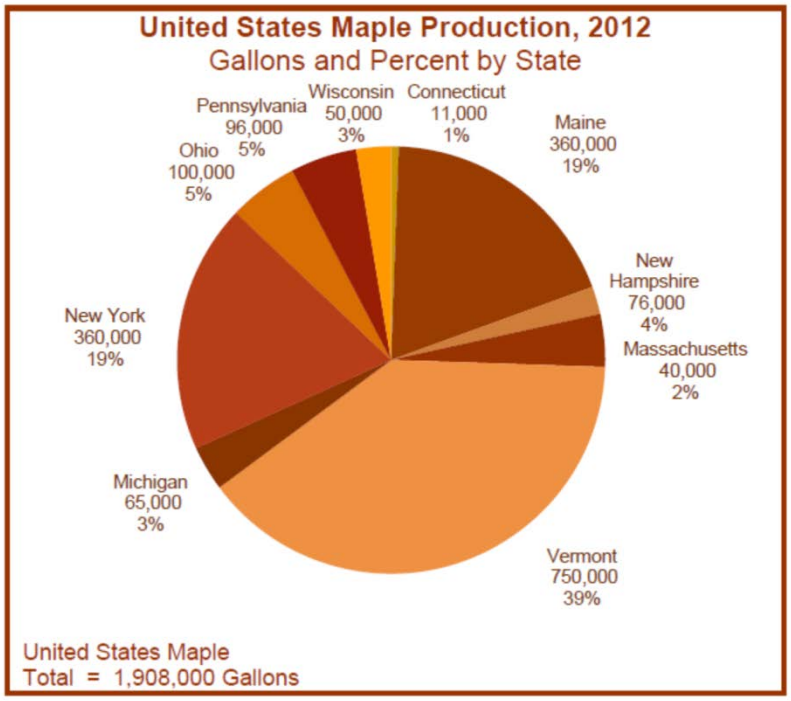
Maple sugar production is economically and culturally important for Northern Forest residents. Using forest inventory data and surveys of landowners, we documented a significant potential to expand this industry. With less than 1% of the available trees tapped for syrup production in the U.S., the maple resource is not a limiting factor to increasing production. USFS FIA data reveal an abundant maple resource throughout the Northern Forest region that could be tapped to expand syrup production. The density of maples within a stand is a much greater limiting factor than the distance of trees to an access road. Considering these factors, there are over 300 million potential taps from sugar and red maples in the Northern Forest region. Only 2.5% of all the optimal sugarbushes in the U.S. are tapped for syrup production, yet in Vermont this utilization rate is much higher at 27%. Despite the relatively low rate of tapping, a much higher percentage of landowners, especially those from the New England states, had positive attitudes towards utilizing their land for syrup production. Significant barriers identified by landowners included concern over the possible loss in sawtimber value from tapping, lack of personal interest and knowledge in the sugaring process, time and labor constraints, and not having enough accessible maple trees. Through development of a Net Present Value calculator that takes into account over 30 variables for an individual tree, we determined that leasing taps for a minimum of five years and then eventually harvesting the tree is the most profitable management strategy over the long-term for most situations. Our analysis of public policies revealed significant differences between states and provinces in government resources devoted to the maple industry in research, extension, and promotion, cost-sharing programs, policies for tapping on public land, and property tax programs that encourage syrup production. Overall, we feel the industry is poised for further expansion and that long-term pricing and profitability will be a major driving force behind the rate of growth.

Maple syrup production in North America since 1850



Sources: Statistics Canada. (2011, Dec. 14). Table 001-0008 – Production and farm value of maple products, annual (table). CANSIM (database) . Retrieved from http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0010008&pattern=maple&tabMode=dataTable&srchLan=-1&p1=1&p2=-1

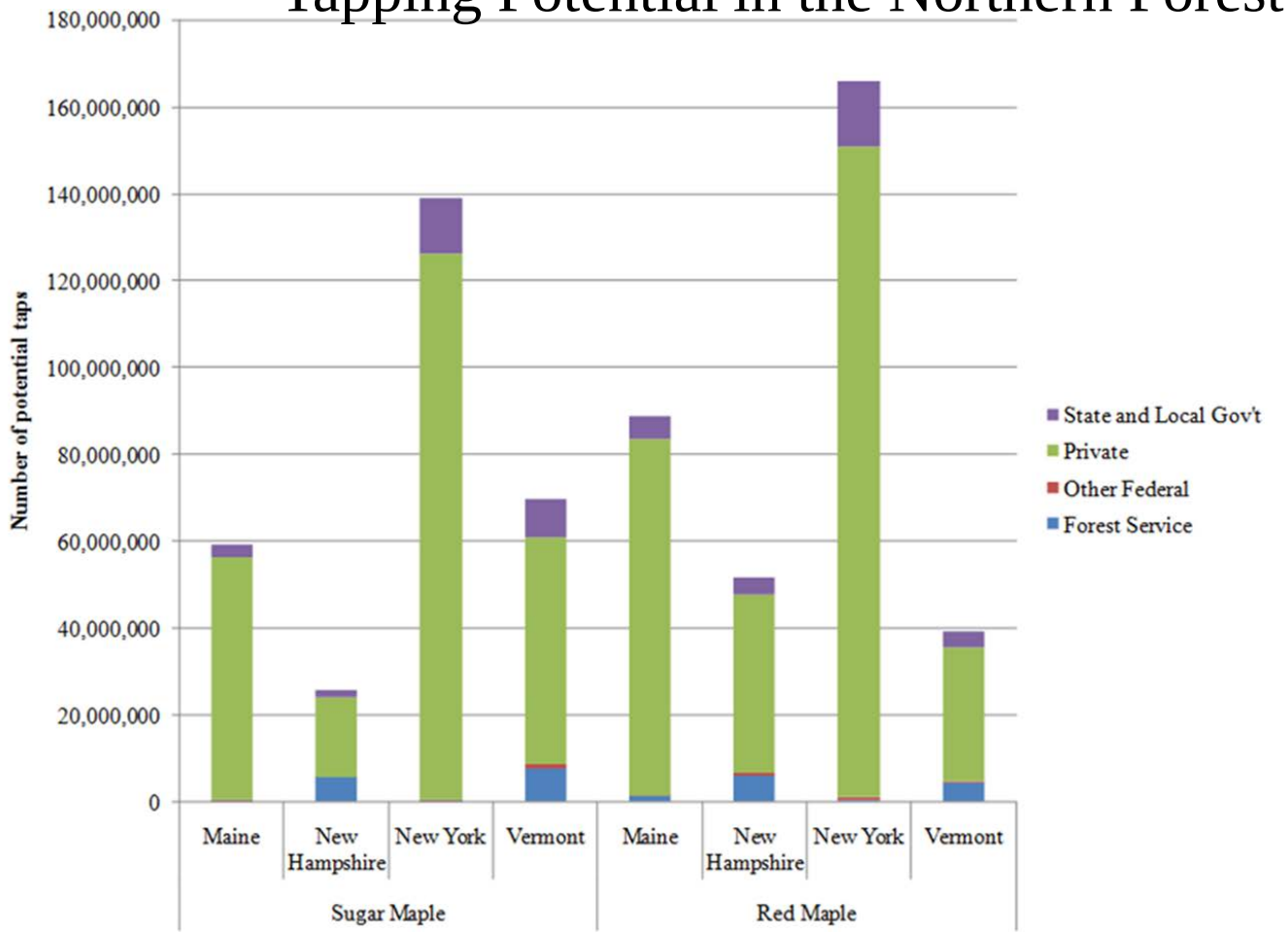
U.S. Department of Agriculture, Economic Research Service. (2011, June 10). *Table 43—U.S. maple syrup production, imports, exports, and prices, by calendar year* [Excel spreadsheet]. Retrieved from http://www.ers.usda.gov/briefing/sugar/data/table43.xls



The Northern Forest states produce nearly 80% of the maple syrup in the United States.

After maple syrup production fell throughout the 20th century in the U.S., it is now the fastest growing agricultural industry in the country. Following the trend established in Canada starting in the 1980s, maple producers in the U.S. are now expanding their operations to fill the growing demand for pure maple.

Tapping Potential in the Northern Forest Region



A strategy with high potential for success is to increase the number of trees that are tapped. Documenting the potential of the maple resource to increase production is a first step to expanding its use.

Preliminary estimates revealed an abundant resource of potentially tappable maple trees in the Northern Forest. Sugar and red maples are two of the most commonly occurring species in the region. One of our goals was to conduct further analysis to determine the percentage of tappable sugar and red maples that occur in stands of sufficient density and accessibility to merit tapping.

Economic tradeoff between tapping and sawtimber production

- Anecdotal reports indicate that many landowners and foresters are hesitant about tapping maples due to the negative effect it has on commercial sawtimber value
- Although tapped lumber can be sold in specialty markets for premium prices, the tapholes and associated stain columns are not desired in standard, commercial markets
- Further research is necessary to determine the extent to which this could limit the development of the maple industry for syrup production
- Additional analytical tools are required to help foresters and landowners determine when it makes more economic sense to utilize a maple tree for syrup or sawtimber production

Methods: Developing a realistic estimate of the number of potential taps

We analyzed the latest US Forest Service FIA (Forest Inventory & Analysis) data for the four Northern Forest states as of October 2011

The number of potential taps for each state is based on "conservative tapping guidelines" that suggest 1 tap for live trees 10-17.9" dbh and 2 taps for trees 18" dbh and larger.

To account for density measurements, we developed four categories of sugarbushes based on the number of potential taps per acre[1].

We also grouped the 'distance to road' figures for each plot into four categories:

(1)≤ 300 ft (2) 301ft- ½ mile (3) ½ mile (4) > 1 mile

Based on differing levels of density, distance to road, and species, we created the following categories of potential sugarbushes:

1. Optimal sugarbushes: ≥60 taps/acre of sugar maples on private land within ½ mile of a road
2. Optimal sugarbushes: ≥60 taps/acre of **sugar and red** maples on private land within ½ mile of a road
3. Feasible sugarbushes: 30-59 taps/acre of sugar maples on private land within 1 mile of a road
4. Feasible sugarbushes: 30-59 taps/acre of **sugar and red maples** on private land within 1 mile of a road

Methods: Determining landowner attitudes towards maple sugaring

- We performed a mail survey of 2,400 landowners who own at least 100 acres in Maine, New Hampshire, New York, and Vermont beginning in October 2009 according to practices outlined by Dillman (2000)[1].
  - Maine sample drawn from the Land Use Regulation Commission (LURC)
  - New Hampshire sample provided by Statewide Program of Action to Conserve our Environment (SPACE)
  - New York sample derived Real Property Tax Service Agency
  - Vermont sample provided by the state Department of Taxes.

A SURVEY OF LANDOWNERS IN THE NORTHERN FOREST

- Of the 2,400 questionnaires that were mailed, we received 1,100 completed questionnaires with 163 undeliverable and 7 not usable, resulting in a total adjusted response rate of 49%.

Cornell University
Human Dimensions Research Unit

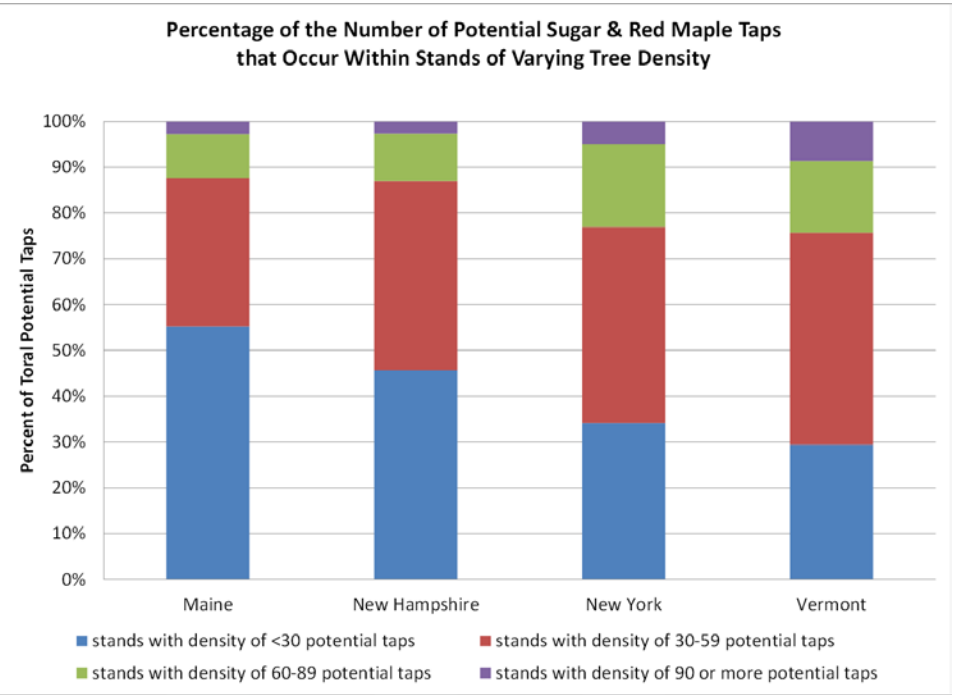
Methods: Determining economics of syrup vs. sawtimber production

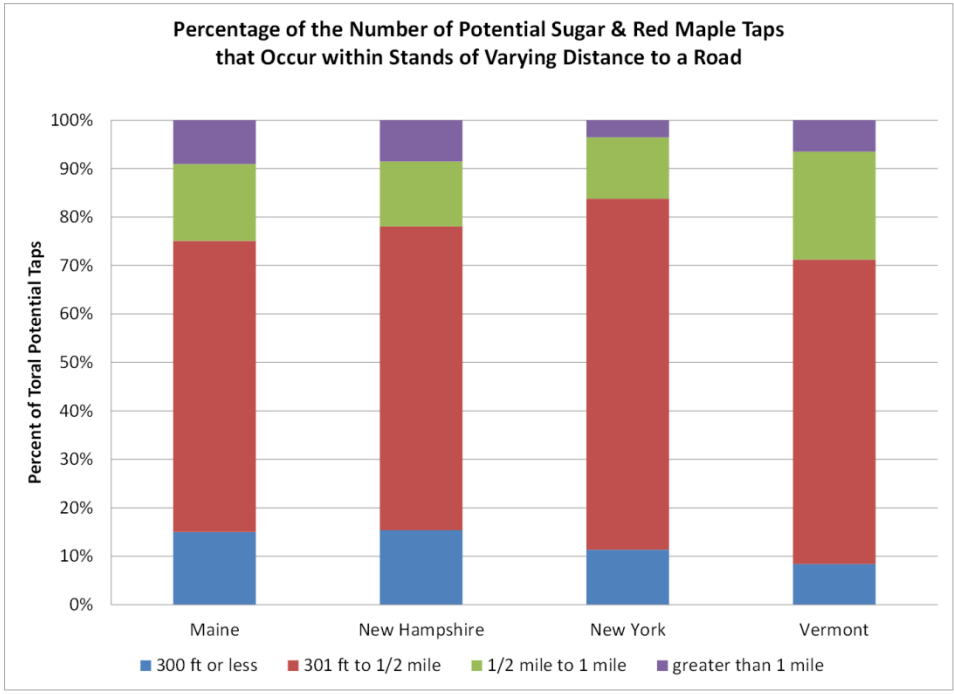
- In order to determine whether a landowner could earn greater revenues by utilizing their maple trees for syrup or sawtimber production, we developed an Excel-based Net Present Value (NPV) calculator in which users enter values for 34 variables based on an individual tree
- NPV Calculator was vetted with forestry and maple professionals, posted on the cornellmaple.com website, and published in the Northern Journal of Applied Forestry

Methods: Evaluating public policy impacts on the maple industry

- We conducted a thorough literature review of all public policies and guidelines that could influence maple syrup production in the Northern Forest region
- We interviewed industry leaders and government officials to hear their direct perspectives on the impact of public policies on sugaring

RESULTS: Refined estimate of tapping potential in the Northern Forest





Density limitations are more important than distance to a road when narrowing down all of the potentially tappable trees to feasible 'sugarbushes'. The following table displays the percentage of maple trees in varying quality of sugarbushes. Vermont is using the greatest percentage of its available trees whereas New York has the greatest potential for expansion.

		Category 1 sugar maples on private land stands with 147+ taps/hectare within 0.8 km of access road		Category 2 sugar+red maples on private land stands with 147+ taps/hectare within 0.8 km of access road		Category 3 sugar maples on private land stands with 74+ taps/hectare within 1.6 km of access road		Category 4 sugar+red maples on private land stands with 74+ taps/hectare within 1.6 km mile of access road	
State	**thousands of taps in 2011**	**thousands of potential taps**	**utilization rate**	**thousands of potential taps**	**utilization rate**	**thousands of potential taps**	**utilization rate**	**thousands of potential taps**	**utilization rate**
Maine	1,470	5,572	26.4%	10,548	13.9%	26,519	5.5%	55,334	2.7%
New Hampshire	420	3,370	12.5%	6,566	6.4%	9,316	4.5%	30,634	1.4%
New York	2,011	15,126	13.3%	48,429	4.2%	63,486	3.2%	171,361	1.2%
Vermont	3,300	6,360	51.9%	12,100	27.3%	32,375	10.2%	56,493	5.8%
Grand Total	**7,201**	**30,429**	**23.7%**	**77,642**	**9.3%**	**131,696**	**5.5%**	**313,822**	**2.3%**

Results: Northern Forest Landowner Survey

Table 2. Landowner's feelings on whether their maple trees should be tapped for syrup production.

	Yes, By me	Yes, By somebody else	No	Not Sure
State				
Multiple (n=77)	4%	30%	33%	33%
ME (n=236)	15%	5%	53%	27%
NH (n=249)	9%	13%	41%	37%
NY (n=230)	6%	8%	57%	30%
VT (n=231)	14%	10%	38%	38%
Total Acreage Owned				
> 2,000 acres (n=62)	10%	20%	45%	25%
500-2,000 acres (n=166)	13%	12%	44%	31%
200-499 acres (n=364)	13%	10%	47%	31%
< 200 acres (n=435)	8%	9%	47%	36%

Larger landowners were the most likely to want to lease their land for sugaring.

Landowners in Vermont and Maine had the most favorable attitudes towards sugaring themselves whereas those who owned land in multiple states were the most likely to want to lease their land for tapping- this is likely due to the fact that at least one of their properties is an absentee ownership.

Reasons why landowners have not started producing syrup themselves

	Never thought of it	No interest in the process	Not enough trees	Land regulations prohibit tapping	Don't know how to get started	Trees are not accessible	Not enough time	Not enough helpers	Cost of equipment is too high	Syrup production is not proftiable enough	Live too far from my land	Tapping would interfere with other uses	Concerned about sawtimber value	Tubing would look bad	Tubing would interfere with trails
Overall	27%	18%	40%	1%	8%	25%	36%	12%	17%	11%	23%	9%	13%	2%	5%
Ownership Jurisdiction															
Multiple (n=77)	25%	11%	25%	0%	8%	25%	41%	10%	8%	16%	25%	16%	25%	2%	5%
Maine (n=236)	34%	21%	46%	1%	8%	26%	35%	9%	12%	10%	24%	9%	10%	2%	2%
New Hampshire (n=249)	26%	17%	52%	1%	9%	35%	38%	13%	16%	8%	21%	5%	5%	2%	6%
New York (n=230)	30%	23%	43%	0%	10%	18%	31%	14%	19%	10%	16%	7%	9%	1%	5%
Vermont (n=231)	21%	15%	22%	1%	9%	25%	43%	15%	29%	14%	32%	14%	26%	3%	10%
Size of Ownership															
> 2,000 acres	16%	16%	11%	2%	4%	18%	29%	4%	4%	13%	13%	38%	47%	2%	0%
between 500 and 2,000 acres	28%	22%	26%	0%	9%	29%	40%	9%	21%	17%	15%	14%	21%	2%	3%
between 200 and 500 acres	24%	18%	41%	0%	8%	23%	40%	12%	18%	11%	22%	8%	9%	2%	7%
less than 200 acres	32%	18%	48%	1%	10%	28%	35%	15%	19%	8%	28%	5%	9%	2%	6%

Our survey clearly indicated the importance of the possible reduction in sawtimber value from tapping among the largest landowners. This concern was also much greater in Vermont and among landowners who owned land in multiple states.

Results: Economics of Syrup vs. Sawtimber Production

We developed a simple table to help foresters and landowners determine if it would be more profitable to use a given maple tree for syrup or sawtimber production.

This table has been published in a peer reviewed journal article[1] and The Sugarmakers Companion, a comprehensive book on maple sugaring.

TABLE 15.5: Variables that Impact Whether Maples Should be Utilized for Syrup or Sawtimber Production

Variables	Conditions that favor leasing taps	Conditions that favor immediate cutting	Conditions that favor long term timber production
TREE SIZE AND QUALITY	Small tree (<12" dbh) Defects in main stem Many lower branches Tree has been previously tapped Tree is a red maple	Large tree (≥18" dbh) No defects in trunk Some dieback visible in top Tree has never been tapped Tree is a sugar maple	Medium size tree (13-16" dbh) No defects in trunk Tall straight tree Tree has never been tapped Tree is a sugar maple
FOREST ATTRIBUTES	Dense stand of accessible maples Large percentage of red maples	Maples are widely scattered and not easily accessible	Maples are widely scattered and not easily accessible
TAPPING METHOD	Low height of tapping zone No metal objects used in collection Log buyer is familiar with tappers	Large height of tapholes/staining Metal objects used in collection No knowledge of past tapping practices	Large height of tapholes/staining Metal objects used in collection No knowledge of past tapping practices
GROWTH RATE	Slow growth rate	Slow growth rate	Fast growth rate
LOG SCALE	Doyle or Scribner	International ¼"	International ¼"
STUMPAGE RATES	Low current prices for maple Low future prices predicted Low price difference for tapped logs	High current prices for maple Uncertainty on future prices High price difference for tapped logs	Low current prices for maple High future prices predicted Low price difference for tapped logs
LEASE RATES	High lease rates above $.50/tap Includes annual fee increases	Low lease rate No annual increase in lease fees	Low lease rate No annual increase in lease fees
PROPERTY TAXES	Tax breaks available for leasing High initial assessment High tax rate	Tax breaks available for forestry Low initial assessment Low tax rate	Tax breaks available for forestry Low initial assessment Low tax rate
DISCOUNT RATE	Low discount rate Landowner wants long-term profits	High discount rate Landowner needs immediate cash	Low discount rate Landowner wants long-term profits
PLANNING	Long time horizon	Short time horizon	Medium time horizon

Results: Impacts of public policies on the maple industry

- Leasing of taps on public land
  - Differing programs in Northern Forest states limits overall resource availability
- Government resources devoted to research and extension
  - Vermont and New York have more extensive infrastructure, Maine is following suit with Maine Maple Task Force
- Government sponsored promotion of the maple industry
  - Vermont clearly leads all states in this regard
- Cost-sharing programs for equipment
  - All states benefit from Federal programs for energy efficiency
- Property tax relief programs
  - New York has most favorable program that provides property tax relief to landowners who produce syrup or lease to a sugarmaker
- Regulation of prices and supply
  - Federation of Maple Producers in Quebec is still tightly regulating supply and prices; their activities will have profound impact on future development of the maple industry in the Northern Forest

Outreach Efforts

- We have shared results of this project through at least 10 presentations at conferences throughout the Northern Forest region in which key stakeholders were present.
- Four peer-reviewed journal articles, a dissertation, and book have all highlighted key findings of our research.
- Media interviews with Mountain Lake PBS, WPTZ-Ch 5 (Plattsburgh-NY), WAMC, the Plattsburgh Press Republican, Adirondack Daily Enterprise, and North Country Public Radio have all highlighted our key findings in regards to the growth potential of the maple industry in the Northern Forest region.
- We have shared key results with our Senators and Congressman; since they are aware of the growth potential and promising development opportunities with the maple industry, Senator Schumer (D-NY), Congressman Owens (D-NY), and Congressman Welch (D-VT) have lobbied to pass the Maple TAP Act as part of the most recent Farm Bill

Implications/Applications for the Northern Forest Region

Is seen in the figure below, if all Northern Forest states tapped the same percentage of trees as those in Vermont (3%), the economic impact would be over 100 million annually. We now have a better understanding of the growth potential of the maple industry and strategies to develop the maple resource in a sustainable manner.

The economic impact of increasing maple syrup production levels to those achieved in Vermont.

	Number of Potential Taps[1]	Number of Actual Taps[2]	Utilization rate	Number of Taps when achieving Vermont's Utilization Rate[3]	Syrup Production Efficiency (oz/tap)[4]	Average Price per Gallon[5]	Current Value of Syrup Production	Potential Value of Syrup Production at Vermont's Utilization Rates
Maine	148,404,616	1,430,000	1.0%	4,361,583	27.9	$ 33.27	$ 10,354,694	$ 31,582,419
New Hampshire	77,720,574	420,000	0.5%	2,284,193	29.5	$ 50.40	$ 4,882,752	$ 26,555,112
New York	305,685,731	1,903,000	0.6%	8,984,045	26.9	$ 38.83	$ 15,543,598	$ 73,381,184
Vermont	108,881,278	3,200,000	2.9%	3,200,000	35.4	$ 34.57	$ 30,566,151	$ 30,566,151
Northern Forest	640,692,198	6,953,000	1.1%	18,829,822	29.9	$ 39.27	$ 61,347,195	$ 162,084,866

1: These are calculated only for non-reserved forestlands, i.e. those that are NOT legally prohibited from timber harvesting or management

2: Based on USDA NASS 2010 Maple Syrup Crop Report

3: These figures are calculated by multiplying the number of potential taps by 2.94%, the utilization rate achieved in Vermont in 2010.

4: Based on the average production per tap for each state between 2007-2009 as seen in the 2010 NASS Maple Syrup Crop Report.

5: Based on the average price received for all retail, wholesale, and bulk syrup sales for each state between 2007-2009, as seen in the 2010 NASS Maple Syrup Crop Report.

- As more people realize the growth potential of the maple industry in the Northern Forest region, existing producers are expanding their operations and new producers are moving in to start large operations. Maple syrup production is now the fastest growing agricultural industry in the U.S., with the Northern Forest region leading the way.

- Since we found that large landowners are the most concerned about the impact of tapping on sawtimber value, and that landowners tend to earn more money from sugaring if they are dealing with non-veneer trees over long-time horizons, this message needs to be publicized as greatly as possible among large landowners and stakeholders in the Northern Forest.

Future Directions

- We will continue our research on the public policy impacts on the maple syrup industry in the Northern Forest. A paper is currently being drafted on this topic and will soon be submitted to *Forest Policy & Economics*.
- We plan to expand our research on landowner attitudes towards maple syrup production to jurisdictions outside of the Northern Forest region and to landowners who own less than 100 acres.
- We will examine the potential to expand the production or birch sap and syrup in the Northern Forest region. This will include developing realistic estimates of the tapping potential and surveying maple producers to determine their perceived opportunities and barriers to also producing birch syrup.
- We will work on expanding the Net Present Value (NPV) Calculator for determining the economics of utilizing maple trees for syrup or sawtimber production to be applicable for an entire stand (rather than an individual tree)
- We will research and develop the value of community sugaring as a community development strategy

Conference Presentations

•Farrell, M. 2013. Evaluating the growth potential of the maple industry in the Northern Forest Region. Poster presentation at the North American Maple Syrup Council Annual Meeting. Moncton, New Brunswick. October 24-26, 2013.

•Farrell, M. 2013. Evaluating the growth potential of the maple industry in the Northern Forest Region. Poster presentation at the North American Agroforestry Conference. Prince Edward Island, Canada. June 21, 2013.

•Farrell, M. 2013. The economics of utilizing maples for syrup or sawtimber production. Joint Meeting of the New England and New York Society of American Foresters. Saratoga, NY. January 31, 2013

•Farrell, M. 2012. Assessing the growth potential of the Northern Forest maple industry. ECANUSA Forest Research Conference. Durham, NH. November 1, 2012.

•Farrell, M. 2012. The economics of utilizing maples for syrup or sawtimber production. North American Maple Syrup Council Annual Meeting. October 24, 2012.

•Farrell, M. 2011. Tapping Potential in the US: An Updated Assessment. Annual meeting of the North American Maple Syrup Council and International Maple Syrup Institute. Frankenmuth, MI. October 23-26, 2011.

•Farrell, M. 2011. The Economics of Tapping vs Timber Production. NYS Maple Conference. Verona, NY. January 21, 2011.

•Farrell, M. 2011. The Economics of Tapping vs Timber Production. Northern NY Maple Expo. Potsdam, NY. January 7-8, 2011.

•Farrell, M. 2011. Net Present Value Analysis on Tapping vs. Timber Production. North American Agroforestry Conference. Athens, GA.

•Farrell, M. 2010. Landowner Attitudes Towards Maple Production in the Northern Forest. Annual Meeting of the North American Maple Syrup Council. Stratford, Ontario. October 2010.

Peer Reviewed Publications

•Farrell, M. and B. Chabot. 2012. Assessing the growth potential and economic impact of the U.S. maple syrup industry. *Journal of Agriculture, Food Systems, and Community Development 2*(2), 11–27. http://dx.doi.org/10.5304/jafscd.2012.022.009

•Farrell, M. 2012. The Economics of Managing Maple Trees for Sawtimber Production or Leasing for Syrup Production. *Northern Journal of Applied Forestry*. 29(4):165-172.

•Farrell, M. 2012. Estimating the maple syrup production potential of American forests: An enhanced estimate that accounts for density and accessibility of tappable maple trees. *Agroforestry Systems*. 87(3): 631-641

•Farrell, M and R. Stedman. 2013. Landowner attitudes towards maple syrup production in the Northern Forest: A survey of forest owners with > 100 acres in Maine, New Hampshire, New York, and Vermont. *Northern Journal of Applied Forestry*. in press

Other Publications

•Farrell, M. 2013. Assessing the growth potential of the maple syrup industry in the United States: A multi-disciplinary approach based on ecologic, socio-economic, and public policy factors. Ph.D. Dissertation, Cornell University. 224 p.

•Farrell, M. 2013. The Sugarmakers Companion: An integrated guide to producing syrup from maple, birch, and walnut trees. Chelsea Green Publishing. White River Junction, VT. 327 p.

.